Packaging product design : a concept towards a more sustainable solution combining packaging and product design

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NANYANG TECHNOLOGICAL UNIVERSITY
SCHOOL OF ART, DESIGN & MEDIA

PACKAGING PRODUCT DESIGN

A CONCEPT TOWARDS A MORE SUSTAINABLE SOLUTION
COMBINING PACKAGING AND PRODUCT DESIGN

HENRIETTE S. PETER

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ABSTRACT

This Master's thesis introduces and presents the term 'Packaging Product Design' which refers to a novel conceptual design approach in interdisciplinary design practices, integrating Packaging Design and Product Design. Packaging Product Design aims to provide an alternative sustainable design approach to reduce generated packaging material waste. This is possible by incorporating the packaging with its packed product to create an additional value in the form of a 'packaging product', lowering the probability of the packaging's disposal.

The research investigation begins with a literature review which addresses the sustainability awareness in Packaging and Product Design. The novelty of Packaging Product Design is proven through the scarcely documented existence and implementation of an integrated approach towards the two fields under research. This gap is addressed through Packaging Product Design. The research continues with an embedded single-case study, which is derived from a methodical triangulation of the following: secondary research, survey and visual analysis. Through an exhaustive search in contemporary design developments, qualifying packaging products could be detected and identified. These identified packaging products were then thoroughly analysed to determine their characteristics, distinctive qualities and approaches. These analyses helped to create a feasible conceptual framework incorporating essential form specific and function specific approaches, together with assessment criteria, formulated to guide and evaluate the sustainable approach of Packaging Product Design. To corroborate its feasibility, a conceptual packaging product prototype is then developed in the form of a smartphone docking station, following the introduced framework and established assessment criteria.

Packaging Product Design contributes as a new viable sustainable alternative to current design practices in Packaging and Product Design, while enabling an interdisciplinary and exciting design approach for product and packaging designers alike. This approach will hopefully also inspire further, out-of-the-box sustainable interdisciplinary approaches and solutions, to solve the crucial global issue of manmade waste and contribute to a better world.

“No longer is it merely about using green materials, but now it’s also important to put a secondary use or function into packaging design. This is the next stage in packaging evolution.”

— Jason Ivey (Founder of Icon Packaging)

1 INTRODUCTION

Packaging is omnipresent in our everyday modern life but often overlooked. It is found in countless forms, materials, textures and colours which people constantly engage with. However, the importance of packaging is often not valued by the consumer, even though packaging is indispensable in protecting, transporting and even advertising a contained desired product. The latter function can account for and influence direct purchase decisions by up to 70 percent at the Point-of-Sale, depending on the product category (Zillgitt, 2011). With such crucial functions, it seems ironic not to realise that packaging is the most dispensable part of a product.

Essential and valuable as packaging is, its sustainable and environmentally friendly disposal is equally crucial. Waste management is a global issue that affects even Singapore, the young, multicultural and cosmopolitan world city that strives for the best and is at the forefront of industry and technology. According to its National Environmental Agency, there will not be any space left on Singapore's only landfill, Pulau Semakau, by 2035 – if the current disposal rate continues at 8.284 tonnes of waste per day. This tremendous amount of waste could be decelerated, if local households would re-cycle more. Statistics show that average Singaporean households re-cycled around 19 percent of their waste in 2015. However, this re-cycling rate has actually dropped from 22 percent since 2010, over the last five years (Boh, 2016). This statistic is unsettling, and presents itself as a major challenge for Singapore's future as a leading nation, where increasing re-cycling procedures and an aggressive re-cycling culture need to be further developed and stimulated. Countries in Europe, such as Austria and Germany are already recycling over 60 percent and all of Europe is targeting to recycle 50 percent of household and similar waste by 2020 (European Environment Agency, 2013).

From all generated household waste, nearly 65 percent consists of packaging materials according to calculations made by McDonough and Braungart (2013). This

represents a substantial volume of packaging material which goes straight into the landfill. Furthermore, trends in waste generation show that the overall volume of produced waste will yet continue to increase (Nielsen, 2011).

The research presented in this thesis aims to contribute to the overall reduction of packaging waste, by finding a novel way of enhancing the conscious relationship of consumers towards packaging. The overall initiative is to integrate packaging and its packed product, so that there is a particular motivation to not dispose of the packaging. This concept is fully elaborated and introduced as Packaging Product Design throughout this study.

1.1 AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to present and introduce the concept of Packaging Product Design as a feasible sustainable alternative to current design practices in the separate disciplines of Packaging Design and Product Design. Packaging Product Design is proposed as an interdisciplinary design approach intended for designers and engineers of both disciplines, which contributes an alternate solution towards reducing the amount of generated packaging material waste. For this purpose, packaging is designed to be integrated with its packed product to present an additional value. The additional value is intended to give a useful afterlife to the packaging's original purpose, deterring its disposal. With this aim, the following research question is considered:

How can the interdisciplinary approach of both, Packaging and Product Design, be consolidated and integrated, as a feasible and sustainable alternative to current design practices?

The presented thesis provides an elaborated endeavour towards discovering, studying and analysing Packaging Product Design to answer this question, by consolidating the following objectives:

- To search and verify any existence of packaging products and its underlying principles in an academic context.
- To detect and identify potential packaging products in the context of contemporary design developments.
- To better understand the current situation of packaging products.
- To determine how a viable packaging product can be created.
- To create and introduce a feasible conceptual framework for Packaging Product Design and establish assessment criteria to verify its sustainability.
- To test the introduced framework and assessment criteria through the development of a conceptual packaging product prototype.

Given the aim, research question and the objectives of this study, an introduction to the topic is necessary, to unfold and understand the origin of Packaging Product Design.

1.2 BACKGROUND OF PACKAGING PRODUCT DESIGN

Packaging Product Design is still an unexplored conceptual design approach to create sustainable solutions by integrating the fields of Packaging Design and Product Design. It is fundamentally necessary to first elaborate on the term ‘sustainability’ and its terminology, as applied in the context of this research. The focus then shifts towards Victor Papanek, a key author of sustainability, to draw a link between sustainability and design, including his view on customers’ behaviour towards packaging. The study eventually leads to Scott Boylston, the key author inspiring this research and his statement regarding the integration of Packaging and Product Design. This sub-chapter concludes by establishing the term ‘packaging product’, which is used throughout this research.

1.2.1 SUSTAINABILITY

The term ‘sustainability’ is often defined in various ways, depending on the context it is used in. As described by Charles V. Kidd in ‘The Evolution of Sustainability’, the term ‘sustainability’ has six separate but related roots (Kidd, 1992). These roots all thematise topics such as the use of resources, population growth and stress on the environment, which are all connected to the contemporary understandings of sustainability. As such, these roots of sustainability are equally valid, as the term ‘sustainability’ was neither used nor properly defined. This research considers the root of Ecodevelopment, a term invented by Professor Ignacy Sachs in 1977, and publicised in his essay ‘The Salient Features of Development’. He did not use the term ‘sustainability’ in his essay, but his contribution influenced and provided the substantive reasoning for the UNEP (United Nations Environment Programme) document in 1978. This document, ‘Review of the Areas: Environment and Development, and Environment Management’, has been denoted to be the first U.N. document to use the term ‘sustainable’ in the context of Ecodevelopment (Brown, Hanson, Liverman, & Merideth Jr, 1987; Kidd, 1992).

In the 80’s the term ‘sustainability’ became popular and began to be used in several books and reports. During this time, non-governmental organisations stimulated debates about sustainability by developing further ideas and concepts. Governmental agencies, on the other hand, responded to these ideas and concepts by adapting them within their own

policies and actions. One independent international study group deserves to be mentioned in the context of this research, as it generated an important contribution by particularly defining the term ‘sustainability’ in the context of development, the World Commission on Environment and Development. In 1987, it released its final report, ‘Our Common Future’, otherwise known as the ‘Brundtland Report’, with its focus on sustainability (Kidd, 1992; Lumley & Armstrong, 2004; Poole, 2007). In this report, sustainable development was defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (World Commission on Environment and Development, 1987, p. 43). It is through this report that sustainability development was brought from a theoretical and academic context to an international political level and encouraged global action (Kidd, 1992).

Given this historical outline on the origins of the term ‘sustainability’, the perspective is shifted towards sustainability in design, by concentrating on one of its key authors, Viktor Papanek.

1.2.2 PACKAGING IS THE PRODUCT

Cited and mentioned as “key author of sustainability” (Walker, 2006, p. 25), the architect, designer and environmental activist Victor Papanek is imperative when it comes to sustainability in the context of design practices (Hiesinger & Marcus, 1993; Kirkham & Weber, 2013; Rodgers & Milton, 2011; Walker, 2006). Papanek is one of the first to subconsciously articulate and introduce the concept of sustainability in his first book ‘Design for the Real World’, even before the term ‘Ecodevelopment’ was invented. In his book, he claims the design-planner to be responsible for almost all human made environmental mistakes, due to poor design decisions (Papanek, 1971). He went on to further suggest that for design to be ecologically responsible, it must be revolutionary and has to go back to its roots, following nature’s principle of least effort – in Papanek’s words: “doing the most with the least” (Papanek, 1971, p. 343). In his last book, ‘The Green Imperative’, Papanek thematised sustainability in Product Design by claiming that sustainability can either be facilitated or held back by design. Sustainability had to be considered, not only after the product had been produced, but rather begun from the moment the designer created the first idea of the new product (Papanek, 2003). Papanek did not only focus on products, he also thematised packaging, as it can serve as a powerful tool in order to not only protect, but also promote the product. Furthermore, he criticised consumer’s behaviour and their obsession with the external appearances of packaging, by declaring that “the packaging is the product”

and that this behaviour still exists as of today (Papanek, 2003, p. 33).

While stating “the packaging is the product”, Viktor Papanek subconsciously expressed what the approach of Packaging Product Design strives to accomplish. Amazingly, fourteen years after Papanek’s first publication of ‘The Green Imperative’, Scott Boylston reinterpreted Papanek’s thought of “packaging is the product”, in his book ‘Designing Sustainable Packaging’ (2009), elaborating a new perspective.

1.2.3 PACKAGING AS PRODUCT

In his book, ‘Designing Sustainable Packaging’, Scott Boylston challenged designers to refocus Packaging Design towards more environmentally friendly approaches. His book is vital for this research, as Boylston is the only scholar found to have taken Papanek’s comment about “packaging is the product” (Papanek, 2003, p. 33) in the most literal sense. Boylston reclaimed the concept of “packaging as product” (Boylston, 2009, p. 52), interpreting the packaging as a product by itself, generating an additional value.

As Boylston reclaimed this concept, he indicated three categories by which packaging with additional value can be sorted (Boylston, 2009):

1. Reuse by default: packaging is used in its original form, serving the same purpose as originally intended. For example, a tin box which originally packed cookies is used again to pack and keep cookies or the like.
2. Reuse by innovation: original packaging is modified, serving a completely different purpose. For example, a wine bottle made of glass is modified to become a lamp shade, by cutting off the lower part of the bottle.
3. Reuse by prescription: packaging that has a well-defined purpose, earlier determined by the packaging manufacturers.

The research presented in this thesis focuses on the last category, reuse by prescription, as this is precisely what Packaging Product Design represents. Items sorted into this category are referred to as ‘packaging product’, a term widely used in this research to describe items which follow Boylston’s third category, reuse by prescription. A further debatable term could be ‘packaging with secondary use’. However, this term may be wrongly associated in the packaging industry with the term of ‘secondary packaging’.

Having elaborated on sustainability, introduced the term ‘packaging product’ and explained the origin of Packaging Product Design, a summarised thesis outline follows.

1.3 OUTLINE OF THESIS

The structure of the thesis was constructed to meet the above stated objectives, leading towards the aim of this research: to present and introduce the concept of Packaging Product Design as feasible sustainable alternative to current design practices in Packaging Design and Product Design. This chapter introduced sustainability in the pertinent context of this thesis, explained the term ‘packaging product’ and elaborated on the aims and objectives of this research, together with the origin of Packaging Product Design.

In the second chapter of this thesis, a literature review is conducted where indications for Packaging Product Design are examined in academic literature. The first part outlines the sustainability awareness in Packaging, whereas the second part investigates sustainability awareness in Product Design. This literature review aims to verify any existence of packaging products and its principles in an academic context.

In the third chapter, an embedded single-case study is conducted where indications for Packaging Product Design are investigated in the context of contemporary design developments. A triangulation of methods is used for this purpose, including: secondary research, survey and visual analysis. The first part detects and identifies existing packaging products in contemporary design developments. Subsequently, based on the found packaging products, two separate analyses were conducted. The first analysis seeks out reasons to help understand the current situation of packaging products better. The second analysis seeks to determine how a viable packaging product can be created. The outcomes of the analyses result in the initial conceptualisation of a Packaging Product Design framework and its assessment criteria.

In the fourth chapter, the approach of Packaging Product Design is laid out based on outcomes from the previous chapters, together with the created conceptual framework and assessment criteria for its sustainability. Packaging Product Design is then implemented and tested to corroborate its feasibility, in the form of a conceptual packaging product prototype. The conceptual prototype is finally evaluated following the introduced framework and assessment criteria, to determine if a successful implementation of Packaging Product Design is possible.

By the end of the thesis, each objective, the overall aim of this thesis and through it, the research question will have been answered. The approach of Packaging Product

Design is hence presented as a novel, feasible and sustainable alternative to current design practises in Packaging and Product Design.

Given the introduction of this thesis and its presented outline, the next chapter investigates indications of Packaging Product Design in the academic literature.

2 SUSTAINABILITY AWARENESS

The outline of the research has been discussed in Chapter 1, including the integrated approach to Packaging and Product Design – Packaging Product Design. This approach has been referred to by Boylston (2009) as packaging with additional value, by following his third category of reuse by prescription. To find further indications of reuse by prescription, this chapter investigates Packaging Product Design in the academic literature. As the concept of packaging products is closely linked to sustainable solutions towards packaging and products, this literature review focuses on the sustainability awareness in both fields: Packaging and Product Design.

Packaging Product Design is categorised in this thesis as a sustainable design approach rather than an eco-friendly design approach. This decision can be argued, depending upon the literature from which individual approaches are defined. However, the definition and categorisation has been taken for this research as made by Charter and Tischner (2001) in their book ‘Sustainable solutions: Developing products and services of the future’. In their book, Eco Design is described as the unity of Product Design and its environmental aspects. Instead, Sustainable Design is described as the unity of Eco Design with social/ethical issues. Packaging Product Design is a pre-distribution solution that aims towards a rather holistic and system based approach. Its democratic principles influence the customers’ values, and its additional use motivate a different train of thoughts towards more sustainable solutions in packaging.

The main objective of this chapter is to search and verify any existence of packaging products and its underlying principles in academic literature of both fields, Packaging and Product Design. These findings help to understand the current state of sustainable approaches and try to find further hints towards an interdisciplinary pre-distribution solution, involving Packaging and Product Design, which offers an additional value. The contents of this chapter are structured as follows.

The first sub-chapter outlines the sustainability awareness in Packaging, including contemporary approaches and currently accredited movements towards sustainable packaging solutions. The term ‘accredited movements’ identifies movements and approaches, which can be traced to accepted terms of definitions, with records in academic literature.

The second sub-chapter investigates sustainability awareness in Product Design, exploring the history of Product Design and its responsiveness towards a growing global environmental awareness. The historical timeframe encompasses approximately 80 years. Since the beginnings of World War II when plastics became the preferred material – suppressing formerly used environmentally friendly packaging solutions –, until now. Additionally, the particular movement of Democratic Design is highlighted.

Both investigations aim to provide a clearer overview of the existing thoughts regarding sustainable Packaging and sustainable Product Design solutions, to establish the theoretical background to the problem under research and find out how to compose a sustainable interdisciplinary approach involving packaging and product design, alike.

In the following, the literature review is first conducted by examining the sustainability awareness in Packaging, through its contemporary approaches and accredited movements.

2.1 SUSTAINABILITY AWARENESS IN PACKAGING

Packaging has always been a part of the consumption process in our lives and is an elementary component of globalisation (Siegle, 2010). While it fulfils essential functions in today's world, packaging is often underrated by most customers. The cause of this strongly correlates with the simple fact that most packaging functions would have served their time, as soon as a consumer has picked up the packaging (Robertson, 2012). Common literature considers packaging to have four primary functions:

1. Protection: The function to protect its commodity content. Packaging dramatically decreases the amount of product waste, as it is designed to protect the product from any damages (Stana, 1994).
2. Containment: The function to contain the packaging's content. Packaging ensures that none of the packed product is dispersed and lost – which would increase pollution through product wastage (Robertson, 2012).
3. Communication: The function to communicate valuable product information, which can be divided into two categories. The first category handles key product information that informs customers of packaging content, ingredients, instructions and the like. The second category comprises the function of marketing, which enhances the brand value of the product by representing the content in an ideal and appealing manner (Stana, 1994).
4. Convenience: The function to facilitate convenience. Packaging should be created to meet the consumption needs of the consumers. This includes, for example, appropriate portion conveyance, resealable containment or ease to open packaging (Robertson, 2012).

These four functions of packaging may often be taken for granted in our everyday lives, though they are crucial for servicing the commodities contained. As such, constant efforts must be considered to find ways that make packaging more sustainable, while tackling one of the biggest issues of our globalised world: man-made waste. Hence, this chapter draws on contemporary practices of sustainable packaging solutions, rather than solely designed packaging solutions.

The term sustainable packaging can be understood and defined in many ways, given their contexts. In this setting, the basic definition given by the Sustainable Packaging Coalition is used. Sustainable packaging is envisioned as a fusion of objectives from environmental strategies of industrial ecology and commercial considerations regarding the packaging's life cycle (Sustainable Packaging Coalition, 2011). Furthermore, the Sustainable Packaging Coalition stated eight criteria, which facilitates the life cycle of packaging materials into a closed loop – as these criteria relate to the value chain of packaging. In the following, the criteria of the Sustainable Packaging Coalition for sustainable packaging are cited in unspecified order:

“Sustainable packaging:

- A. Is beneficial, safe & healthy for individuals and communities throughout its life cycle
- B. Meets market criteria for performance and cost
- C. Is sourced, manufactured, transported, and recycled using renewable energy
- D. Optimizes the use of renewable or recycled source materials
- E. Is manufactured using clean production technologies and best practices
- F. Is made from materials healthy throughout the life cycle
- G. Is physically designed to optimize materials and energy
- H. Is effectively recovered and utilized in biological and/or industrial closed loop cycles” (Sustainable Packaging Coalition, 2011, p. 1)

In addition to the above criteria of the Sustainable Packaging Coalition, it is important to note that all approaches towards sustainable packaging are intended to benefit the environment, minimise the carbon footprint of man-made packaging waste and also to cut down costs (The Economist, 2007).

Given this definition of sustainable packaging, the emphasis of this chapter shall include considerations of contemporary industrial approaches, as well as movements led by autonomous parties and designers, which promote more sustainable packaging solutions.

From the encompassed approaches and movements, either created industrially or by individuals, some of the listed movements and implementations of sustainable packaging are still in the concept stage, whilst others are already found as finalised applied solutions, distributed on the market. These sustainable packaging solutions comprise different approaches, including pre- and post-distribution solutions, as well as the use of alternative materials. For better overview of developments, the available solutions are separated into

two main executant groups, the industry and autonomous parties (individuals and groups), including designers. In the case where a movement or approach has been addressed by both executant groups, it is attributed to the group with the most frequent use.

The movement of Zero-Waste has been excluded from this listing, as its purpose is not only to reduce, but also to stop the impact we have on landfills. This is conducted by embracing the 3 R's, to re-duce, re-use and re-cycle everything to the fullest (Korst, 2012; Siegle, 2010). As the latter two approaches are already addressed in this chapter, the Zero-Waste concept loses its distinctiveness.

Finally, the outcome of some of the collated movements, found mainly in Section 2.1.2 Autonomous Parties and Designers, can actually be considered and described as products. Nonetheless, they are listed in this section, concerning sustainability awareness in Packaging, as their initial production states and original purposes were as packaging.

Keeping all of these considerations in mind, this section begins to discuss sustainability awareness in Packaging, following common contemporary industrial approaches.

2.1.1 INDUSTRIAL APPROACHES

Under the term of contemporary industrial approaches, every sustainable method requiring suitable machinery is considered. However, all of the following industrial approaches originated from autonomous parties and designers, hence, some of these approaches are still being practiced by these groups. Nonetheless, befitting their popularity and technological advancements, they were efficiently adopted by the industry to be executed on a large scale. In the following, probably the most noted and acclaimed industrial approach is discussed first: Re-cycling.

RE-CYCLING

Re-cycling is a post-distribution solution, defined by the International Organization for Standardization (ISO) as a manufacturing process by which used packaging material are physically or chemically reprocessed into a product (International Organization for Standardization, 2013). The principle of re-cycling may be very simple, but actual re-cycling processes of different materials are significantly different. Each of these materials (e.g. paper, plastics, glass, metal, etc.) including every subdivision (plastics: PP, PE, PET, PS, PVC, etc.; glass: blue, green, brown, white; etc.) have their own re-cycling processes within various

different machineries. These machineries are needed to sort, filter, wash, chop, bleach, dry, melt, mould, cool and process all materials into their re-cycled state. Re-cycling is also known to be more energy efficient and cleaner during the re-production process, since used materials have already been processed and refined previously (Siegle, 2010).

Initial ideas of re-cycling have been traced back to 2000 BC, where evidence for a recovery system of bronze scrap was found (Siegle, 2010). In a more contemporary context, re-cycling resurfaced around 1974, following the energy crisis in 1973. During this period, society was painfully made aware of its limited resources, along with issues of pollution and other environmental factors. Designers were quick to respond to the new demands of society (Hauffe, 1998). Over the years, the industry has initiated various attempts, in order to be able to re-cycle more materials, more effectively. One approach which was launched, and is still being practiced in some areas of the world, is the kerbside programme. Following programme guidelines, consumers sort garbage into separate bins for paper, plastics, glass and the like. Through this approach, processing has become easier for re-cycling companies. However, many consumers remain ignorant about the hows and whys of separating garbage. Due to this, new trends and solutions emerged, like the co-mingled or single stream collection. This new approach of dealing with garbage made it convenient for households and more efficient for the industry. Through new technologies, re-cyclable garbage can be nearly automatically identified, sorted and processed (The Economist, 2007).

DOWN-CYCLING

The term down-cycling was first used during an interview with Reiner Pilz, in an article by Thornton Kay of *Salvo*, in 1994. In this, Pilz, a German engineer, up-cycler and owner of Pilz GmbH, harshly criticised re-cycling, by rather considering the current re-cycling processes as down-cycling. In his own words, “they [EU Demolition Waste Streams directive] smash everything” (Kay, 1994, p. 14).

Down-cycling was rapidly adopted and obtained a proper definition. Down-cycling appears when waste material is either mixed with materials of reduced quality or undesirable elements. This process generates a material of less value as it impairs its original properties, such as its mechanical performance (Koffler & Florin, 2013). This definition by itself already addresses issues of the down-cycling approach – a post-distribution solution – which were further elaborated by McDonough and Braungart in their book ‘Cradle to Cradle’, in 2002. McDonough and Braungart cautioned that down cycling not only reduces the mechanical performance and the quality of a material over time, but also increases the

pollution of the environment. The reasoning behind this is that, in order to make the materials useful again, more chemicals are required compared to the original production of its predecessors. A clear example for additional required chemicals is the reprocessing of plastics. During the remoulding process of plastics, polymers are altered. This alteration can cause the plastic to be, for example, less elastic, along with other problems. In order to regain this flexibility, more chemical additives are added (Lewis & Gertsakis, 2001; McDonough & Braungart, 2002).

USE OF BIO-BASED MATERIALS

The raw elements for bio-based materials are primarily annually renewable resources, such as corn, rice or beeswax (Robertson, 2012). The use of bio-based materials is generally considered a pre-distribution solution and their use as packaging dates back several centuries. Packaging out of bio-based materials slowly phased out at the beginning of the twentieth century, when petrochemicals were used for most industrial products. However, in the beginning of the twenty-first century, growing sustainability concerns helped bio-based materials to be applied in evolved forms (Robertson, 2012).

Some of the presented solutions may still be in conceptual stages or recently introduced into the market. What they all have in common, is that intensive research, knowledge, technology and machinery developments are required in order to produce them. This approach is divided into four different categories according to their material types and degradation processes, namely: natural materials, processed biodegradable materials, dissolvable materials and edible materials.

Natural Materials

The first use of bio-based packaging materials are natural materials which remain unaltered and do not contain any toxic or chemical substances. These materials can be derived from living substances such as milk, pulp or beeswax (Yeang, 2006). Consequently, they can be released back into nature where it decomposes naturally, through its short life span. In the following study, two cases of packaging solutions are introduced, which represent the principles of natural materials.

The first example of natural materials for this study was introduced in 2012 by the Swedish company Tomorrow Machine (Bakutyte, 2014). In their concept series called: 'This too shall pass', they created three food packaging, using different natural materials as seen

in Figure 2.1-Figure 2.3.

Figure 2.1: © Tomorrow Machine - Oil packaging

Figure 2.2: © Tomorrow Machine - Smoothie packaging

Figure 2.3: © Tomorrow Machine - Rice packaging

Figure 2.1 shows a caramelised sugar packaging with a coating of beeswax. The packaging is meant to pack oil based products and can be cracked open like an egg. Figure 2.2 shows an agar-agar seaweed gel packaging. The packaging serves as smoothie packaging and allows a drinking straw to easily puncture the packaging for consumption. Additionally, the agar-agar seaweed gel withers within the same life-span as its content. Figure 2.3 shows a biodegradable beeswax packaging. The packaging is meant to pack rice in individual portions, which can be peeled like a fruit for consumption (Bakutyte, 2014).

Figure 2.4: © Szczypek - Happy Eggs

Another example of the use of natural materials is a concept created by the Polish designer Maja Szczypek called Happy Eggs, shown in Figure 2.4. The packaging features an egg carton made of heat-pressed cut hay. Hay was used as it thematically represents the natural environment of chicken eggs and naturally degrades with time (Kwan & Ho, 2014; Martínez, 2014).

Processed Biodegradable Polymers

The second use of bio-based packaging materials are processed biodegradable polymers – also referred to as PLA (PolyLactic Acid). Processed biodegradable polymers contain similar raw material sources as natural materials. However, in order to create a processed biodegradable polymer, the raw material like corn starch, sugar cane and the like, needs to be chemically altered through either direct condensation or a ring-opening polymerisation. This alteration, which happens during the production process, causes the raw material to obtain attributes that are rather known from petrochemical-based plastics (Drumright, Gruber, & Henton, 2000). What makes PLA distinctly different from petrochemical-based plastics, besides its raw material, is its ability to be decomposed by bacteria or fungi. Nonetheless, it is generally unsuitable to be disposed into a home compost pile or a landfill (Davis & Song, 2006).

PLA was first discovered in 1845 by the French chemist Théophile-Jules Pelouze. However, considering the scope of this research, the most relevant literature regarding processed biodegradable polymers, points towards 1988. By this time, an international food conglomerate, Cargill Incorporated, began further researching the production and application of PLA. Due to the state of technology back then, Cargill Incorporated came to the conclusion that the production of PLA was unfeasible at a large scale. Nonetheless, almost a decade later in 1997, Cargill and The Dow Chemical Company merged to become Cargill Dow LLC and began developing the technology and production of NatureWorks™ PLA (Gruber, 2003; Gruber & O'Brien, 2005).

Figure 2.5: © BIOTA - Degradation process of NatureWorks™ PLA

To illustrate the nature of processed biodegradable polymers, the example of BIOTA is given. BIOTA is a spring water company which fills their mineral water in NatureWorks™ PLA bottles made of corn starch. This bottle is able to biodegrade completely, as observed in Figure 2.5. However, the bottle needs to be placed in a

commercial composting situation, under special conditions, in order to achieve a complete degradation within months (Banda, 2011; Boylston, 2009).

Another example of innovation in biodegradable polymers comes from the German start-up Qmilk, Figure 2.6. With a peripheral stock of two million tons of milk, which cannot be used for food production in Germany, the start-up has found another way to make use of these vast resources. Qmilk produces polymer granulate, powder and fibres out of the Casein of normal milk. These Qmilk-polymers could serve as substitutes for micro-plastics as they possess the same abrasive and peeling properties found in scrubs and some toothpaste. Furthermore, Qmilk-polymers can be used for weaving textiles and producing skincare cosmetics (Bünnagel, 2014a).

Figure 2.6: © Qmilk - Products

Processed biodegradable polymer innovations may still be in their infancy, however, the technology to make them viable at an industrial scale is catching up. Additionally, production trends are enforcing processed biodegradable polymers as alternatives in replacing petrochemical-based plastics. Evidences of this can be found in German packaging journals, where polymers have been one of the main and most discussed topics in 2014. Even the European association, European Bioplastics, predicted an increase of the bioplastics production to six million tons by 2017 (Bünnagel, 2014b). Quite a number of different materials have already been developed (Davis & Song, 2006; Worrell, 2012) and many well-known companies endorse the idea of biodegradable polymers, like TetraPak (Neue Verpackung, 2014a), BASF (BASF, 2014) and ES-Plastic (Neue Verpackung, 2014b).

Dissolvable Materials

The third use of bio-based packaging materials are dissolvable materials. In this context, the term dissolve refers to a material that, under the influence of water, breaks down rapidly and vanishes completely. The dissolvability of the material can be

engineered to be either soluble in hot water, cold water or soluble regardless of the temperature (Dent & Sherr, 2015). One such example was created by the Canadian atelier BangBang, a concept toothbrush packaging called Dissolve, Figure 2.7. The packaging comprises 60 gsm of cellulose-based tree pulp and PVA (PolyVinyl Acetate), which is 100 percent biodegradable. The ink used is environmentally friendly and based on black soybeans. This packaging dissolves within 10 seconds under the influence of water (Dent & Sherr, 2015; Martínez, 2014).

Figure 2.7: © BangBang - Dissolve

Figure 2.8: © Monosol - Vivos® Films

Another example of innovation in dissolvable materials comes from the company MonoSol. MonoSol is a producer of polymer films, pouches, sachets and the like. Their product, Vivos® Films, is a transparent, non-toxic, odour and tasteless film which can be used for example to portion rice, see Figure 2.8. Under the influence of hot or cold liquid, the Vivos® Films releases its content (Dent & Sherr, 2015).

Dissolvable materials are considered to be one of the future leading trends, as it goes one step further than processed biodegradable polymers, by not requiring physical recycling treatments and vanishing on the spot (Blackman, 2013). This is underpinned by the amount of newly written patents on dissolvable materials, published over the past 5 years.

Edible Materials

The last use of bio-based packaging materials are edible materials. Edible materials are derived from renewable sources, which are mainly by-products or waste from the food industry (Janjarasskul & Krochta, 2010). As edible packaging needs to completely enclose the food product, its particular qualifying requirement is that it must be either tasteless or be taste compatible with the packed product (Cuq, Gontard, & Guilbert, 1995).

One such edible packaging example is Oohol, created by the London-based start-up Skipping Rocks Lab, Figure 2.9. This spherical water container is constituted from

seaweed, which is strong, hygienic and biodegradable. A frozen ball of water is encapsulated with layers of a calcium chloride and a brown algae membrane. Its membrane can easily be nibbled open, releasing the contained water (Howard, 2015).

Figure 2.9: © Skipping Rocks Lab - Ooho!

Figure 2.10: © Quantum Designs, LLC - perfectly free™

Another example is perfectly free™, a non-dairy frozen ball, containing a vanilla core, Figure 2.10, formerly known as WikiPearls, by Quantum Designs, LLC. Its edible packaging can contain food particles like cocoa, cherry or blueberry, to complement its vanilla core. The edible skin serves to protect its content and ease consumption, as no cutlery is required (Dent & Sherr, 2015).

Recent innovations of edible materials present a lot of application potentials in the food and pharmaceutical industries. Nevertheless, it still has to overcome production challenges and stringent hygienic requirements from the Packaging and Food industries (Janjarasskul & Krochta, 2010).

Giving this section's overview of industrial approaches towards sustainable packaging solutions, this investigation continues to discuss sustainability awareness in Packaging made by autonomous parties and designers.

2.1.2 AUTONOMOUS PARTIES AND DESIGNERS

Autonomous parties and designers create and execute sustainable approaches towards packaging which are partly inherent in their cultural ethos. Small initiatives, such as re-using aesthetically pleasing packaging, can already be considered a sustainable approach. However, with a progressively connected world of environmental awareness, an exchange of sustainable solutions has boomed under the DIY movements, short for do-it-yourself (Bony, 2005). The first and probably most popular approach is re-use, a practice related to re-cycling, which was mentioned earlier in Section 2.1.1.

RE-USE

To re-use packaging, its design must be conceived so that it is refillable and it can repeatedly serve its original intention, without reprocessing (Yeang, 2006). Re-use is a post-distribution solution which is implemented at both fronts: the industry and autonomous parties. Industrially, the re-use movement includes processes such as the German *Mehrwegsystem* – which loosely translates as multi-way system. It is usually applied to packaging for water, juice or beer bottles made out of glass or hard plastics. To enforce this system, each bottle is purchased with an additional monetary bottle deposit. Following the consumption of its content, the bottles can be brought back to the retailer for a deposit refund. The bottles proceed to be checked for damages, cleaned and refilled, to restart its cycle (Elander, 2010). There are many other industrial systems of re-use in place, however, the approaches of autonomous parties and designers are of particular relevance to the presented research.

The movement of re-use, applicable to autonomous parties and designers, is now common in many households and is carried out consciously and subconsciously (Fisher & Shipton, 2010). A typical endemic example is the ordinary plastic shopping bag dispensed by grocery stores. Re-using this bag means to repeatedly employ the already used bags, for the exact same purpose – transporting groceries from the store. Re-using is a common practice and, in broad contexts, almost anywhere. However, the re-used packaging needs to withstand and endure these several uses.

The practice of re-use probably dates back to the beginning of human civilisation and can be considered one of the oldest sustainable movements. Therefore, it can be assumed that this sustainable solution will be present for many more centuries yet to come.

UP-CYCLING

The second and last approach to be discussed is up-cycling. The term up-cycling originates in the same interview with Reiner Pilz as the earlier defined term of down-cycling. Pilz claimed that up-cycling is needed, rather than re-cycling, which he refers to down-cycling (Kay, 1994). Today, the term up-cycling has been widely adopted and can be defined in several ways. For purposes of this research, up-cycling is considered for its ability to uplift the value of waste material to make it useful again (Crabbe, 2013; Siegle, 2010).

In general, the movement of up-cycling, being a post-distribution solution, can be separated into two approaches: the industrial approach and the hand-made approach. The

industrial approach is quite similar to re-cycling. For example, old glass water bottles can be collected and melted down, but instead of becoming bottles in its next life cycle, they are formed into something else with a new function (e.g. a glass vase). This process, like many others found in the industry, requires established industrial facilities. The next segment shall look at the hand-made approach by autonomous parties and designers, as it is pertinent to this research.

Autonomous Parties

Figure 2.11: Earring out of plastic bag - created by the author

Figure 2.12: © Cooley - Taccus

Up-cycling is strongly present in online communities maintained by autonomous parties such as: Hipcycle – Upcycled Products, Upcycle That, We Upcycle, Upcycled City, The Upcycle Movement, etc. In these communities, members share their most recent creations on a semi-commercial basis. Usually handicraft instructions are provided, including tips, tricks and step by step images or videos. One example of an autonomous party up-cycling project is the use of old grocery bags by layering, ironing and cutting them into jewellery, seen in Figure 2.11. Another simple up-cycling project would be Taccus (Cooley, 2014), Figure 2.12. The creator uses an old PET bottle and transforms it into a coloured plant pot.

The difference between autonomous parties and designers, regarding the up-cycling movement, is that autonomous parties and communities design products as a hobby and are not necessarily interested in monetary or commercial gains. Therefore, most of them generously share their discoveries and innovations with others, free of charge. The practices and protocols for designers are different.

Designers

Designers approach up-cycling in a different way and mind-set than autonomous parties. To designers, up-cycling is seen as a challenge for innovation and visualisation of how used materials can be altered to gain a new use – lifting them to the status of premium products (Crabbe, 2013). Not only is this reflected in their splendid forms and used materials – mainly post-consumer waste rather than packaging – but is also reflected in the resale price range. This up-valued price range can arguably be considered as being disproportionate, in relation to the actual cost of the used material. One perfect example is the Ella lampshade by Sarah Turner, a British designer. This up-cycled lampshade light, crafted out of soda plastic bottles, has a market value between £ 450 and £ 1300, depending on the size (Crabbe, 2013; Turner, 2016), Figure 2.13. The high cost embodies the qualities of design and the labour. The more complex and time consuming the up-cycled product, the more expensive it becomes. The real monetary value, practical use and aesthetics of these products may be controversial. Consequently, the product appeals to a very specific type of customers. Nevertheless, these products could also find their way into galleries as prototypes which might inspire or challenge other designers to create more significant and comprehensive solutions to man-made waste (Crabbe, 2013).

Figure 2.13: © Turner - Ella

The up-cycling movement, whether conducted by autonomous parties or designers, provides a great opportunity for used packaging to aspire a greater value than its trivial intended purpose of packing products. However, the collective creativity and crafting skills of consumers are essential for these solutions to thrive and proliferate. This movement concludes the investigation of sustainability awareness in Packaging. In the next sub-chapter, the sustainability awareness in Product Design is thematised.

2.2 SUSTAINABILITY AWARENESS IN PRODUCT DESIGN

The term ‘product’ is omnipresent in our everyday life. To such extent that everything can be considered a product like: the product of globalisation, the product of democracy, a new bank savings account and even a life insurance scheme. As the term ‘product’ is widely used in all disciplines and frameworks, it is essential to define its meaning for this research. In the context of this thesis, the term product, and with it, the appearance of Product Design, only becomes applicable whenever people interact with physical objects (Rodgers & Milton, 2011).

According to Paul Rodgers, Professor of Design Thinking in the School of Design at University of Northumbria in the UK, and Alex Milton, the Programme Director for Irish Design 2015, there are different categories into which products can be sorted. An outline of these categories is listed as follows – including characteristic product examples (Rodgers & Milton, 2011):

- Bulk products: are to be understood as raw materials, which are used in the manufacture of other products. Examples for bulk products are laminates, plastic resin or metal roll sections.
- Consumables: are to be understood as fast-moving goods (Rundle-Thiele & Bennett, 2001), where the design of packaging, marketing and branding usually form the defining factor, rather than the consumables themselves. Notable examples include bottled water, packed butter or motor oil.
- Consumer products: are to be understood as a wide range of designed objects, which need to fulfil various criteria. Besides functionality, they have to appeal in their appearance and the cost-benefit ratio. Examples of consumer products rank from personal computers to furniture, and medical products.
- Industrial equipment products: are to be understood as products created for industrial use, which execute complex tasks in their self-containing device. Their functionality, quality and performance are preferred, instead of appearances. Examples are earth-moving machinery and industrial workstations.
- Industrial plant: is to be understood as a built product, which connects and regulates

different devices and industrial equipment. Examples for industrial plants are telephone networks and water purification systems.

- Industry products: are to be understood as manufacturing components, which are to be assembled into new products. The functionality and performance of these products clearly precedes the appearance. Characteristic examples are gas turbine engines, motors and circuit boards.
- One-off artistic works: are to be understood as production batches on a yearly basis or in limited editions, which are often considered works of art, as well as design works. The appearances for these products tend to be more important than their functionality. Notable examples are the iPod or special edition Coca-Cola bottles.
- Special purpose products: are to be understood as customised industrial products, whose specialised tasks may change rapidly depending on its temporary use. Examples for this category of Product Design are produced in small series like special purpose robotic machineries and assembly machinery.

With the above typological definitions of the term ‘product’, the scope of this research refers solely to the category of consumer products. To enforce better understanding of this chapter, an additional definition is necessary, to capture the meaning of sustainable Product Design. Sustainable Product Design can be described as the design of products that assists the sustainability of the respective product’s system (Rodgers & Milton, 2011).

Product Design has a long history by itself, however, the elaboration of its sustainability awareness began with the second half of the 20th century. Then, the term sustainability was adopted and society finally found terms to describe the rising concern of long-term environmental consequences (Kidd, 1992). Within this given time frame of about 80 years, the field of Product Design experienced countless movements around the world, which tended to overlap, intersect, interact and inspire one another over time. This time frame can largely be separated into two main periods – according to the events which brought further the sustainability awareness in Product Design.

The first period of interest to issues of sustainability is to be found during the ‘Plastic Era’ which began during World War II and ended with the energy crisis of 1973. Over that period, the use of plastics experienced a boom in various global industries. The second period, ‘Design for Environment’ came slightly before the energy crisis around the 1960’s, when consumers started to realise its environmental impact due to the waste and pollution created over the past decades. This awareness still influences design processes

of today. In addition to these two periods, a particular movement is discussed, which has been present throughout the last century and is closely related to the ideology of Packaging Product Design: Democratic Design. The following sections analyse the sustainability awareness in Product Design, beginning with the Plastic Era.

2.2.1 THE PLASTIC ERA

The word plastic comes from the Ancient Greek *plastikos*, which means ‘moulded’. In our contemporary context, it stands for synthetic materials. There are three general types of plastics: thermoplastics, thermosets and elastomers. Each type has different characteristics and are used for different applications (Kozel & Hellmann, 2013; Mosberg, 1989). For example, some can be reformed (and re-cycled) like thermoplastics, unlike thermosets which cannot. However, the detailed characteristics and their applications are out of the scope of this research. Nevertheless, an overview of the growing consciousness towards sustainability over the last decades is presented.

The Plastic Era started around World War II, during which mass production of already invented plastics was finally possible. The military had a monopoly over most newly discovered plastics, mainly used for parachutes, bazooka barrels and even the atomic bomb. By the end of the war in 1945, demand for plastics sank dramatically, forcing the plastic production infrastructure and capacity to migrate into different industries. As early as 1943, DuPont, an American Conglomerate, forethought a solution to this emerging excess. Within a couple of months after the war ended, it successfully introduced plastic houseware into the US market at the first National Plastics Exposition in New York. This was marked as the starting point for plastics, flooding the world market with new products such as housewares, lightweight suit cases and clear packaging materials. The latter example enabled customers to see packed content before purchasing (Freinkel, 2011).

Other industries followed and extensive uses for this new, cheap and light material were found such as, for example, Earl Tupper who marketed Tupperware in 1947 (Raizman, 2003). With plastics, everything seemed possible and a wave of consumption began – which was especially welcomed after the suffering and shortages caused by World War II. Furniture became colourful, affordable and even cheap (Campos, 2007). This made products easily replaceable, forcing the industry to quickly meet the accelerated demands of the fast changing fashion trends. With the end of the war, throwaway design also became fashionable. Dresses made of paper, furniture out of cardboard and inflatable plastic were habitual, see Figure 2.14 - Figure 2.16 (Bony, 2005; Kalweit, Paul, Peters, &

Wallbaum, 2005; Kirkham & Weber, 2013). The sum of all these reflected an end to suffering, a life of abundance and affordability for everyone.

Paper dress

Figure 2.14: © Campbell Soup Company - The Souper Dress (1966-1967)

Foldable cardboard chair

Figure 2.15: © Peter Murdoch - Polka-Dot chair for children (1963)

Inflatable plastic furniture

Figure 2.16: © Paolo Lomazzi, Donato D'Urbino and Carla Scolari - Blow inflatable armchair (1967)

The duration of the plastic boom did not last for long. Due to unaware consumers, unintentional consequences arose from such a splurge use of plastics. Overconsumption and the Plastic Era came to a conspicuous end in 1973, as the energy crisis instigated rising oil prices. Plastic furniture and articles became an expensive good (Bony, 2005). The image and perception about plastics also deteriorated to the point where it was no longer considered modern and high-tech. In turn, it gained the reputation of being tacky, tasteless and un-ecological (Hauffe, 1998). Not only designers, but also consumers began to worry about the waste produced, its issues of pollution and the scarcity of resources. A new approach towards design was needed, an ecologically responsible approach like the already pilloried by Papanek in his book 'Design for the Real World' (Papanek, 1971, p. 343). According to Papanek, design has to be revolutionised, radicalised, and people should be "consuming less, using things longer, [and] recycling materials". Papanek's book stirred an international impact with new generations of designers, inspiring them to consider eventual environmental impact during their design choices (Kirkham & Weber, 2013). This turn of events leveraged the next period of the sustainability awareness in Product Design: Design for the Environment.

2.2.2 DESIGN FOR THE ENVIRONMENT

The history of Design for the Environment overlaps to some extent with the Plastic Era, as it emerged before the energy crisis. A key event, which is linked to the initiation of Design for the Environment, is the publication of Rachel Carson's 'Silent Spring' in 1962 (Fuad-Luke, 2010; McDonough & Braungart, 2002; Walker, 2006; Yeang, 2006). Carson condemned chemical corruption in large scale commercial farming practices, which heedlessly used pesticides without prior and adequate investigations on any harmful effects on the environment and humanity. She warned that the "sugar coating of unpalatable facts" (Carson, 2002, p. 13) has to stop for the sake of future generations and the all life-supporting nature. This book was only the foundation, as society became critically aware and conscious about the environmental movement after the energy crisis that struck in 1973 – when costs of petrochemical-based products like plastics became more expensive and led back to the use of natural materials such as wood (Bony, 2005; *Product design: International award-winning designs for the home and office*, 1984).

Over the late 60's and early 70's, the environmental movement gained traction and triggered the birth of many organisations and parties, such as the Environmental Protection Agency in the US or Greenpeace in Canada (Congress of the United States Office of Technology Assessment, 1992; Walker, 2006). Initially, eco-fanatics were first labelled as hippies, tree-huggers or geeks, even though environmental awareness had inspired technological urgency – which in turn inspired innovative development and cutting-edge products (e.g. solar panels). This unprecedented progressive technology also facilitated environmentally friendly design to appear drastically different from conventionally marketed products, which limited adoption by the general public. In the meantime, global economics pushed a return towards the once again cheaper oil and energy resources. This caused, another booming market consumption of petrochemical materials and resources during the 80's and 90's (Bergman, 2012). However, the seeds of environmental awareness had already been planted and the global industries saw customers welcoming bio-based materials – or at least the more natural looks of products. Lower priced plastics then assimilated the appearances of nature in the form of synthetic laminates and leather imitations (Kozel & Hellmann, 2013).

Another turning point which swung an increasing environmental awareness was the publication of 'Our Common Future' in 1987, otherwise known as the Brundtland report. This document incited global environmental consciousness while presenting sustainable development as a possible solution to the public (World Commission on Environment and

Development, 1987). This report consolidated the principles and ideas of sustainable approaches, which were already addressed by pioneer and key advocates of sustainability, like Victor Papanek and Richard Buckminster Fuller. The latter, an American architect, philosopher, inventor and engineer, advocated for his believe in using science and technology in responsible manners – in order to fight systemic starvation and poverty (Walker, 2006). He articulated and enforced to do “more and more with less and less until eventually you can do everything with nothing” (Fuller, 1938, p. 252). Papanek’s book ‘The Green Imperative’, was first published in 1995, a few years after the Brundtland report. As referenced in the previous chapter, he subconsciously professed the reductive idea of “packaging is the product” (Papanek, 2003, p. 33). This thought and original concept remained mostly untouched for the next fourteen years.

The environmental movement incurred another significant boost at the change of the millennia. Fuel prices again rose, which prompted collective consumer interests regarding energy conservation, along with the growing awareness of climate change. By this time, environmentally conscious design finally became mainstream (Bergman, 2012). The development of a sustainable global consciousness over the last few decades, coupled with increasing interests from consumers to protect the environment from pollution, compelled a change of policies from industrialists. This motivated the development of several re-cyclable synthetic and biodegradable materials, which were rapidly introduced into commercial production. Besides the innovation in more sustainable product materials, many different approaches, suggestions, concepts and strategies were explored and elaborated by various scholars, engineers, designers and businessmen. All with the objective to make products, their manufacturing production and disposal processes, more sustainable, while pushing the boundaries of environmental thinking even further. These methods are now known under various collective names: Environmental Movement, Green Movement, and Ecological Movement. Additionally, these movements were followed by and further intertwined with elaborated and iterative terms such as Environmental Design, Sustainable Design, Green Design, Eco-Design, Green Engineering, Cradle to Cradle Design, Life Cycle Design, Triple Bottom Line, Eco-Labels, 4 R’s and the like (Bergman, 2012; Braungart, McDonough, & Bollinger, 2007; Congress of the United States Office of Technology Assessment, 1992; Fiksel, 2009; Fuad-Luke, 2010; McDonough & Braungart, 2002; Rodgers & Milton, 2011; Stahel & Reday-Mulvey, 1976/1981; Vergheze, Lewis, & Fitzpatrick, 2012; Zbicinski, Stavenuiter, Kozłowska, & Van de Coevering, 2006). All in regards to the different contexts, industries, application processes or literature in question.

Their philosophies and definitions differ only in small degrees (Bergman, 2012; Fiksel, 2009). For clarity, these methods and terms have been grouped together to cover the overall idea of Design for the Environment.

If we look back about 20 years ago, the term Design for the Environment would have had a different definition than it covers today. Back then, it would have meant to protect the product against environmental impacts, such as humidity or corrosion (Congress of the United States Office of Technology Assessment, 1992). Today and along with the contexts of this research, Design for the Environment is understood by following the definitions of an authority on sustainable business practices, Joseph R. Fiksel's – the current Executive Director of the Center for Resilience at The Ohio State University, and Principal and Co-Founder of Eco-Nomics LLC. He defines Design for the Environment as “the systematic consideration of design performance with respect to environmental, health, safety and sustainability objectives over the full product and process life cycle” (Fiksel, 2009, p. 6) and it should be viewed as a compilation of design procedures targeting sustainable products and processes (Fiksel, 1996).

The overall purpose of Design for the Environment is considered a combination of the aforementioned sustainable movements and terms. However, in order to understand and consolidate the idea of Design for the Environment, some terms and their objectives are explored next, which includes:

- The 4 R's: Re-duce, re-use, re-cycle and re-think/regulate (Bergman, 2012; McDonough & Braungart, 2002).
- The dual goal of the Green Design: Waste prevention and better material management (Congress of the United States Office of Technology Assessment, 1992).
- The Cradle to Cradle Design approach: A production-consumption framework which aims to design industrial processes and products whose materials, in turn, become once again the base nutrients for future production (Braungart et al., 2007).
- The strategy of the Triple Bottom Line: Separation of sustainability in three closely intertwined dimensions: social/people, environmental/planet and economic/profit (Bergman, 2012).
- The twelve principles of Green Engineering: These principles include importantly, amongst others, waste prevention instead of waste collection, emphasises the use of single-material solutions instead of multicomponent products and enforces material

and energy uses from acquired renewable sources (Anastas & Zimmerman, 2003).

- The Life Cycle Design: A philosophy which encompasses most environmental principles and ideas and is, therefore, the most commonly known when it comes to sustainable processes. The Life Cycle Design establishes a key-philosophy of Design for the Environment which envisages a holistic view of the environmental performance throughout the full life cycle of a product, without harming nature during the processes (Bhander, Hauschild, & McAlloone, 2003; Graedel & Allenby, 1996). Countless literature can be found addressing this life cycle, aiming to create holistic, waste-free processes. It is used as assessment and engineering process or system guide, always depending on their main focus (e.g. products, packaging, management, etc.) (Bhander et al., 2003; Fava, 2011; Giudice, La Rosa, & Risitano, 2006; Keoleian, Menerey, & Curran, 1993).

The concept of the Life Cycle Design includes all the phases of a product's life cycle, which can be observed in Figure 2.17 – in accordance with an illustration of Rodgers and Milton (2011).

Figure 2.17: Product design life cycle

From this figure, it becomes clear that not only one branch, company or process needs to be optimised in order for the whole product to be more sustainable. Every step needs to be intertwined with each other, to enable a holistic system. The life cycle of a product has to continuously evolve until there are ways to optimally eliminate harmful environmental impacts at all stages of the life cycle. This would present itself as the biggest challenge for companies, products and processes.

With the introduction of these methods and terms, it becomes clearer that Design for Environment represents the unity of all of these various strategies, as they are all closely related. Additionally, the research presented in this thesis focuses on the life cycle from a product design context, as the packaging product is intended as a product by itself.

Fiksel defined the term ‘Design for Environment’ in 2009, the same year in which Papanek’s subconscious pronouncement of “packaging is the product” (Papanek, 2003, p. 33) resurfaced in a scholarly context. Papanek’s ingenious slip of an idea was expounded and discussed in Boylston’s book, ‘Designing Sustainable Packaging’, in which he reclaimed the concept in its most literal sense: of packaging as product (Boylston, 2009). However, Boylston does not elaborate enough on this thought. He only briefly presents the idea of Packaging Product Design in Boylston’s third category of packaging with additional value, reuse by prescription. Papanek and Boylston, with their perspectives, were featured earlier in Section 1.2.2 and 1.2.3.

The current movement of Design for the Environment, including the fresh ideas found in Boylston’s book, marks the end of this section. With a consorted view of the sustainability awareness in Product Design throughout recent history, the next chapter connects with one particular movement: Democratic Design. This movement has proven to be exceptionally relevant to this research.

2.2.3 DEMOCRATIC DESIGN

Democratic Design is a design philosophy that can be traced throughout the history of Product Design, which is found to have been developed as a natural and evolutionary design approach of Scandinavian Design. Democratic Design had its origins in the early twentieth century, however, it still finds considerable relevance as a contemporary approach towards design. Back then, designers started to share a common goal under the Scandinavian commitment, to create *vackerare vardagsvara*, which means to create “more beautiful everyday objects” (Fiell & Fiell, 2002, p. 12; Nelson & Cabra, 2004, p. 27). Democratic Design was conceptualised and created in order to eliminate social barriers, elitism and to produce high-quality products in a manner of mass production. With *vackerare vardagsvara*, society should unify in its taste and form, to enhance the quality of life (Nelson & Cabra, 2004). This notion of unified taste can also be referred to as good taste or good design (Fiell & Fiell, 2002; Nelson & Cabra, 2004). For democratic designers, according to the literature, a practical and relevant product can only be created when aspects of functionality and aesthetic appeal are well balanced and go hand in hand (Fiell & Fiell,

2002). In addition, products are to be made of high quality and reproducible through mass production, becoming affordable and available to all (Nelson & Cabra, 2004). These statements are summarised in the five qualities which good Democratic Design should pursue (Fiell & Fiell, 2002; Nelson & Cabra, 2004; Stoll, 1999):

- Functionality
- Aesthetic appeal
- High quality
- Producibility on a large scale
- Affordability

Today, democratic designers aim to involve users in the design process. For example, by letting them decide for themselves how to arrange the compartments of a shelf system, according to their needs (Bürdek, 2005; Nelson & Cabra, 2004). An excellent example that follows a Democratic Design approach in most of its products is the Swedish furniture company IKEA (Fallan, 2012; Raizman, 2003). In fact, IKEA has embedded Democratic Design in their philosophy, as stated on their homepage (IKEA, 2016). However, IKEA extends the five qualities of Democratic Design by incorporating sustainability in their production philosophy (IKEA, 2016). This contemporary adjustment has clearly been influenced by Design for the Environment and is a welcome addition to Democratic Design.

The five characteristic qualities of Democratic Design, extended through sustainability, share similar values with Packaging Product Design. These values become evident further on as packaging products are investigated, elaborated and implemented in Chapter 3 and 4.

A summary of Chapter 2 is presented in the following, where the literature review on sustainability awareness in the fields of Packaging and Product Design is condensed and presented in closing form.

2.3 SUMMARY AND CONCLUSION

This chapter has presented the sustainability awareness in Packaging and Product Design and is meant as a pertinent and connected overview of the history and the current state of sustainability awareness in both fields.

Sustainability awareness in Packaging exposes several contemporary attempts to facilitate a more sustainable future, by promoting and executing pre-distribution and post-distribution solutions. It also demonstrates that much energy, effort and research is being continuously invested in alternatives and sustainable policies, in order to eliminate environmental hazardous and non-compostable materials.

Putting this chapter into perspective with packaging products (packaging with additional value), Boylston's third category of 'reuse by prescription' is recalled. In this, packaging is designed by manufacturers with a well-defined additional purpose, which comes into effect after its originally intended packing use (Boylston, 2009) –a pre-distribution solution. After reviewing and analysing the existing packaging movements, it becomes apparent that none of the recognised practises in Packaging follow a 'reuse by prescription' approach. Only one movement vaguely fits the qualifications of this approach, the up-cycling movement. However, it presents itself as a post-distribution solution, which requires additional creativity and effort from the consumer.

Sustainability awareness in Product Design demonstrates increasing efforts towards a sustainable future. Various initiatives have been pursued to create more sustainable products, enforce sustainable production and alleviate the environmental impact. Existing products in the industry are showing a strong trend towards bio-based materials and the application of holistic environmentally friendly solutions throughout the life cycle. However, besides Papanek's comment about "packaging is the product" (Papanek, 2003, p. 33) and Boylston's reinterpretation into packaging as product, packaging has never been actively nor comprehensively considered as part of the packed product and is, therefore, rarely included in sustainability efforts of Product Design.

Finally, the philosophy of Democratic Design, with its five original qualities, was presented. This design movement is increasingly being complemented with sustainable efforts by big corporations like IKEA. Functionality, aesthetic appeal, high quality, producibility on a large scale, affordability and now sustainability form the contemporary

framework of Democratic Design. Democratic Design has been around for quite some time and the fruits of their philosophy have already enjoyed great success, globally. As the qualities of Democratic Design and the values of Packaging Product Design are found to be analogous, the approach of Democratic Design is considered and further explored in Chapter 4.

This chapter demonstrated the scarce documented existence and implementation of the concept of Packaging Product Design in academic literature. It also establishes the absence of a design movement in either of the fields – Packaging and Product Design – which undertakes Boylston's third category of packaging with additional value, reuse by prescription. This presents itself as a gap in the academic literature and thus confirms the uniqueness of Boylston's third category and enforces the relevance in further conduction and fundamental prospects of packaging products, through this research.

Given that there is almost no mention of the concept of packaging products in academic literature, the next chapter brings investigations a step further, away from academic findings and theories, and into contemporary design developments. This is conducted via an embedded single-case study, which surveys the current state of available packaging products, not through qualitatively defined terms of words, but through visual perception and resourcing of various Packaging and Product Design study books and periodicals, as well as the internet.

3 METHODOLOGY

In the previous chapter, the sustainability awareness in Packaging and Product Design was discussed by conducting a literature review. Through the review, a critical absence of a clearly assigned design movement in the academic literature, undertaking packaging products, was found. This demonstrated the uniqueness of Boylston's third category of design by prescription – packaging products. Taking off from this finding, this chapter shifts the investigation of packaging products from an academic context, towards the context of contemporary design developments.

The core objective of this chapter is to find and classify any existing qualifying packaging products in contemporary design developments. Once found, they are further surveyed and studied, to extract particular information and assist further analyses. With all gathered data, a series of analyses follows, to help understand the current situation of packaging products better and how packaging products can be created. The findings facilitate the formulation of a simple framework towards creating packaging products and guide the design process in Chapter 4. The contents of this chapter and its objectives are structured as follows.

The first sub-chapter outlines and introduces the overall framework of the conducted case study. The approaches and methods are indicated and details of their use is elaborated.

The second sub-chapter includes the conduction of an embedded single-case study, regarding the presence of packaging products in the context of contemporary design developments. Through this, arguments are developed that shall aid to understand the current situation of packaging products and how packaging products should be approached. From the outcomes of the case study, an initial framework for Packaging Product Design is formulated.

The following sub-chapter introduces and outlines the overall framework of the case study.

3.1 FRAMEWORK

The framework presented here comprises an embedded single-case study, conducted through a triangulation of methods using secondary research, survey and visual analysis. In the following, the approach of the case study and the methods applied are described in detail, providing justifications while drawing further insights on the benefits of their usage.

3.1.1 CASE STUDY AND ITS METHODS

The framework of this case study is based on a qualitative research approach. This approach is relevant as its conduction aims to gain perceptual and in-depth understanding of a certain subject (Muratovski, 2016) – in this case, packaging products.

In the literature review from Chapter 2, it was shown that packaging products have not been properly addressed or explored, except for the brief mention in Boylston's book. Nonetheless, packaging products are found in contemporary design developments. Therefore, an embedded single-case study is to be included in the qualitative research approach, which involves two separate analyses (Yin, 2014). These analyses aspire to obtain insights to better understand the current situation of packaging products and how a packaging product should be approached, in order for it to be sustainable.

For an effective and creditable conduction of the embedded single-case study, a triangulation of methods is tailored. Triangulation of methods allows different methods to be used, in order to understand the given topic better, as different aspects from different perspectives are being revealed (Denzin, 2009). The methods involved in the triangulation are:

- Secondary research
- Survey
- Visual analysis

These three methods were chosen, as they look at packaging products from the following involved perspectives, respectively:

- Design experts and online communities

- Creators of existing packaging products
- Researchers and future creators

Figure 3.1: Triangulation of case study methods

The methods used, including their targeted perspectives are visualised in Figure 3.1. In the following, the methods of the embedded single-case study are briefly introduced, together with their potential benefits.

SECONDARY RESEARCH

Secondary research of packaging products in contemporary design developments is used to collect information from existing data through various sources (B. Martin & Hanington, 2012). The literature review conducted in Chapter 2 was already part of the secondary research. However, it focused on academic literature addressing contemporary practices, approaches and acknowledged movements in Packaging, as well as the sustainability awareness in the history of Product Design. Through this previous review, the absence of a clearly assigned design approach featuring packaging products in the academic literature was demonstrated. The secondary research in this chapter, as part of the conducted case study, aspires to reveal existing packaging products in contemporary design developments, through the perspectives of design experts, design communities and enthusiasts. The packaging products introduced in this secondary research were discovered and recognised as packaging products through visual perception and function analysis. In order to search for existing packaging products, two main resource types were used, illustrated Packaging

and Product Design publications and the internet. Illustrated Packaging and Product Design publications cover contemporary and sustainable design solutions and developments, whereas the internet covers sustainable Packaging and Product Design solutions endorsed by design communities and enthusiasts.

The use of internet resources for secondary research is academically questionable, due to the lack of trace credibility of its sources (B. Martin & Hanington, 2012). However, in the context of the research presented in this thesis, its overall strategic field coverage and benefits outweigh these concerns. The internet represents possibly the largest, most complex, fastest updating and expanding database of human information, making knowledge easily accessible for everyone (Dreyfus, 2006). It may take months and even years to publish a book, gain exposure, attention and acknowledgement. On the contrary, the internet, with its technologies and immediacy, can achieve similar exposure, attention and acknowledgement within minutes, as design concepts can be easily shared and appreciated globally. In the case of packaging products, sustainability aware design communities and social media are of great interest, as they already feature sustainable Packaging and Product Design solutions and share it on their platforms. Deliberately including internet resources significantly increased the amount of found packaging products, as it disregards their current states of development and allows the inclusion of the latest packaging products. This makes the internet a crucial resource for the presented case study.

SURVEY

A survey needs to be conducted in order to gain specific information and experienced knowledge from targeted audiences about their perceptions and thoughts about specific topics (B. Martin & Hanington, 2012). As packaging products are found through the secondary research, the conduction of a small scale survey has two objectives:

1. To gather critical information about such existing packaging products.
2. As a pilot study in due prospect of a potentially bigger survey or interview sessions with creators about their inspiration, experience and approaches towards packaging products.

The initial survey comprised emails to creators of the respective packaging products with fundamental questions about, for example, the exact year the packaging product was designed, whether they had seen similar packaging products prior to their design and their sources of inspiration.

However, due to the scarce number of replies from the email survey, the conduction of interviews was no longer pursued. The few responses received had no specific trigger for inspiration, approach or knowledge about other packaging products. However, the gathered results could be used in combination with the secondary research, extending the database of information and supporting the conclusions drawn through the first analysis of the case study.

VISUAL ANALYSIS

Visual analysis is used to study and explore potential meanings and implications of objects and forms, in this case packaging products. Therefore, it is used to observe gathered data as a whole –potentially revealing patterns, specific forms and materials (Muratovski, 2016; van Leeuwen & Jewitt, 2001). To effectively approach visual analysis, any implied or missing information about the used material is extracted through visual perception. Additional values of the previously found packaging products are interpreted in order to complete the database of packaging products. Once sufficient details of the considered packaging products are found, the procedures of visual analysis can be adequately performed by conducting two analyses, which are conducted through the perspective of a researcher and future creator.

The first analysis focuses on comparing the gathered data, in order to extract deeper understanding on the current situation of packaging products. Comparative similarities and divergences between different aspects of packaging products are thus obtained. These observations are then formulated into statements to support the thesis objectives.

The second analysis focuses on detecting different patterns from common approaches in existing packaging products, in order to identify how a packaging product can be created. Within these patterns, two corresponding approaches may be found: form specific and function specific approach. These later on serve to form the initial framework of the design process, which may aid to create viable packaging products.

With this overview of the case study's framework and its involved methods, the next sub-chapter goes on to discuss and present the conducted case study.

3.2 CASE STUDY OF PACKAGING PRODUCTS

In this sub-chapter, the earlier discussed framework of an embedded single-case study is conducted in three main sections:

- The first section illustrates and briefly introduces packaging products that were found. All presented information was retrieved via secondary research, including further additional information gathered in the survey and visual perception. The gathered information is then sorted into two tables, providing a condensed overview of the found packaging products for subsequent analyses.
- The second section conducts the first part of the visual analysis. In this analysis, correlations between different features and information of the displayed packaging products are examined. Through this examination, implicit knowledge is gained about the current situation of packaging products. Additionally, a niche within existing packaging products is identified: the consideration and integration of internal packaging material in Packaging Product Design.
- The third section conducts the second part of the visual analysis. In this analysis, different patterns of design approaches from packaging products are observed and extracted. These patterns offer a better understanding of how viable packaging products can be created. With these identified patterns, an initial framework for Packaging Product Design can be generated.

Following the given framework in Sub-chapter 3.1, the case study of packaging products begins with the introduction and illustrations of the identified existing packaging products.

3.2.1 IDENTIFICATION OF PACKAGING PRODUCTS

This section introduces existing packaging products, which have assumedly not been explored or included in the academic literature. These packaging products may appear scattered in contemporary design developments. Some are available in the market while others remain in conceptual states. Following a thorough search, only twenty packaging products could be found which match and fulfil the criteria of Boylston's third category:

‘reuse by prescription’. The scarce amount of packaging products found confirms the uniqueness of the overall research subject, towards the integrated design of products and their packaging.

The following sections present the found packaging products, excluding student productions, together with the more pertinent qualities and descriptions.

CASE 1: BOOMBOX

Creator:	Pirlo GmbH & Co. KG
Origin / Year:	Austria / 2014
Packaging:	A metal container for a bottle or cans
Additional value:	Loudspeaker
How:	The metal container is augmented with an integrated Bluetooth speaker.
Sources:	(Pirlo GmbH & Co. KG; Verpackungs-Rundschau, 2014)

Figure 3.2: © Pirlo GmbH & Co. KG - BoomBox

CASE 2: BUELL CRATE/TABLE

Creator:	Buell
Origin / Year:	USA / ca. 2011
Packaging:	Wooden shipping-crate for a Motorcycle
Additional value:	Workbench
How:	The parts of the crate can be appropriated, and reassembled as a workbench.
Sources:	(Dent & Sherr, 2015)

Figure 3.3: © Buell - Buell Crate/Table

CASE 3: CAVALLUM

Creator: Ciclus
 Origin / Year: Spain / 2007
 Packaging: Cardboard box with wooden sleeve for a bottle
 Additional value: Table lamp
 How: The smaller cardboard compartment contains an electric cord and a socket which can be used as the base

Figure 3.4: © Ciclus - CAVALLUM

for the lamp. The lamp-shade is made of the wooden sleeve, and placed over the base.

Sources: (*Box it up: Graphic express*, 2014; Ciclus, 2007; Kwan & Ho, 2014)

CASE 4: CHINESE BRUSH DUAL-USE PACKAGING

Creator: Li Xu & Qin Zou
 Origin / Year: China / 2012
 Packaging: Cardboard box for Chinese brushes
 Additional value: Brush holder
 How: The cardboard box is cut and folded into a brush holder, without any adhesives.

Figure 3.5: © Li & Qin - Chinese Brush Dual-Use Packaging

CASE 5: CHRISTMAS COOKIE JAR

Creator: Sold by Marks & Spencer
 Origin / Year: Unknown / ca. 2011
 Packaging: Tin container for Christmas cookies
 Additional value: Rotating music box
 How: The bottom of the container can be winded up and released to generate music, while the inner tin container rotates.

Figure 3.6: © Marks & Spencer - Christmas Cookie Jar

Sources: (C., 2011)

CASE 6: COFFEE TABLE

Creator: Boca Design e Comunicazione
 Origin / Year: Italy / 2007
 Packaging: Expanded Polypropylene (EPP) protectors for glass surface
 Additional value: Coffee table legs
 How: The EPP protectors can be interlocked with one another, to form the table's legs.

Figure 3.7: © Boca Design e Comunicazione - Coffee Table

Sources: (Barbero & Cozzo, 2012; Boca Design e Comunicazione, 2007a)

CASE 7: EGGYPLAY

Creator: Eggs Posure A/S
 Origin / Year: Denmark / 2012
 Packaging: Egg carton made of Polypropylene
 Additional value: Building blocks
 How: The plastic cartons can be interlocked and connected to be used as play construction building blocks for children.

Figure 3.8: © Eggs Posure A/S - Eggyplay

Sources: (Due Andersen, 2015; Eggs Posure, 2014)

CASE 8: FASHIONABLY CLICQUOT

Creator: Veuve Clicquot
 Origin / Year: France / unknown
 Packaging: Cardboard box (presumably plastic coated) for champagne bottles
 Additional value: Ice bucket
 How: The inner part of the cardboard box can be unfolded to serve as ice bucket.

Figure 3.9: © Veuve Clicquot - Fashionably Clicquot

Sources: (Staff writer, 2013; Veuve Clicquot)

CASE 9: HANGERPAK

Creator: Steve Haslip
 Origin / Year: United Kingdom / ca. 2007
 Packaging: Mailing cardboard box for a t-shirt
 Additional value: T-shirt hanger
 How: The cardboard box can be folded into a hanger.
 Special note: There are at least seven further imitations of this idea. This one is the first registered.
 Sources: (Haslip, 2007; Klanten & Moreno, 2009)

Figure 3.10: © Haslip - Hangerpak

CASE 10: LAMPAN TABLE LAMP

Creator: IKEA
 Origin / Year: Sweden / unknown
 Packaging: Plastic bucket for a lamp
 Additional value: Table lamp
 How: The plastic bucket is used as a lamp shade and serves as a table lamp when assembled with its content.
 Sources: (IKEA, 2016)

Figure 3.11: © IKEA - LAMPAN Table Lamp

CASE 11: LEMNIS BOX

Creator: Celery Design Collaborative
 Origin / Year: USA / 2007
 Packaging: Recycled paper box for a light bulb
 Additional value: Lampshade
 How: The bottom of the box can be detached from the rest of the carton, unfolded and turned inside out.

Figure 3.12: © Celery Design Collaborative - Lemnis Box

Sources: (Boylston, 2009; Celery Design Collaborative; Welter, 2015)

CASE 12: LITE2GO

Creator:	Knoend
Origin / Year:	USA / 2008
Packaging:	Biodegradable packaging for a lamp
Additional value:	Lamp
How:	The complete packaging can be unfolded and reassembled with its content to become a lamp shade.
Sources:	(Burke, Pietruszynski, & Baer, 2011; Knoend; Martínez, 2014)

Figure 3.13: © Knoend - Lite2Go

CASE 13: MUSTARD GLASS

Creator:	Kühne
Origin / Year:	Germany / early 1960's
Packaging:	Glass container for mustard
Additional value:	Drinking glass
How:	The emptied glass container can be appropriated as a regular drinking glass for beverages.
Special note:	Earliest packaging product found; many competitors have created similar solutions.
Sources:	(Wottawah, 2015)

Figure 3.14: © Kühne - Mustard Glass

CASE 14: PACKAPPLIQUE

Creator:	Boca Design e Comunicazione
Origin / Year:	Italy / 2007
Packaging:	Polystyrene box for a light bulb
Additional value:	Wall lamp
How:	The polystyrene box can be used as spacer/placeholder between the wall and the cord.
Sources:	(Boca Design e Comunicazione, 2007b)

Figure 3.15: © Boca Design e Comunicazione - Packapplique

CASE 15: RORY'S STORY CUBES

Creator:	The Creativity Hub
Origin / Year:	United Kingdom / 2013
Packaging:	Cardboard display for dices
Additional value:	Storage and transportation box
How:	The cardboard display can be wrapped around the dices to create a box that contains the sold dices.
Sources:	(Akdeniz, 2014)

Figure 3.16: © The Creativity Hub - Rory's Story Cubes

CASE 16: SKINS SHOE PACKAGING

Creator:	Jiani Lu
Origin / Year:	Canada / 2012
Packaging:	Cardboard box for a pair of shoes
Additional value:	Hanging wall organiser or shoe shelf
How:	The packaging can either be unfolded or stacked to assemble a wall organiser or shoe shelf.
Sources:	(Lu, 2012)

Figure 3.17: © Lu - SKINS Shoe Packaging

CASE 17: STANLEY HONEY

Creator:	The Partners
Origin / Year:	United Kingdom / 2005
Packaging:	Clay pot for honey
Additional value:	Flower pot
How:	The emptied clay pot can be utilised as flower pot – to provide bees with new flowers for further honey production.
Sources:	(Savoir, 2008)

Figure 3.18: © The Partners - Stanley Honey

CASE 18: TRESDON - WINE RACK SYSTEM

Creator: Icon Packaging
 Origin / Year: USA / 2006
 Packaging: Wooden case for wine bottles
 Additional value: Wine rack
 How: The interlocked wooden pieces can be reassembled into a wine rack. Additional sets can be linked to expand the rack.

Figure 3.19: © Icon Packaging - Tresdon - Wine Rack System

Sources: (Boylston, 2009; Icon Packaging; Industrial Designers Society of America, 2005; Klanten & Moreno, 2009; Savoir, 2008)

CASE 19: TV PACKAGING STAND

Creator: Tom Ballhatchet
 Origin / Year: United Kingdom / 2007
 Packaging: EPP packaging for a flat screen TV
 Additional value: TV Stand
 How: The EPP pieces can be stacked through an integrated interlocking system into a TV shelf. The protective inserts stabilise the shelf.

Figure 3.20: © Ballhatchet - TV Packaging Stand

Sources: (Ballhatchet; Jedlicka, 2009; Reis & Wiedemann, 2010)

CASE 20: Y WATER

Creator: Fuseproject
 Origin / Year: USA / 2008
 Packaging: Plastic bottle for a children's drink
 Additional value: Playful learning toy
 How: The bottles can be connected and interlocked into various forms, using special Y-Knot connectors.

Sources: (Fuseproject; Klanten & Moreno, 2009; Lanks, 2014; Pilloton, 2009)

Figure 3.21: © Fuseproject - Y Water

These twenty cases conclude the identification and brief introduction to the found packaging products, in the context of contemporary design developments. In the following summary, the products are condensed for better overview in a tabular format, to be later thoroughly analysed in Section 3.2.2 and Section 3.2.3 for distinct correlations and insights.

SUMMARY

For a more condensed overview, the twenty packaging products are sorted and summarised into a tabular format, as shown in Table 3.1. This tabulation serves to facilitate analytical procedures in the following sections and is structured as follows:

The packaging products are listed on the left of the table, arranged alphabetically, according to their given name. The columns present specific features of the packaging products and are broken down into seven main groups, namely:

- Material: displays the used material types, specifically: Glass/ceramics, metal, wood, paper or plastics.
- Used packaging part: implies whether the internal or the external part of the packaging was used to create the additional value.
- Product category: sorts the items into consumables or consumer products.
- Market situation: gives an insight on the current market situation of the item, it is either stated as being a conceptual work or being available in the market.
- Agent: specifies the profession of the item's creator, e.g. a company, agency or a designer; students are excluded.
- Target market: categorises items into their target markets, if available, e.g. seasonal, specific audiences and exclusive goods.
- Additional information: includes miscellaneous information, e.g. whether the product is a collectible merchandise, the product's origin, year of creation and whether an official web address exists.

The collected information from Table 3.1 is expanded into a second table, Table 3.2, which is organised to provide pertinent information of three main groups: agent, target market and additional information.

	Material				Used packaging part	Product category		Market Situation		Agent			Target Market			Additional Information					
	Class/Ceramics	Metal	Wood	Paper		Plastics	Internal	External	Consumable	Consumer product	Conceptual	In the market	Company	Agency	Designer	Seasonal	Specific audiences	Exclusive	Collectibles	Origins	Homepage
1.		x					x	x		?	?	x					?		AT	x	2014
2.			x				x		x	?	?	x							US	x	~2011
3.			x	x			x	x			x	x					x		ES	x	2007
4.				x			x		x	x				x					CN	x	2012
5.		x					x	x			x	x			x	x	x		?	?	~2011
6.					x		x		x	x		x							IT	x	2007
7.					x		x	x				x							DK	x	2012
8.				x	x		x	x			x	x				x	x		FR	x	?
9.			x	x			x		x	x				x				x	UK	x	~2007
10.					x		x		x			x							SE	x	?
11.				x			x		x	x			x					x	US	x	2007
12.					x		x		x			x					x	US	x	x	2008
13.	x						x	x				x						x	DE	x	1960's
14.					x		x		x	x		x							IT	x	2007
15.				x			x		x			x							UK	x	2013
16.				x			x		x	x				x			x	x	CA	x	2012
17.	x						x	x		?	?	x							UK	x	2005
18.		x						x		?	?	x						x	US	x	2006
19.					x	x	x		x	x				x					UK	x	2007
20.					x		x	x			x[1]	x						x	US	x	2008

Key: x: yes; ?: uncertain, not clearly specified; [1]: Not anymore

Table 3.1: Packaging products and their attributes

By thoroughly observing the existing imagery of packaging products and distilling their characteristic qualities, two clear approaches towards their design can be implied which involve both, form and function. With all packaging products found in this section of the case study, together with the overview provided from both tables (Table 3.1 and Table 3.2) and the sighting of different characteristic applied approaches, future analyses can be conducted efficiently. The first analysis, presented in Section 3.2.2, examines correlations between the features of packaging products. This serves to better understand the current situation of packaging products. The second analysis, presented in

Section 3.2.3, expands and elaborates further on the detected approaches following form and function to understand how viable packaging products can be approached and created.

	Agent			Target Market			Additional Information	
	Company	Agency	Designer	Seasonal	Specific audiences	Exclusive	Origins	Homepage
1.	BoomBox	Ptito GmbH&Co. KG					Austria	http://www.ptito.com
2.	Buell Crate/Table	Crispin Porter + Bogusky					USA	http://www.cpbgroup.com
3.	CAVALLINI	Cielus				36 € no wine	Spain	http://www.cielus.com
4.	Chinese Brush DualUse Pack.		Xu&Qin Zou				China	www.xuli.cc [not working]
5.	Christmas Cookie Jar	Marks & Spencer		Christmas	Kids	40 S\$	?	?
6.	Coffee Table	Boca Design e comunicazione					Italy	http://www.studiobocait
7.	Eggplay	Eggs Posure A/S			Kids		Denmark	http://www.eggs-posure.com
8.	Fashionably Clicquot	Veuve Clicquot			Legal Age	Champagner	France	http://www.veuve-clicquot.com
9.	Hangepak		Steve Haslip				UK	http://stevhaslip.com
10.	LAMP/ANIable Lamp	IKEA					Sweden	http://ikea.com
11.	Lemnis Box		Celery Design Collaborative				USA	http://www.celerydesign.com
12.	Jire2Go	Knoend				38 US\$	USA	http://www.knoend.com
13.	Mustard Glass	Kühne					Germany	http://www.kuehne-
14.	Packaplique	Boca Design e comunicazione					Italy	http://www.studiobocait
15.	Rory's Story Cubes	The Creativity Hub					UK	http://www.creativityhub.com
16.	SKINShoe Package		Jiani Lu			Luxury Shoes	Canada	http://www.lujiani.com
17.	Stanley Honey	The Partners					UK	http://www.the-partners.com
18.	Tresdon - WineRack System	Icon Packaging			Legal Age	?	USA	http://www.iconpackaging.com
19.	TVPackaging Stand		Tom Ballharchet			?	UK	http://www.tomballharchet.com
20.	YWater	Fuseproject			Kids		USA	http://www.fuseproject.com

Key: ?; uncertain, not clearly specified

Table 3.2: Packaging products and further details to the agent, target market and additional information

3.2.2 ANALYSIS OF CORRELATIONS

The first analysis of the case study of packaging products aims to detect correlations between different features of the listed packaging products, with the prospect to better understand the current situation of packaging products. The analysis is conducted by establishing the eight most prominent statements. These statements were sourced through visual analysis, in particular through the observation of the existing data gathered through secondary research, the outcomes of the survey and analytical reflection from the patterns observed in Table 3.1. These statements are later analysed and justified with literary or visual evidence. The eight elaborated statements comprise general correlations about the following aspects:

1. The years of creation: Most packaging products were created after 2005.
2. The origins: Most packaging products tended to be created in Europe or North America.
3. The creative agents: Packaging products created by companies are most likely in the market.
4. The target market: Packaging products for exclusive goods are most likely in the market.
5. The product category: All packaging products for consumables are made for groceries.
6. The use as collectibles: More than a third of the found packaging products can be considered collectible merchandise.
7. The used packaging part: External packaging material is mostly used as packaging product.
8. The chosen material: Designers are most likely to use cellulose materials for packaging products.

These asserted statements are made to identify what aspects distinguish viable packaging products and narrow down the scope of the next chapter, which implements the concept of Packaging Product Design. Through one of the statements, a particular niche was also determined, regarding the use of internal packaging material.

In the following, the eight statements are thoroughly analysed and elaborated.

CORRELATION STATEMENTS

Statement 1: Most packaging products were created after 2005

The first statement of this analysis discusses and emphasises the time-frame during which the found packaging products were created. Figure 3.22 illustrates packaging products created since 2003, excluding the Mustard Glass from the 1960's, as it is the only listed packaging product created prior to 2005. The x-axis indicates the year of origin, whereas the y-axis indicates the number of packaging products created within that year. Different colours used in the graph specify whether the packaging product was created by a company or another agent. The combined graph highlights two years during which the creation of packaging products peaked: in 2007 and 2012. Intriguingly, these are the only years in which agencies and designers have also contributed with their packaging product solutions.

Figure 3.22: Appearance of packaging products since 2003

This statement and the findings within clearly demonstrate the novelty of packaging products, as almost all of the found examples were created during the past decade.

The literature review in Chapter 2 demonstrates that there is no concrete evidence of packaging products to be found in academic context – except for Papanek's critique of the customers' obsession to view packaging as products in 1995 (Papanek, 2003); and Boylston's reclaim of using the concept of packaging as product in its most literal sense, in 2009 (Boylston, 2009). From the data shown in the graph above, it may be noted that both publications did not assert an immediate impact on the appearance of packaging products. Additionally, the scarce replies from the conducted survey (see Appendix), from Eggs Posure A/S (Eggyplay), Celery Design Collaborative (Lemnis Box) and Kühne

(Mustard Glass), could not recall any specific triggers, which might have inspired their own packaging product – may it be literature or other packaging products. However, coincidentally, Eggs Posure A/S and Celery Design Collaborative created their packaging products during the two years when the creation of packaging products peaked. To look at this figure from another perspective, Boylston might have been inspired to write his book about sustainable packaging design, from having noted and observed the first wave of packaging products. He even featured the Tresdon-WineRack System, including an interview with its creator, Jason Ivey (Boylston, 2009). It can be speculated that recent appearances of packaging products could have been triggered by the growing awareness of the environmental conscious design – which is becoming mainstream since the turn of the century.

Statement 2: Most packaging products tended to be created in Europe or North America

This statement asserts that all except one of the listed packaging products were created in high-income countries, mainly in Europe and North America. The most evident reason for this finding is the language barriers presented through a global approach to this research. Another possible reason could be as discussed by Hopkins and McKeown, regarding the influence of education in order to achieve sustainability in which they referred to the Agenda 21 (Hopkins & McKeown, 2002). This agenda, published in 1992, is a non-binding document drafted by the United Nations Conference on Environment and Development, with the intent to guide the world towards sustainable development. Hopkins and McKeown summarised chapter 36 of Agenda 21, dedicated to the education on sustainable development, into three priorities:

1. Improving basic education: Basic education, as a whole, not only improves agricultural productivity, but also reduces population rates, increases the status of women and enhances awareness of environmental protection.
2. Reorienting existing education: As most educationally developed nations leave the deepest ecological footprints, existing education has to be shifted towards sustainable development.
3. Public understanding, awareness and training: The general population needs to be made aware and guided, in order to succeed in any national sustainability plans.

This summary of sustainable education could strengthen the argument as to why

packaging products are yet only to be found in high-income countries. To elaborate further, it can also be agreed that these countries have greater autonomy to focus on the second and third listed priorities, due to their higher levels of basic education. Whereas low-income countries tend to focus efforts on the first priority. According to Hopkins and McKeown (2002), lower levels of education severely limit developments of any short- and long-term national plans for a sustainable future, which can be sooner and more effectively achieved by high-income countries.

Statement 3: Packaging products created by companies are most likely in the market

This statement looks at the correlation between the different types of agents and the market presence of their packaging products. Besides four unknown situations, namely BoomBox, Buell Crate/Table, Stanley Honey and Tresdon-WineRack System and one withdrawal, Y Water, almost all remaining products, available in the market, have been created by companies. This fact confirms that a packaging product made by a company has higher probability to be introduced in the market.

This finding is naturally predictable and expected. Companies can be big establishments that have operational facilities and process knowledge from fields of expertise in engineering, marketing, distribution, sales, research and design development. Additionally, they may have key relations to other companies, which are complementary to their operations (Benedetto, 1999). Having access to such a web of expertise presents itself as an enormous advantage which allows a company to plan, time and foresee market launches more efficiently than other agents.

Statement 4: Packaging products for exclusive goods are most likely in the market

In this statement, another correlation can be drawn between packaging products for exclusive goods and their presence in the market. Exclusive goods are characterised by a higher price placement in relation to similar products, which is reinforced by consumers' perceptions (Groth & McDaniel, 1993), as higher priced exclusive goods are not commonly accessible to all consumers. In the course of this analysis, only one packaging product for exclusive goods was not available in the market, which incidentally is the particular packaging product for exclusive goods not created by a company.

This correlation of packaging products for exclusive goods and their availability in the market can be explained by the nature of the creating agent, in this case, mainly

companies. As already elaborated in Statement 3, companies have operating resources and advantages, enabling to effectively plan and launch a packaging product. Furthermore, companies tend to take advantage of their product-related marketing strategies, which suggests value enhancing features endowed on the product (Groth & McDaniel, 1993). This same value enhancing feature is, indeed also perceived as additional value, which a packaging product features. With this strategy, prices can be inflated under the pretext of the additional value. However, the exclusivity does not support Democratic Design values of affordability which is sought after by Packaging Product Design.

Statement 5: The product category: All found and presented packaging products for consumables are made for groceries.

This statement reveals a correlation between consumable products and groceries. As can be seen in Table 3.1, all items that were sorted into the consumable product category can be considered as groceries and are created by companies. Groceries as consumables are everyday necessities, which presents itself as a better commercial advantage as compared to other product categories. As necessities, considerable attention is given to these products on a daily base. Incorporating any additional value into such products gives the consumer the opportunity to purchase a necessary product of greater perceived value. This enhanced value generally develops brand loyalty (Cunningham, 1956) and can therefore lead to greater profits.

Another possible reason for the insurgence of packaging products in the food industry was given by Mette Due Andersen, the marketing manager of Eggs Posure A/S. During an email survey, on the 18th of June 2015, Due Andersen pointed out that as a food company, they are very much aware of their responsibilities to reduce the increasing volume of packaging waste, created by the food industry. As a result of this awareness, reducing packaging waste has become the prior objective while creating their packaging product, Eggyplay (Due Andersen, 2015).

Statement 6: More than a third of the packaging products can be considered collectible merchandise

This statement indicates that a substantial amount of packaging products has been developed and implemented into collectible merchandise. Collectible merchandise includes packaging products that can either be bought several times without becoming useless, like Hangerpak or Tresdon-WineRack System; or that need to be bought multiple times in order to

make the best use out of the additional value, for example, Eggyplay or Y Water. Interestingly, the latter example incorporates packaging products exclusively into children's toys.

Creating packaging products as collectible merchandise has the simple benefit of enhancing the brand loyalty of the customers (Slater, 2001), which could additionally enhance sales for other products in the creator's product range. The creation of packaging products as collectible children toys follows a similar strategy. Children are considered an important marketing demography, because they have the ability to influence their parents' purchase decision (Bhattacharyya & Kohli, 2007). This behaviour is further encouraged by, for example, the packaging product Eggyplay. In this case, empty egg cartons can additionally be purchased online. Unfortunately, this thinking dilutes the sustainable principle and goal of packaging products – which is to reduce waste.

Statement 7: External packaging material is mostly used as packaging product

This statement indicates that the external packaging material is mostly used for the creation of packaging products. Of the 20 packaging products surveyed, only three involve internal packaging in their solutions. A product is usually packed in several layers of packaging throughout its supply chain, namely: primary, secondary and tertiary packaging (Davis & Song, 2006). However, this research particularly focuses on the primary packaging, with its two most relevant layers concerning packaging products, the internal and external packaging. The first layer is the internal packaging, found in direct contact with the product. Its role is to secure, conserve and sometimes organise the product in its box. Internal packaging is essential when the product is fragile or odd in form. The second layer is the external packaging, usually produced in economical and manufacturing-friendly geometric forms, following defined measurements and conditions, which depend on respective logistical regulations. External packaging serves to protect the goods in transport handling and also to market and inform the customer about its content.

As earlier mentioned, there are only three cases in which internal packaging has been used as packaging products. However, only one packaging product is explicitly created purely out of internal material, the Tresdon-WineRack System by Icon Packaging. The other two examples, CAVALLUM by Ciclus and TV Packaging Stand by Tom Ballhatchet, are created from a combination of external and internal packaging material. Arguably, the TV Packaging Stand by Tom Ballhatchet and the Coffee Table by Boca Design e Comunicazione could both be considered purely out of internal packaging, but their use as internal packaging could not be specifically verified from the existing sources

and are therefore categorised as external packaging. Additionally, not all of the listed packaging products were contingently packed with two layers of packaging materials. As such, single layered packaging products are considered and referred to as external packaging.

Using external packaging material to create a packaging product presents a clear advantage. The customer is able to immediately appreciate some features of the packaging product such as the material and colour. This could have possibly led to an obvious preferential use of external packaging materials in Packaging Product Design. Another possible reason for the existing preference towards external packaging products might simply be the creators' effort to reduce as much material as possible, therefore avoiding the use of internal packaging. Nonetheless, depending on the packed product, its fragility and necessary protection, eliminating internal packaging is not a viable solution.

Creating packaging products exclusively out of external material also presents a critical disadvantage. As the external packaging material is exposed to external influences, damages such as scratches, nicks and dents are likely. These marks become visible on the packaging product, affecting its perceived market value. To avoid this, an additional layer of packaging would thus be required, which in effect counters all intended sustainable benefits.

Statement 8: Designers are most likely to use cellulose materials for the found and presented packaging products

The last statement involves the correlation between designers and the material types being used in their packaging products. In general, it can be observed from the found packaging products that various different types of materials have been used. However, designers seem to prefer cellulose materials, as all but one designer have decided on using cellulose materials in their solutions.

Creating packaging products out of plastic, wood or glass requires expertise, machinery and initial production investments. As earlier elaborated in Statement 3, companies generally have the expertise, infrastructure and connections to different manufacturers at hand (Benedetto, 1999) which, together with financial liquidity, are able to produce and order any desired quantity. Therefore, companies are more likely to use more complex, mass manufactured materials, as compared to designers and agencies. Designers, on the other hand, may not enjoy that same leverage. This presents itself as a plausible reason for designers to use cellulose materials, as the technological production techniques are affordable, accessible and relatively inexpensive at their direct creative disposal.

SUMMARY

This section presented and conducted the first analysis of the gathered data, to better understand the current situation of packaging products.

Regarding the first two statements, it can be seen that most packaging products mostly emerged after 2005, mainly in high-income countries like Europe and North America. In following, statements three to six, gathered what could have made packaging products viable and available in the market. While some outcomes were obvious, others helped identify the current trends and applications of packaging products in the market. Most existing packaging products in the market are created by companies, created to pack exclusive goods, target perishable groceries or are created as collectible merchandise for children. The last two statements, seven and eight, addressed technical aspects of the packaging products surveyed. The analysis highlighted a finding that packaging products are mostly created from external packaging materials and a particular preference for designers to take advantage of cellulose materials such as paper and cardboard.

The findings presented in this analysis helped to gain a better and overall understanding of existing packaging product solutions. Additionally, these findings have aided to form the scope and lead to the extraction of a specific niche, which is further elaborated and explored in Chapter 4, Packaging Product Design.

In the following, the scope and niche of the pursued packaging product is introduced, conditioned, defined and explained:

- Creating packaging products for exclusive goods is avoided. This is done as exclusivity does not support the Democratic Design values. Furthermore, the design should focus on a wide range of consumers and maximise the impact of sustainable benefits towards packaging waste. For this purpose, packaging products need to be affordable to all.
- Creating packaging products for the consumable category is excluded. Appropriate and specialised sustainable solutions already exist for this category such as use of biodegradable or dissolvable packaging materials. These solutions are still subject to extensive research, but already present themselves as effective consumable packaging alternatives. Therefore, this research focuses on packaging product solutions for consumer products.
- Creating packaging products for collectible merchandise is excluded. Most collectible merchandise can also be found on consumable products – which are

outside the scope of this research. Most collectibles also require additional purchases to obtain the intended additional value, which is not supported within ideologies of sustainability.

- Creating packaging products using external packaging material is excluded. This is due to potential transportation and handling defects and the many already existing sustainable alternatives involving external packaging material, such as re-use and up-cycling. In contrast, internal packaging material is often thrown away and disposed with little sustainable considerations. Therefore, the use and inclusion of the internal packaging material into packaging products presents itself as an impactful consideration, which would significantly reduce waste. Only one case from the available packaging products is considered to have found an actual effective use of internal packaging material, namely Tresdon-WineRack System. Nonetheless, the scarce presence of packaging products created from internal packaging material enforces the niche and significance of this study, which is further elaborated in Chapter 4.
- Cellulose is used in this study, as most designers of packaging products have already been using a cellulose material for their solutions. Cellulose materials are easily accessible, malleable, affordable and can be processed without investments in heavy production machineries. In addition, the packaging product has to fulfil its original purpose of packing, securing and protecting the packed product. Harder materials like glass and metal would not be well suited for this purpose. The use of cellulose materials would exclude the use of plastics and bio-based plastics which, at this point of time, are not considered holistic sustainable materials yet – due to their specific degradation requirements. While cellulose materials might have a shorter life-span than other materials, the versatility, sustainability and renewability of the material still defines it as an ideal material for a packaging product out of internal packaging.

With the above scope set and the niche presented, the next section explores and analyses existing packaging product approaches to develop a conceptual framework and create viable packaging products.

3.2.3 DISCOVERY AND ANALYSIS OF DIFFERENT APPROACHES

This second analysis aims to detect and identify different patterns of the surveyed packaging products. They derive from found characteristics which packaging products have in common, with the objective of understanding how to create a viable packaging product. Through visual analysis, two main approaches could be detected: form specific and function specific.

When addressing a distinction between form specific and function specific design approaches, a commonly known and frequently discussed argument between them is raised. Debates over which approach should be more important and what should be focused on first, during the creation of an item, has been extensively elaborated by various scholars (Crabbe, 2013; Noble & Kumar, 2010; Townsend, Montoya, & Calantone, 2011). As the ideology of Packaging Product Design closely relates with those of Democratic Design, the relationship between form and function shall be taken to follow the model of Democratic Design. Recalling the earlier elaborated introduction in Section 2.2.3, form and function should be in an optimal balance in order to create truly purposeful and relevant objects (Fiell & Fiell, 2002). Therefore, this statement makes both attributes of form and function to be equally important for packaging products. As such, it is recommended that both approaches are considered equally, run simultaneously and are regarded as a holistic approach, in the creator's mind. Considering the inclusion of form specific and function specific approaches, we can determine various categories found in packaging products.

With the form specific approach, two categories are identified:

- Packaging products where the packaging's original form is conserved
- Packaging products where the packaging's original form is rearranged

With the function specific approach, three categories are identified:

- Packaging products as a necessary part of the packed product
- Packaging products as products on their own, unrelated to the packed product
- Packaging products as an optional complement to the packed product.

These approaches, including their categories, are used as framework for the design process of viable packaging products, presented in Chapter 4. However, it is important to already highlight that, for the deliberate creation of a packaging product, at least one category from each approach is required. In the following, the identified approaches and categories are presented and introduced, beginning with the form specific approach.

FORM SPECIFIC APPROACH

The form specific approach focuses on the outer appearances of a packaging product and how its appearance evolves during the transformation, from a packaging to a product. As earlier stated in the introduction, the form specific approach is divided into two categories:

- Packaging products where the packaging's original form is conserved
- Packaging products where the packaging's original form is rearranged

In the following, each of these two categories are explored, by analysing existing packaging products which fit into these categories.

Conservation of the packaging's original form

Packaging products that follow this category do not vary in their physical appearance throughout their lifetime and retain their originally conceptualised form during both phases. They serve the original purpose of being a packaging and a packaging product, unchanged. Furthermore, no modifications or adaptations to its original form are necessarily performed, for example: restacking of packaging parts. Three examples of packaging products in this study can be assigned to this category:

Figure 3.23: © Pirlo GmbH & Co. KG - BoomBox

Figure 3.24: © Marks & Spencer - Christmas Cookie Jar

Figure 3.25: © Kühne - Mustard Glass

In Figure 3.23, the original purpose of this metal bucket is to contain a beverage bottle or can. The packaging, resembling the form of a paint bucket, can then serve as a loudspeaker through an integrated Bluetooth speaker, while maintaining its original form. In Figure 3.24, the original purpose of this tin can is to contain cookies. The packaging product can also be used as a music box through the inbuilt winding mechanism which plays a song, without changing its original form. In Figure 3.25, the original purpose of this glass container is to pack mustard. The packaging product can then be used as a drinking

glass through its convenient form, including a handle, without changing its original form.

These examples illustrate the effortlessness of this category, as the secondary function is clear, detectable and requires little to no additional effort to generate the additional value. A clear advantage of this approach is that rigid materials can easily be used, such as glass, ceramics or metal. In the overall case study, all packaging products out of rigid materials followed this category of form conservation, retaining their original form. However, using rigid materials also presents disadvantages, as they might increase the overall product's price due to additional material costs and weight, potentially affecting its market success. In this case, an acceptable trade-off has to be found between the benefits and disadvantages of rigid materials, on a case by case basis.

Rearrangement of the packaging's original form

Packaging products that follow this category have varied physical appearances throughout their lifetime. With these packaging products, the consumer is involved in restructuring and reassembling parts of the original packaging in particular ways, appropriating its additional value. This means that parts of the original packaging can be torn, separated, folded, restacked or newly organised, in order to achieve the additional value. Three examples of packaging products in this study can be assigned to this category:

Figure 3.26: © Haslip - Hangerpak

Figure 3.27: © Celery Design Collaborative - Lemnis Box

Figure 3.28: © Ballhatchet - TV Packaging Stand

In Figure 3.26, the original purpose of this cardboard box is to contain and protect one t-shirt, while being shipped to its customer. On arrival, the packaging can be ripped, folded and reassembled to its additional value, a t-shirt hanger. Almost the entire packaging can be repurposed without additional adhesive. In Figure 3.27, the original purpose of this cardboard packaging is to contain and protect a light bulb. After purchase, the base can be detached, while the rest of the packaging is unfolded and turned inside out, to present its additional value of a lampshade. In Figure 3.28, the original purpose of this EPP packaging is to contain and protect a TV flat screen. After the product is un-packed, the packaging

can be reassembled and repurposed through a designed interlocking system, which securely stacks both packaging parts into its additional value of a TV stand and shelf. Additional protective inserts are used to stabilise the central structure.

These examples illustrate the flexibility and ingenuity of this category, which includes endless possible applications and combinations through rearrangement processes like folding, stacking and tearing. The flexibility of this category presents vast functional reapplication design potentials for future packaging products. Nevertheless, it requires a lot of contextual considerations and innovative thinking from the creator, along with necessary basic handicraft skills from the consumer.

FUNCTION SPECIFIC APPROACH

The function specific approach focuses on the core function of the packaging product and how its additional value relates to the packed product. As earlier stated in the introduction, the function specific approach is divided into three categories:

- Packaging products as a necessary part of the packed product
- Packaging products as products on their own, unrelated to the packed product
- Packaging products as an optional complement to the packed product.

In the following, each of these three categories are explored, supported by analyses of existing packaging products which fit into each category.

Packaging as a necessary part of the packed product

Packaging products that follow this category play an essential role after its original purpose, as the packaging materials becomes a necessary part of the packed product. This means that the packed product, on its own, is incomplete and needs the additional value of the packaging in order to fully function. Three examples of packaging products in this study can be assigned to this category:

Figure 3.29: © IKEA - LAMPAN Table Lamp

Figure 3.30: © Knoend - Lite2Go

Figure 3.31: © Boca Design e Comunicazione - Coffee Table

In Figure 3.29, the original purpose of this plastic bucket is to contain and protect a lamp stand, a light bulb and an electric cord. After unpacking, the plastic bucket can be assembled with the lamp stand to serve as lampshade and complete the lamp. In Figure 3.30, the original purpose of this biodegradable plastic packaging is to contain and protect a rolled up lampshade, a light bulb and an electric cord. After unpacking, the packaging can be inserted into the unrolled lampshade to serve as a light bracket, holding the light bulb and giving the lighting design its unique form. In Figure 3.31, the original purpose of this EPP packaging is to protect the edges, stabilise and handle a table top out of glass. After unpacking, the two EPP packaging parts are cross-braced, to serve as table legs and form the integral structure and design of a coffee table.

These three examples showcase ingenious solutions, where the designer completely incorporates the packaging into the actual product. Designing packaging components as integral parts of the packed product is the least represented category in this case study. This is to be expected, as packaging product designs of this category are probably the most challenging, requiring excellent interdisciplinary proficiency in packaging and product design. This approach can be considered an ideal Packaging Product Design solution, as almost the entire packaging is repurposed.

The first two examples featured lamps, but are distinguished by one interesting aspect. In the first example, LAMPAN by IKEA, the lampshade was created out of the external packaging material. With the second example, Lite2Go by Knoend, the lampshade was stored inside the external packaging, whilst the external packaging serves as inner structure and luminaire design. This small, but elementary difference, highlights a major challenge for the design of packaging products. External packaging is originally purposed to protect its content from scratches, nicks and dents, during transportation and handling. As such, a packaging product created out of external packaging is prone to damage and can, therefore, lose value. IKEA uses the lampshade as external packaging and tries to prevent

such marks by shrink wrapping the lampshade in plastic foil. However, this cheap solution does not effectively protect the lampshade from nicks and dents. Furthermore, the shrink wrap creates additional and unnecessary waste. Knoend, on the other hand, avoids this by repurposing the external packaging as internal support structure for its lamp shade. Designers of packaging products need to take the potential external damages into critical account and try to minimise the risk. Two effective approaches found to solve potential external damages are to utilise external packaging as less visible component parts of the packaging product or to develop packaging products entirely from internal packaging.

Packaging as an individual product

Packaging products that follow this category becomes a separately repurposed individual product. This means that the packaging product has no further relation to the originally packed product and works by itself under its additional value.

Three examples of packaging products in this study can be assigned to this category:

Figure 3.32: © Ciclus - CAVALLUM

Figure 3.33: © Eggs Posure A/S - Eggyplay

Figure 3.34: © The Partners - Stanley Honey

In Figure 3.32, the original purpose of this cardboard is to contain and protect a wine bottle. After unpacking, the smaller base-box serves as light bulb socket holder, whilst the outer wooden sleeve becomes a lamp shade. The internal packaging box, containing the wine bottle, needs to be discarded. In Figure 3.33, the original purpose of this plastic egg carton is to contain and transport eggs safely. After serving its original purpose, the plastic carton can be used as building play-blocks for children. The cartons can interlock and be connected with each other to create more complex structures. In Figure 3.34, the original purpose of this ceramic pot is to contain and transport honey. After the honey has been consumed and the packaging served its original purpose, the pot can be used to plant flowers. The flora grown can in turn, contribute to the larger ecosystem with bees producing honey.

Creating a packaging product as a separate individual product can be challenging,

as two different product contexts need to be taken into account during the design process. A clear advantage of this approach is that the consumer gets two products out of one purchase. However, this may be seen as a disadvantage, as some customers may not purchase the product if there is no need for both – the product and the packaging product. Some customers may prefer a different brand that only offers the contained product, with possibly lower pricing. Furthermore, the potential lack of need or interest may lead to the disposal of packaging products, which presents an overall disadvantage for sustainable principles. Ultimately, this may create more waste than a standard packaging would have created. This dilemma has a potential solution which is presented in the next category.

Packaging as an optional complement to the packed product

Packaging products that follow this category become an optional complement to the packed product. This last category presents itself as a viable middle ground amongst the previously mentioned function specific approaches. Packaging products, which are an optional complement of the packed product, may be used along with the bought product, used with other similar products or chosen not to be used at all.

Three examples of packaging products in this study can be assigned to this category:

Figure 3.35: © Li & Qin - Chinese Brush Dual-Use

Figure 3.36: © Veuve Clicquot - Fashionably Clicquot

Figure 3.37: © Icon Packaging - Tresdon-WineRack System

In Figure 3.35, the original purpose of this cardboard box is to contain and protect Chinese brushes. After unpacking, the material is torn along an imprinted template and folded into a holder for brushes. This useful brush holder is complementary to the function, with the packed product. In Figure 3.36, the original purpose of this cardboard box is to contain and protect a champagne bottle. After unpacking the bottle, the material can be reconstituted to serve as an ice bucket. This ice bucket complements the packed product. In Figure 3.37, the original purpose of this wooden case is to distribute and market wine bottles. After unstacking, the wooden plies can be restacked and interlocked, to become a

wine rack, complementing bottles. Additional boards can be modularly added to expand the rack.

These given examples illustrate how deliberate design processes integrate the packaging to produce complementary packaging products. The benefits of receiving two products out of one purchase also apply to this category and the close relationship between the packaging product and the desired product increases the appeal of an additional value. The additional value is obvious, clear and is thematically relevant to the product. Nonetheless, the packaging product might still be potentially disposed of. Such, unnecessary production processes, additional, expensive and harmful materials should be reconsidered and reflected upon (Boylston, 2009). As seen in the previous examples, little additional material was included, the material was limited to cellulose and no substantial changes in production were necessary. The solutions may appear simple, however, it is a challenging design process and approach to pursue. Finding a thematically relevant additional use and incorporating it with the packaging design involves many different variables and thoughtful sustainable considerations.

SUMMARY

This section presented and conducted the second analysis of the gathered data, to detect and identify different approaches, which existing packaging product solutions have in common, in order to understand how viable packaging products can be created.

The analysis was conducted by visual perception, through which two required approaches of packaging products were identified: form specific approaches and function specific approaches. These two approaches include different categories in which all found packaging products were assigned into, as illustrated in Table 3.3. This table presents the packaging products, their approaches and respective categories.

The next table, Table 3.4, provides the condensed outcome of the conducted analysis of the approaches and categories of packaging products. Additionally, a key particular advantage and disadvantage of each category is briefly elaborated. With these findings, a better understanding of existing design approaches can be established, including solutions toward viable packaging products.

		Form specific		Function specific		
		Retention	Rearrangement	Necessary	Individual	Optional
1.	BoomBox	x			x	
2.	Buell Crate /Table		x		x	
3.	CAVALIUM		x		x	
4.	Chinese Brush Dual-Use Pack.		x			x
5.	Christmas Cookie Jar	x			x	
6.	Coffee Table		x	x		
7.	Eggyplay	x			x	
8.	Fashionably Clicquot		x			x
9.	Hangerpak		x			x
10.	LAMPANTable Lamp		x	x		
11.	Lemnis Box		x			x
12.	Lite2Go		x	x		
13.	Mustard Glass	x			x	
14.	Packaplique	x				x
15.	Rory's Story Cubes		x			x
16.	SKINShoe Package	x				x
17.	Stanley Honey	x			x	
18.	Tresdon - WineRack System		x			x
19.	TVPackaging Stand		x			x
20.	Y Water	x			x	

Table 3.3: Form specific and function specific approaches of the packaging products surveyed

Table 3.4 could serve as a potential framework for Packaging Product Design. As such, it is meant to aid future packaging product creators, to be able to quickly apply design methods with thorough and conscious decisions on the existing categories and hence, be able to focus on the desired design process outcomes. This conceptual framework, as developed, is also used in this thesis in order to implement Packaging Product Design by creating a conceptual packaging product prototype, which is to be found in Chapter 4. In the following, the categories required by each approach are considered and elaborated for the creation of the conceptual packaging product.

Following a form specific approach, the rearrangement of the packaging's original form is considered during the design process. This decision affords creative flexibility and also facilitates any form into a potential packaging product. Furthermore, a solution out of internal packaging material is considered, so it is critical to ensure that the security of the packed product is not compromised by any additional value of the internal packaging. Some inherently protective forms may be impossible to translate into a viable packaging products. However, by giving the internal packaging material the possibility to be rearranged, a good performance as packaging and as packaging product might be easier to attain. Packaging

products out of internal material ensure that no external damages are caused, and also take advantage of the existing niche that internal packaging material presents. As it could be identified in the case study, few existing packaging product solutions were found to have integrated internal packaging materials. Creating a packaging product, with the flexibility of rearrangement of the packaging's original form, out of internal packaging, would present itself as a creatively stimulating design challenge and also present a novel solution to reduce packaging waste. This implementation is of particular interest for fragile products, where internal packaging is essential.

Approaches and Categories		Advantage	Disadvantage
Form Specific	Retention of the packaging's original form	Solid materials may be used and no modification is necessary	Potential price increase and limited design possibilities
	Rearrangement of the packaging's original form	Design flexibility with endless possible applications and combinations	Contextual considerations and innovative thinking of creator is required
Function specific	Necessary part of the product	Waste of material is reduced and kept to a minimum	Potential damage from external influences
	Individual product	Two separate products for one	Customer may require demand for both products
	Optional complement to the product	Thematically relevant additional value	Packaging product might still be disposed of

Table 3.4: Advantages and disadvantages of the form specific and function specific approaches and their categories

Following a function specific approach, the use of packaging as an optional complement to the packed product is to be considered during the design process. This decision stimulates creative thinking and informs constructive design process of a packaging product designer. Creating the packaging as an optional complement to the packed product presents the following main challenges:

- The consideration of a thematically relevant additional value to the product
- The need to maximise the overall potential of a desirable additional value
- The critical consideration from instances of potential disposal of the packaging product

These three challenges need to be successfully resolved in packaging products which follow the function specific approach of packaging as an optional complement to the packed product.

In a concise manner, the following categories are explored during the Packaging

Product Design implementation in Chapter 4 of this thesis. The form specific category of rearrangement along with the function specific category of packaging as an optional complementary product. These approaches are found valuable as they contain highly creative potentials to be considered truly sustainable, resource saving and, therefore, more meaningful for customers to purchase. This chapter concludes with a summary of the findings of the second analysis and the presentation of the approaches of the conceptual packaging product design.

3.3 CONCLUSION

This chapter presented the methodology of this research, including its framework and the conduction of a case study involving a triangulation of methods. The main objective was to find existing products in contemporary design developments which could be considered packaging products. These found packaging products were further investigated and surveyed to gather the most information and understand them better. Extensive analyses of the extracted information were conducted to better understand the current situation of packaging products and how packaging products can be created.

The framework of this study consisted in an embedded single-case study. For its conduction, a triangulation of methods was created, which included: secondary research, survey and visual analysis.

Secondary research was conducted by including various relevant sources in contemporary design developments, which delivered evidence that packaging products do already exist. The found packaging products were introduced, including key information gathered. This information was coherently sorted into Table 3.1 and Table 3.2 for a better overview that facilitated further analyses later on. The secondary research of existing packaging products highlighted how recent and undiscovered this field has been, as of now.

A survey to the creators of packaging products was attempted. This survey included key questions about their inspirations and design process. Unfortunately, very few responses could be gathered. There could be multiple reasons, as to why the creators were reluctant to share their experiences creating a packaging product. Due to unavailable substantial data, the results from the survey were not considered for analysis. However, the few responses and further information obtained, enhanced the secondary research and strengthened arguments done in the visual analysis. The individual responses of the approachable packaging product creators can be seen in Appendix C.

Visual analysis was effected as the final method in the embedded single-case study, which consisted of two separate analyses, where the final objectives of this chapter could be met: to understand the current situation of packaging products better and how a viable packaging product can be created.

The first analysis examined the correlations between the information of the presented packaging products. Reasonable information resulted to understand packaging

products better. Ultimately, this finding aimed to aid creators to generate desirable packaging products but also presented other findings through statements elaborated in Section 3.2.2. A particularly interesting finding was a niche regarding the use of internal packaging material as packaging product. After evaluating the findings, decisions were taken to focus on the implementation of Packaging Product Design for the conceptual packaging product prototype, developed in Chapter 4:

- Packaging product out of the internal packaging material
- Packaging product available and affordable for everyone
- Packaging product for consumer products
- Packaging product out of cellulose materials

The second analysis uncovered different design approaches and categories found in existing packaging products. These approaches helped to understand, how packaging products are created. Ultimately, an initial packaging product framework was introduced, which may help future creators to quickly apply design methods with thorough and conscious decisions during the design process, see Table 3.4. In particular, two main approaches were detected: Form specific and function specific approach. Both of these approaches are essential and need to be included in the creation of a packaging product. These two approaches were then further categorised and analysed. The findings and the initial framework can be found in Section 3.2.3.

For the implementation of Packaging Product Design, the initial framework was applied and a category for each approach was chosen. For the conceptual packaging product, the following combination of categories was selected:

- Form specific approach: Packaging products where the packaging's original form is rearranged
- Function specific approach: Packaging products as an optional complement to the packed product

Given the findings and outcomes of the embedded single-case study and the decisions made for the Packaging Product Design implementation, the next chapter presents and develops an implementation of the design process of a packaging product.

4 PACKAGING PRODUCT DESIGN

In the previous chapter, an embedded single-case study was conducted, highlighting the presence of packaging products in the context of contemporary design developments. In this case study, two analyses were conducted to provide knowledge on the current situation of packaging products and how a packaging product can be created. Extended from these findings, this chapter discusses and implements the proposed design approach of Packaging Product Design.

The main objective in this chapter is to present Packaging Product Design as a new, valuable and valid design approach for any design process. The established design approach is subsequently tested, by creating a conceptual packaging product prototype. Testing this new design approach helps infer whether Packaging Product Design is indeed feasible and if it is a valid design approach to be taken into consideration for future design processes. The contents of this chapter and its objectives are structured as follows.

The first sub-chapter formally presents and introduces Packaging Product Design as a new conceptual sustainable design approach. Its framework and assessment criteria are presented and discussed. The purpose of the assessment criteria is to guide the creator during the design process and to later on verify if the approach towards Packaging Product Design was feasible for the created prototype or not.

The second sub-chapter comprises the implementation of Packaging Product Design through the introduced initial framework and assessment criteria, to corroborate its feasibility. This is done by first introducing the inspiration and context of the conceptual packaging product. Then, the general direction of the implementation, previously determined in Section 3.2.2, in form of a scaled down design brief, is presented. Once the design brief is defined, the design process and concept development of a packaging product prototype follows. After considering the respective design issues and challenges of the proposed concepts, the most feasible is selected for refinement to become a conceptual

packaging product prototype. This prototype is then evaluated regarding two aspects. The first aspect deals with how applicable the implementation of the framework was. The second aspect reflects on the assessment criteria to evaluate whether the implementation of Packaging Product Design, in this particular case, was successful.

4.1 A NEW SUSTAINABLE DESIGN APPROACH: PACKAGING PRODUCT DESIGN

In this sub-chapter, a new sustainable design approach is formally introduced, the approach of Packaging Product Design. This approach aims to incorporate packaging products as a sustainable alternative to current design processes in Packaging and Product Design. To facilitate this, the approach of Packaging Product Design comprises a conceptual framework and assessment criteria. These are compiled by information gathered through the earlier conducted analyses of the embedded single-case study in Sub-chapter 3.2. In the following, the framework of Packaging Product Design is presented.

4.1.1 FRAMEWORK

This section presents the initial framework of Packaging Product Design. The framework was generated through the outcome of the second analysis of the embedded single-case study, conducted in Section 3.2.3. The outcome suggested two types of approaches to create packaging products: form specific and function specific approach. These approaches comprise the following categories.

Form specific approaches:

- Conservation of the packaging's original form
- Rearrangement of the packaging's original form

Function specific approaches:

- Packaging as a necessary part of the packed product
- Packaging as an individual product
- Packaging as an optional complement to the packed product

This framework of Packaging Product Design is furthermore illustrated in Figure 4.1.

Figure 4.1: Packaging Product Design framework - created by the author

For a deliberate packaging product design, one category of each specific approach is a fundamental requirement for the creation of a packaging product. Additionally, these two categories need to be intertwined and balanced to guarantee a holistic Packaging Product Design approach, as illustrated in Figure 4.1. The next section introduces a critical set of assessment criteria for Packaging Product Design to help along the design process and provide an evaluation device for successful packaging products.

4.1.2 ASSESSMENT CRITERIA

This section discusses the assessment criteria, which are used to guide the creator during the design process and evaluate the packaging product and its feasibility. The core principle applied to the formulations of the assessment criteria is based on contemporary values and qualities of Democratic Design as reviewed in Section 2.2.3. These values and qualities include: functionality, aesthetic appeal, high quality, producibility on a large scale, affordability and sustainability (IKEA, 2016; Stoll, 1999). These essential qualities are adopted, contextualised and further enhanced through the case study's finding of the previous chapter, in order to match the concept of Packaging Product Design.

The following elaborations of individual assessment criteria help guide the design process and to evaluate the created item as successful Packaging Product Design.

FUNCTIONALITY

- A function specific approach should be deliberated and chosen: packaging product as necessary part of the packed product, as individual product or as an optional complement to the packed product, as to reduce potential disposal.
- The function needs to be human-centric and operated by a wide range of users.
- The four primary functions of any packaging should be guaranteed: protection, containment, communication and convenience.

AESTHETIC APPEAL

- A form specific approach should be chosen: the retention or the rearrangement of the original packaging material.
- The final form, chosen material and colour of the packaging product needs to be of attractive and of intrinsic value to the customer in order to avoid potential disposal, to increase environmental fulfilment and to ensure a long lasting object-user relationship satisfaction.

HIGH QUALITY

- The packaging product should be durable and aspire towards a valuable and meaningful feel.
- The packaging product should be robust against incidental damages and uncontrollable external influences.

AFFORDABILITY

- The packaging product should not add substantially to the packed product's actual costs. Except for packaging products intended as a necessary part of the packed product.
- Producibility on an industrial scale should be considered to reduce costs.

SUSTAINABLE MATERIALS

- A bio-based or recycled material should be preferred, which can again be recycled

and fed back into its life cycle. Fast growing, annual and local materials are also considered valuable sustainable alternatives.

- Material use should be optimised: using as much material as necessary and as little material as possible to reduce packaging waste.
- Single material or easily disassembled material design solutions should be considered. An effortless and responsible disposal of the materials shall be ensured.

The assessment criteria represent an initial standard of Packaging Product Design, which can be further extended or adapted for each individual design case. Some trade-offs between criteria might be inevitable and necessary in order to ensure a viable packaging product, which follows the ideas and expectations of the customer or creator. As such, the creator needs to thoroughly consider and design an optimal balance amongst these criteria.

Given this introduction of the new conceptual design approach, Packaging Product Design, its framework and assessment criteria, the next sub-chapter continues by implementing a conceptual prototype.

4.2 IMPLEMENTATION OF PACKAGING PRODUCT DESIGN

To experiment and validate the earlier presented framework and assessment criteria, a conceptual packaging product prototype is designed. First, the context and inspiration of the prototype and a scaled down design brief are elaborated. Then, the design process and concept developments follow, which leads to the refinement of one potentially feasible design concept. Finally, the overall performance of the conceptual prototype is evaluated, together with the framework and assessment criteria. In the following, the implementation of Packaging Product Design is presented, beginning with the context and inspiration of a conceptual packaging product.

4.2.1 CONTEXT AND INSPIRATION OF THE CONCEPTUAL PACKAGING PRODUCT

This particular design opportunity is representative of the above presented new design approach in the current digital age, where smartphones are part of everyday life. Inspirations for this conceptual prototype came from a commonly observed inconvenience many people face, to regularly charge smartphone batteries. This is usually done overnight at home, or during the day at the office. Charging smartphones are habitually assigned a defined place either on a night stand or at the workstation. Common to both situations is to find a smartphone laid flat on a table's surface. Consequently, the charging cable frequently slips off the surface and falls to the floor when not connected to the smartphone, requiring the user to search for the cable to bring it back to its defined place. This typical annoying situation inspired a packaging product solution for smartphones. The suggested packaging product design is thus: a docking station.

A docking station gives a smartphone an upright or slightly tilted position, facilitating functions such as notifications or interactive backgrounds, e.g. a clock wallpaper. If smartly designed, a docking station also allows to hold the charging cable, refraining it from sliding onto the floor – keeping it conveniently at hand for future charging. Such a docking station could also include a criteria of compactness to allow for portability of docking and charging whenever and wherever needed.

The key intent of this prototype is to create a representative packaging product, using the internal packaging material of a smartphone to design a docking station.

4.2.2 DESIGN BRIEF

At the beginning of every design process, a design brief is written to address the problems of a client, which is the key challenge to be resolved with the resulting design (DuPuis & Silva, 2008; Rodgers & Milton, 2011). This is a pertinent process in both, Packaging and Product Design. A design brief usually consists of five main considerations (Muratovski, 2016), which are:

1. Project title
2. Problem statement (client's profile, needs, target audience, key competitors)
3. Proposed outcome (design considerations, design constraints)
4. Budget
5. Timetable

For methodical reasons, the process of drafting an extensive client's design brief for this research is set aside, as no clients are involved. As an alternative, a scaled down version of an actual design brief is presented, excluding the usually common client's profile and needs, key competitors as well as the budget and timetable. The design brief incorporates earlier scope and niche found in the first analysis (Section 3.2.2) and can be viewed in the following section.

SCALED DOWN DESIGN BRIEF FOR A PACKAGING PRODUCT SMARTPHONE DOCKING STATION

The following modified design brief is meant to direct the later implementation of Packaging Product Design:

1. Project title: A smartphone docking station as a packaging product for a smartphone
2. Problem statement including the target audience:
 - The target audience for this design solution are smartphone users – typically young to middle-aged users. The chosen educated target audience is prone to adopt the usage of packaging products and keen to rearrange the internal packaging, perceive and enjoy its additional value.

3. Proposed outcome including design considerations and constraints:

- Packaging Product Design including its framework and assessment criteria are considered. Only using one design approach with one focus is in general not an optimal solution (Fava, 2011). However, in this case, the creation of packaging products needs to be further explored to validate its feasibility, ensuring an absolute and non-distracting focus on Packaging Product Design.
- All common additional accessories found within traditional smartphone packaging solutions should be taken into account. The docking station should allow for portability and additionally facilitate cable transportation.
- Internal packaging material is considered, as packaging products designed out of internal packaging present a niche, as demonstrated in Section 3.2.2. This consideration also avoids incidental damages caused from transportation and handling – these are pertinent in solutions using external packaging materials.
- The packaging product is constrained to consumer products. Packaging for consumables already present more suitable and established sustainable solutions.

Keeping the presented design brief in mind, the following sections engage the design process of creating the conceptual prototype.

4.2.3 CONCEPTUAL PROTOTYPE: SMARTPHONE DOCKING STATION

DESIGN PROCESS

To steer the design process, the Packaging Product Design framework (Figure 4.1) is used to decide on a particular category of each approach to follow. For this prototype, the form specific category of rearranging the packaging's original form and the function specific category of creating the packaging as an optional complement of the packed product is applied, as already elaborated in Chapter 3. The decision is visualised in Figure 4.2.

In order to learn from precedent solutions, informing the design outcome, contemporary internal packaging for smartphones and docking station/stand designs were inspected. Examining current smartphone packaging solutions and their internal packaging demonstrated a range of accessories, which are usually included in the smartphone purchase. These commonly encompass a charging cable, a wall charger, headphones and a printed product manual – including a start-up

guide, warranty guidelines and other information. All internal packaging materials are structured to arrange and support the smartphone with its accessories, a requirement which a smartphone packaging product should fulfil. Docking stations and stands are also studied to consider existing mechanisms and principles. Most affordable docking stations and stands are made of plastic, which is not considered a sustainable solution. The potential creation of packaging products out of a cellulose packaging material can serve the same function, be affordable and consciously sustainable.

Observing existing solutions of smartphone packaging and docking stations/stands helped to understand what particular attributes a potential packaging product may have. The packaging product needs to secure all packaged content within the box, while presenting an appealing form of a docking station as its additional value. This is the design challenge, as the packaging is re-appropriated, rearranged and transformed to become a packaging product, e.g. through tearing, folding or restacking. Furthermore, a material needs to be considered which fulfils criteria for structural functionality, durability, looks, sustainability and later disposal. The overall measurement requirements of the packaging need to take into account the typical proportions of a smartphone.

Having elaborated on the design requirements for the packaging product with its potential approach, the following concept developments present different potential design outcomes for a smartphone packaging product, providing the additional value of a docking station.

Figure 4.2: Decision of framework components for the first prototype – created by the author

CONCEPT DEVELOPMENT

This section explores four different concepts for a prospective smartphone docking station/packaging product. The development of each concept begins with principal guiding thoughts, followed by conceptual sketches. These first two development stages serve to give a rough notion of the potential packaging product's characteristics and principles. Further refinements concerning the form of the packaging product, its closing/locking mechanisms and the incorporation of the cable fixture, is elaborated later on, in the 'Refinement of Prototype' section. However, the section presented here rather highlights the various challenges and problems met during the concept development, along with their possible solutions. Additionally, it elaborates arguments on each solution and supports the most feasible concept, to be refined towards a conceptual prototype.

In the following, the generated concepts for a potential packaging product are briefly presented.

Concept 1

For the first concept, the rearrangement of the packaging material into a product focuses on refolding. The length of the internal packaging was kept equal to the length of the smartphone, in order to hold everything in place. Additionally, the cable is stored within the packaging product/internal packaging, allowing for easy transportation. This design concept produces the following outcome.

The packaging product (Solution 1a: Figure 4.3 - Figure 4.9) has an elongated hexagonal shape as an internal packaging (see Figure 4.5). The docking station can be created by flipping both sides of the hexagon over a pointed end. The angle of the pointed end of the internal packaging allows the final form to have the right distance and stability, in order to serve as a docking station for the packed smartphone. A pentagon with parallel sides can also be used with the same principle as illustrated in Solution 1b (Figure 4.10 - Figure 4.13).

Sketches:

Figure 4.3: Solution 1a - closed; perspective view

Figure 4.4: Solution 1a - opened; perspective view

Figure 4.5: Solution 1a - closed; top view

Figure 4.6: Solution 1a - opened; top view

Figure 4.7: Solution 1a - exploded view

Figure 4.8: Solution 1a - packed; front view

Figure 4.9: Solution 1a - packed; side view

Figure 4.10: Solution 1b - closed; perspective view

Figure 4.11: Solution 1b - opened; perspective view

Figure 4.12: Solution 1b - closed; top view

Figure 4.13: Solution 1b - opened; top view

Concept 2

For the second concept, the rearrangement of the packaging material into a product focuses on restacking. The width of the internal packaging was kept equal to the width of the smartphone, while the length was reduced to half of the smartphone's length, allowing more space for accessories. Additionally, the cable could also be stored inside the packaging product/internal packaging. This design concept, produces the following outcome.

The packaging product (Solution 2a) has a squared shape as an internal packaging, viewed from the top. The docking station is created by unstacking and restacking the two pieces of the square, as seen in variations 2b and 2c (Figure 4.21 - Figure 4.24). On restacking, the new arrangement of the internal packaging pieces allows the final form to incline the smartphone at different angles, in horizontal or vertical positions. These different angles may be achieved by designing a series of creases on the base portion, though they are not illustrated in the sketches.

Sketches:

Figure 4.14: Solution 2a - closed; perspective view

Figure 4.15: Solution 2a - opened; perspective view

Figure 4.16: Solution 2a - closed; side view

Figure 4.17: Solution 2a - opened; side view

Figure 4.18: Solution 2a - exploded view

Figure 4.19: Solution 2a - packed; front view

Figure 4.20: Solution 2a - packed; side view

Figure 4.21: Solution 2b - opened; perspective view

Figure 4.22: Solution 2b - opened; side view

Figure 4.23: Solution 2c - opened; perspective view

Figure 4.24: Solution 2c - opened; side view

Concept 3

For the third concept, the rearrangement of the packaging material into a product focuses on slotting and restacking. The length and width of the internal packaging are kept equal to the length and width of the smartphone in order to hold everything in place. In this case, the cable could also be stored inside the packaging product/internal packaging. The design concept produces the following outcome.

The packaging product (Solution 3) is rhomboid-shaped as an internal packaging. The docking station can be created by sliding out the inner part and stacking it on top of the outer part of the internal packaging. This mechanism of sliding one piece of the packaging into the other helps to secure and enclose the cable in the box during transportation. Existing slots in the outer part of the internal packaging and the angle of the restacked packaging pieces creates a stable and eye catching final form, as seen in Figure 4.31.

Sketches:

Figure 4.25: Solution 3 - outer part; perspective view

Figure 4.26: Solution 3 - outer part; side view

Figure 4.27: Solution 3 - inner part; perspective view

Figure 4.28: Solution 3 - inner part; side view

Figure 4.29: Solution 3 - closed assembly; perspective view

Figure 4.30: Solution 3 - closed; top view

Figure 4.31: Solution 3 - Reassembly; perspective view

Figure 4.32: Solution 3 - Reassembly; side view

Figure 4.33: Solution 3 - exploded view

Figure 4.34: Solution 3 - packed; front view

Figure 4.35: Solution 3 - packed; side view

Concept 4

For the last concept, the rearrangement of the packaging material into a product focuses on restacking of the lap joint. The length and width of the assembled internal packaging were kept equal to the length and width of the smartphone, holding everything in place. Furthermore, the cable can be wrapped around the collapsed packaging product/internal packaging for convenient transportation. This design concept produces the following outcome.

The packaging product (Solution 4) has a slim and rather rectangular shape when collapsed as seen in Figure 4.36. When assembled, it becomes cross-shaped by restacking its lap joint. Comparing with other previous design concepts, this docking station is in its assembled state as an internal packaging. The packaging product is only disassembled for transportation, making it extremely flat and allowing the cable to be easily wrapped around it.

Sketches:

Figure 4.36: Solution 4 - closed; perspective view

Figure 4.37: Solution 4 - opened; perspective view

Figure 4.38: Solution 4 - closed; top view

Figure 4.39: Solution 4 - opened; top view

Figure 4.40: Solution 4 - exploded view

Figure 4.41: Solution 4 - packed; front view

Figure 4.42: Solution 4 - packed; side view

DESIGN ISSUES AND CHALLENGES

The packaging product featured in this research is only an indicative conceptual packaging product prototype. As such, the overall design process does not assert a formal design engagement and is not yet completed at this stage of development. In the industry, the packaging product, as well as the entire packaging (including external packaging) would need to undergo several stages of analyses, tests, evaluations and possible redesigns – before it is finally accepted for production and distribution. In turn, these processes need to follow several guidelines from the industry, producers and distributors, which are not discussed in this thesis. Nonetheless, these stages comprise quality and feasibility tests, which confirm its producibility on a large scale, including the final choice of material, ink and manufacturing processes. The safe arrival of the packed products also needs to be ensured through various tests, including drop or compression tests. These might result in the inclusion of an additional protective layer. For example, in this particular case, the electronics within the packaging might require anti-static wrapping, corrosion protection or additional cushioning to ensure a safe product distribution.

Going back to the proposed design at the conceptual stage of development, potential design issues and challenges surfaced and have been noted. The distinct forms and rearrangement procedures have to work in confluence. Additionally, other phone accessories need to be accounted for. The main design concerns of the presented design concepts are the following:

1. Internal space: This issue is predominant in all four concepts to varying degrees, as measurements of the potential packaging product were based solely on the measurements of the smartphone, using the least material possible. Because of this, accommodating additional accessories became a difficult task and a real challenge. Some phone manufacturers, such as Motorola with their Moto G, have compromised on this issue by not including wall chargers (T. Martin, 2013). However, it might be better to meet expectations by including common accessories provided with most smartphone purchases. The internal space issue is resolved by enlarging the external packaging to fit all accessories. However, any enlargement would require additional packaging material which is, from a sustainable point of view, undesired. Concept 4 is the most space/volume efficient solution, as it is the only design concept which is not intended to encapsulate any cable. Therefore, it is the most suitable to accommodate additional accessories. However, if the electrical charging plug BS 1363 (Singapore, UK) is present, the packaging product would need additional height to accommodate it.

Trade-off:

Compact and sustainable → restrictive packaging product design, challenging to pack and accommodate all conventional accessories.

2. Assembly: This issue is present again in all four concepts to varying degrees, as the internal packaging of each solution consists of more than one piece. Assembly issues are a likely challenge of the form specific approach of rearrangement, as separate packaging product pieces are likely to be misplaced or lost. This problem may be solved through custom mechanics, such as the interlocking lap joint found in the assembled Concept 4. Other solutions may include magnetic attachments, additional sleeve/rubber bands or hinge systems such as in Concept 1. Some of these solutions would require the use of additional and/or different materials, which could compromise the sustainable benefits of single material solutions and result in more complex re-cycling processes.

Trade-off:

Multiple packaging pieces → need for special interlocking mechanisms or potential use of additional and/or different materials.

3. Cable transportation: This issue is present in Concept 1 and 2, as the cable is not fully enclosed or wrapped around the packaging product in a secure mode. This

implies that the cable may easily fall off and get lost during transportation. This issue could be resolved by enclosing the cable and packaging product entirely through a sleeve or by keeping them in place using a rubber band. However, this would require the additional use of a different material, which is to be avoided.

Trade-off:

Secure cable transportation → fully enclosed or wrapped around packaging product design, or potential use of additional and/or different material.

4. Material: This issue is substantially present in Concept 3 and also affects Concept 1 and 2, as the packaging incorporates additional materials. This is expected as packaging products tend to require additional or different materials, compared to traditional packaging solutions. In the case of Concept 3, the internal packaging product is double layered in some areas along the shorter sides, creating an excess of packaging material. Concept 1 and 2 do not have material excesses, but require the use of different material for assembly purposes. These problems could be solved by finding a sustainable balance in the design between the added value of the packaging product and its potential environmental material impact.

Trade-off:

Minimised use of additional materials → restrictive packaging product design or balance additional value with the least required material and material types as possible.

5. Structural stability: This issue is present in Concept 4, as the current design solution allows the smartphone placed in a vertical or horizontal position. Since the packaging product's angle of inclination is tied to the smartphone upright measurements, the docking station can become unstable. This issue is particularly present when the smartphone is placed vertically at the narrowest part of the cross-shaped docking station, tipping the balance to the rear of the packaging product with risks of a potential fall. This problem could be avoided by omitting the vertical placement of the smartphone, as the angle of the packaging product pieces cannot be altered.

Trade-off:

Maximise docking stability → compromises functionality by enabling only horizontal placement of the smartphone.

Following the analyses of the different concepts with their main challenges and issues for real world implementation, one concept is chosen for further refinement into a conceptual packaging product. The argumentation for this decision is elaborated next.

DESIGN DECISION

Having explored and developed basic concepts of possible smartphone docking station packaging products, along with considerations of their potential design issues and challenges, a specific concept option is to be considered for further refinement.

For this purpose, the various solutions are evaluated regarding their main issues, encountered during the concept development. This proceeds with an objective and factual decision making process, which filters the most feasible and efficient packaging product concept. In the following, the design concepts are listed briefly, including their principal characteristics and potential challenges/issues:

- The first design concept focuses on refolding the packaging components, while providing storage space for the cable inside the closed packaging material. This concept presented internal space, assembly and cable transportation issues.
- The second design concept focuses on restacking the packaging components, while providing storage space for the cable inside the closed packaging material. This concept presented internal space, assembly and containment issues.
- The third design concept focuses on slotting and restacking the packaging components, while providing a closed storage space for the cable inside the packaging material. This concept presented internal space, material and minor assembly issues.
- The fourth design concept focuses on restacking the packaging products, while enabling the cable to be wrapped around the collapsed packaging product. This concept presented structural stability issues and some minor internal space/assembly issues.

Internal space issues are the most common faced in all packaging product concepts due the small size of the smartphone. Concept 4 is the most effective as it can accommodate and organise most accessories without requiring much additional space. Assembly issues are evident in all concepts, as it is a native challenge found in packaging products with the form specific approach of rearrangement. Concept 3 and 4 present better

optimisations as they do not require different materials to be structurally held in place. Cable transportation issues were also apparent when considering this functionality in the packaging product concepts. Concept 3 and 4 present themselves better suited, as they already provide a more secure cable transportation solution. Material issues are present, which involve additional material compared to standard packaging solutions. However, Concept 4 presents itself as a material efficient solution involving only two flat surfaces. Finally, structural stability issues of the docking station remain to be detailed in design. Concept 1 seems to be less prone to this issue, however, it can also be avoided in the other concepts, by circumventing potentially unstable vertical docking capabilities.

Following the above analysis, the most feasible and efficient packaging product concept to pursue becomes apparent. Concept 4 is to be chosen for its material and internal space efficiencies. These, together with the embedded lap joint mechanism and the wrap-around cable transportation functionality, present good conditions for a feasible packaging product design. In addition, its manufacturing process may be more cost and time efficient than the other concepts, as the pieces are designed flat and easily batch produced. Overall, this packaging product design concept showed significant strengths compared to the others, making Concept 4 worth exploring for the refinement stage.

REFINEMENT OF PROTOTYPE

In this section, the chosen packaging product design concept for a smartphone docking station is refined. The packaging product presented in Concept 4, repurposed from internal packaging, is assembled from stacked internal packaging parts. The solution also allows the cable to be wrapped around the collapsed packaging product for transportation purposes. The refinements begin by presenting the specific design issues of Concept 4, along with viable solutions. Further sketches are derived from the original design, taking basic features while expanding the scheme to create a unique, more unified and viable solution. Once conceptualised, a 3D test model of the prototype is built, followed by arguments regarding potential use of materials – keeping in mind sustainable objectives of a packaging product solution.

Design Issues and Solutions of Concept 4

Concept 4, while being the most effective and potentially viable packaging product design from the earlier presented concept development, still contains design challenges and issues which need to be taken into account. These are detailed next, together with viable workarounds and solutions.

- Internal space issues: the refined design has to fit all common smartphone accessories into the packaging. To accommodate them, the height of the packaging can be extended to include the electrical charging plug BS 1363 (Singapore, UK).
- Assembly issues: the refined design needs to ensure that individual component pieces are not lost when disassembled. This can be resolved by wrapping the cable around the collapsed packaging product. However, including an optional rubber band or a plastic twist tie can also be considered.
- Material issues: the refined design should maintain high sustainability standards by providing a single material solution.
- Structural stability issues: the refined design needs to ensure that the packaging product is stable during use. Vertical positioning might compromise the stability of the chosen concept and is therefore omitted. Additional angles for horizontal placement are considered, instead.

While minor, these design adjustments are necessary to create a robust solution which enforces the sustainability principles of packaging products. The following section presents sketches of the design process refinement, taking into account the above design challenges and solutions.

Refinement Sketches

The basic packaging product concept of a docking station is based on two simple rectangular pieces interlocked through a lap joint, whose essential features are seen in Figure 4.43. The shape of the selected packaging product is further stylised to be more dynamic, aesthetically pleasing and appealing, while maintaining the essential features and stability of an internal packaging, as seen in **Error! Reference source not found. - Error! Reference source not found.**

Figure 4.43: Basic features that need to be preserved; side view

Figure 4.44: Design 1; side view

Inspired by natural rounded shapes, recreating waves in its sinuous hydrodynamic essence highlighting a natural and sustainable unison.

Figure 4.45: Design 2; side view

Inspired by practicality, a blend of curved and angular design highlighting the essential features of this packaging product.

Figure 4.46: Design 3; side view

Inspired by natural crystalline shapes, recreating an edgy and futuristic look highlighting the engineering precision of the design.

From this refinement stage, Design 3 was chosen for further polish as it best suits the technological nature of the packed product and target audience. This last step is conducted in

four stages, building up on functionality and fine-tuning the overall shape and form.

Figure 4.47: Refinement of both packaging pieces; stage 1

Cable slot modified for handling purposes, sharp edges bevelled, minor proportions modified.

Figure 4.48: Refinement of both packaging pieces; stage 2

Smartphone slot modified for stability purposes, minor modifications to bevels.

Figure 4.49: Refinement of both packaging pieces; stage 3

Contact proportions modified for stability and packaging robustness.

Figure 4.50: Refinement of both packaging pieces; stage 4

Lower part modified in shape for stability purposes and functional enhancements.

Following these four stages of refinement, the conceptual Packaging Product Design prototype is formed. The design found at the last stage, Figure 4.50, encompasses all originally planned features with further extensions, while maintaining a modern form and complementing the smartphone's technological nature. The designed form was furthermore extended by including an alternative horizontal positioning angle and placement for the smartphone. In the following, the packaging product is visualised and presented as a 3D model in Figure 4.51 - Figure 4.57.

Figure 4.51: Restacked and interlocked packaging product with smartphone; position 1

Figure 4.52: Restacked and interlocked packaging product with cable; position 1

Figure 4.53: Upside down packaging product with smartphone; position 2

Figure 4.54: Upside down packaging product with cable; position 2

Figure 4.55: Entire packaging including all accessories packed in the box; exploded view

Figure 4.56: Collapsed packaging product ready for transportation

Figure 4.57: Main accessories packed in the box; top view

The conceptual packaging product prototype outcome illustrated above, includes the following features:

- All additional accessories commonly included in the smartphone packaging are accommodated. (Figure 4.55 and Figure 4.57).
- The smartphone can be docked horizontally at two different angles by flipping the docking station upside-down (Figure 4.51 and Figure 4.53).
- The cable can be suspended and stored in the respective slot at the rear end of one packaging piece, keeping it easily at hand, secured with the docking station (Figure 4.52 and Figure 4.54).
- The separate packaging pieces can be secured by wrapping with the charging cable, head phones, a rubber band or plastic twist tie. (Figure 4.56).
- The separate packaging pieces could also be secured by intertwining or interlocking them with each other, if the packaging product is made of flexible material (Figure 4.58 and Figure 4.59).
- The included product manual can serve as protective buffer in between the smartphone and the additional accessories (Figure 4.55). Furthermore, an appealing design could be printed on the manual cover, to support the design of the smartphone and its packaging product.

Having discussed all the available features found in the conceptualised packaging product prototype, the following section elaborates on the choice of materials and how this can also be used to enhance the functionality and reduce the ecological footprint.

Choice of Material

Different materials can be considered for the presented conceptual packaging product, depending on the desired properties. With the use of an appropriately flexible material, the packaging pieces can be interlocked when collapsed, as Figure 4.58 and Figure 4.59 demonstrate. The material thickness also influences the feasibility of this interlocking mechanism, which would solve any potential assembly issues while integrally holding the packaging pieces together. However, a flexible material comes with other issues, as it tends to be lighter and may negatively influence the stability of the docking station.

Figure 4.58: Interlocking of both packaging pieces; option 1

Figure 4.59: Interlocking of both packaging pieces; option 2

A more stable and robust choice would be a higher density material, nonetheless, this might lead to additional transportation costs due to the extra weight. However, the higher stability is crucial for smartphone docking purposes. Viable material options could be thoroughly tested before production, which may include: cork, recycled particle boards, laminated wood or local and fast growing bamboo. The use of biodegradable materials is highly encouraged, such as latest material innovations by PaperFoam (2016) and Myco Board, created by Ecovative Design (Evans, 2012).

For the purpose of this conceptual packaging product prototype and its evaluation in the next section, locally grown bamboo is used in the form of bamboo composites, such as bamboo plywood, to test the validity of the overall concept of Packaging Product Design.

EVALUATION OF PROTOTYPE

In this section, the created prototype is evaluated to verify whether the packaging product concept was successful and if the overall approach of Packaging Product Design can be considered a realistic design approach. The evaluation of Packaging Product Design and the developed conceptual packaging product prototype is conducted in two steps. The conceptual packaging product prototype is first juxtaposed with the created and implemented framework of Packaging Product Design and then evaluated with the prescribed assessment criteria.

Evaluation of the Framework

The framework, presented in Section 4.1.1, is envisioned to guide creators in designing packaging products. For the packaging product concept created through this study, the docking station for a smartphone, this framework was implemented to consider choices of rightful approaches on the essential aspects of packaging products. Through this, the form specific approach of rearrangement and the function specific approach of

packaging as an optional complement of the packed product were chosen. This facilitated the thinking processes and design directions during the concept development.

The framework may be considered successful for it distils the approach of Packaging Product Design and presents them in a balanced manner. This balanced application of form and function specific approaches represents the main characteristics of packaging products.

Evaluation of the Assessment Criteria

The assessment criteria, found in Section 4.1.2, help to validate the created packaging product. Through this validation, the creator can evaluate if a prototype fulfils each criterion and estimate if the solution can be considered a feasible packaging product. In the following, the docking station for a smartphone made out of internal packaging material is assessed, following the earlier introduced criteria.

Functionality:

- ✓ A function specific approach of a packaging product as optional complement to the packed product was the chosen design direction. The optional complement of the prototype is a smartphone docking station, which is not essential but complements the smartphone purchase.
- ✓ The simplicity of the interlocking and reassembling mechanism allows easy handling for a wide range of users, as minimal instructions and steps are required.
- ✓ The smartphone can be docked horizontally at two different angles, which allows for additional functional versatility.
- ✓ The four primary functions of a packaging are guaranteed. The functions of protection and containment are achieved via the cross-shaped arrangement of the internal packaging pieces. The various contact points to the external packaging keeps the arrangement in place, while the additional accessories are kept in a tight fit, which helps to further protect the product and its additional accessories. The function of convenience is achieved, as the whole product packaging arrangement can simply be lifted out of the external packaging, allowing a convenient accessibility to the additional accessories. The function of communication is not required, as this packaging product is made entirely out of internal packaging.
- During transportation, the collapsed packaging pieces can be kept together solely

through the wrapped cable or an additional band.

Aesthetic appeal:

- ✓ A form specific approach of a packaging product as a rearrangement of the packaging material was chosen. In the case of the designed smartphone docking station, the form changes when the internal packaging/docking station is disassembled for transportation purposes and gains a new function after its renewed assembly.
- ✓ The form of this packaging product was inspired by crystalline shapes. Crystals symbolise strength, durability and at the same time quality and style. Further inspiration was obtained from the accompanied technology of a smartphone, which inspired an edgy and futuristic look of the conceptual prototype. Combining these features with an organic material like bamboo plywood, with its natural colour, brings the design back to earth and creates a solid, almost rooted appearance, which is sustainable and still reflects the engineering precision and a modern look.

High quality:

- ✓ Bamboo plywood is a durable natural bamboo composite with a premium organic feel.
- ✓ A packaging product designed from internal packaging material is kept safe from dents and incidental damages from uncontrollable external influences. Additionally, the visible side of the packaging product can be kept in pristine condition during later transportation, by collapsing the packaging pieces in such a way that the visible sides face inwards.

Affordability:

- The chosen bamboo plywood might slightly increase the overall cost of the entire product, depending on the current material and manufacturing costs.
- ✓ Producibility on an industrial scale is possible as the packaging product can be cut out flat and does not require any additional materials or refinements. The manufacturing processes are kept at a minimum which makes it inexpensive and easy to produce.

Sustainable materials:

- Bamboo, as a source material, needs around five years until harvested, which does

not make it an annual material. However, it re-grows substantially faster than trees, making bamboo more sustainable than other types of timber materials. Bamboo is also considered a local material in South East Asia and is easily accessible due to Singapore's strategic location.

- ✓ The design of the packaging product uses as little material as possible, while still considering its unique design, stability and functionality. Additionally, the shape of the design can be cleverly nested during manufacturing to optimise the production process and reduce the residual material waste. The impact of this approach is visualised in Figure 4.60 and Figure 4.61.

Figure 4.60: Individual arrangement of packaging product pieces; space for 16 packaging products

Figure 4.61: Nested arrangement of packaging product pieces; space for 19 packaging products

A nested arrangement optimises the raw material to produce more pieces from the same source. In Figure 4.61, six additional pieces could be obtained which account for three packaging products more, compared to Figure 4.60. This demonstrates clearly how space efficient the nesting and possible manufacturing of this packaging product prototype could be.

- ✓ The packaging product design concept is based on a single material solution, bamboo plywood. Additionally, it is simple to disassemble and its organic nature makes it easy to dispose of.

The docking station repurposed out of internal packaging material has met most criteria of Packaging Product Design. Therefore, the packaging product design concept prototype can be considered a successful packaging product. The proposed framework and assessment criteria were effectively applied during the design process and substantially aided the development the conceptual prototype to its current state. Packaging Product Design has initially proven to be a viable building block for future sustainable alternatives.

4.3 SUMMARY AND CONCLUSION

The main objective of this chapter was to present and formally introduce Packaging Product Design as a new sustainable design approach for any design process. The presented design approach proposes a framework and assessment criteria which were first introduced and later implemented and tested by creating a conceptual packaging product prototype. The conceptual packaging product prototype affirmed the viability of Packaging Product Design with its effectiveness for future design processes, incorporating it as a sustainable alternative to current design processes in Packaging and Product Design.

The framework of Packaging Product Design was introduced, which comprises two equally important and necessary approaches that can be further divided into the following categories:

1. Form specific approach:
 - Conservation of the packaging's original form
 - Rearrangement of the packaging's original form
2. Function specific approach:
 - Packaging as a necessary part of the packed product
 - Packaging as an individual product
 - Packaging as an optional complement to the packed product

To create a packaging product, one category of each approach is considered necessary.

The assessment criteria, based on contemporary values and qualities of Democratic Design, were introduced and listed. The assessment criteria originally helped to validate the feasibility and determine the success of the created packaging product at the end of the prototyping process. However, the criteria have also shown to be extremely useful by guiding the creator through the design process and thinking of Packaging Product Design. The assessment criteria are based on the following five qualities:

- Functionality
- Aesthetic appeal

- High quality
- Affordability
- Sustainable materials

Conclusively, Packaging Product Design, its design framework and its assessment criteria were implemented in a conceptual packaging product prototype: a smartphone docking station. The general direction was chosen following the introduced framework, by selecting the form specific approach of rearrangement of the packaging's original form and the function specific approach of packaging as an optional complement to the packed product. The assessment criteria guided the design process to meet each criterion. The creation of a conceptual prototype, following the principles of Packaging Product Design, engaged and evaluated the design framework, the created packaging product in accordance to the assessment criteria and the conceptual approach of Packaging Product Design as a whole.

The presented framework effectively aided to focus on the core aspects of a packaging product, the balance of form and function specific approaches. These are required to create an item that can be considered a packaging product. However, only a packaging product that meets the assessment criteria can be considered a result of deliberate Packaging Product Design, especially regarding its sustainable aspects. The assessment criteria have proven to be useful when evaluating the presented packaging product concept and have thus positively influenced the entire design process.

For the created conceptual packaging product prototype, Packaging Product Design has been successfully implemented, as most of the assessment criteria were met. Minor trade-offs were necessary, but the overall result of the implementation of Packaging Product Design is constructive. Packaging Product Design proves to be a viable new design approach for this and future sustainable design solutions. However, further study is required in order to refine the design approach to quantitatively present evidence of its applicability and reception in actual practices.

Given the findings and outcomes of Packaging Product Design, the next chapter presents an overall discussion and conclusion of this research.

5 DISCUSSION AND CONCLUSIONS

The overall aim of this research was to present and introduce the concept of Packaging Product Design as a feasible sustainable alternative to current design practices in the separate disciplines of Packaging Design and Product Design. To this purpose, the study presented in this research incorporated various objectives:

- To search and verify any existence of packaging products and its underlying principles in an academic context.
- To detect and identify potential packaging products in the context of contemporary design developments.
- To better understand the current situation of packaging products.
- To determine how a viable packaging product can be created.
- To create and introduce a feasible conceptual framework for Packaging Product Design and establish assessment criteria to verify its sustainability.
- To test the introduced framework and assessment criteria through the development of a conceptual packaging product prototype.

With the preceding objectives being met, the outcome of this research was iteratively refined and tested in order to present an applicable framework and assessment criteria towards Packaging Product Design, which may guide potential developers along the design process of sustainable packaging products. This chapter reflects on, and highlights pertinent conclusions of the study. It includes a discussion over the outcome, the significance, the current limitations and proposes possible areas and directions for future research.

5.1 OUTCOME OF STUDY

The study presented in this research was divided into three main parts, individually addressed in their respective chapters. Each chapter is necessary and plays a fundamental function to meet the objectives of this research and ultimately answer the research question:

How can the interdisciplinary approach of both, Packaging and Product Design, be consolidated and integrated, as a feasible and sustainable alternative to current design practices?

In Chapter 2, literature review was conducted whose main objective was to search and verify any potential existence of packaging products and its underlying principles in an academic context. The existence of the underlying principles could indeed be verified in an academic context, though the scarce documented existence and implementation confirmed the uniqueness of Packaging Product Design. Through the review, only two scholars were found to have hinted on the idea of integrating Packaging with Product Design (Section 2.2.2). The first scholar to mention this integration was Victor Papanek, who was an architect, designer and key initiator of the ideas of sustainability. In his book ‘The Green Imperative’, Papanek subconsciously stated the idea of “packaging is the product” (Papanek, 2003, p. 33), as he critiqued consumers’ behaviour and their obsession with the external appearances of packaging. The second scholar to be mentioned in this context is Scott Boylston. In his book ‘Designing Sustainable Packaging’, Boylston reclaimed and reinterpreted Papanek’s idea in its most literal sense, interpreting it as “packaging is the product” (Boylston, 2009, p. 52). Packaging as a product, manifests itself after the packaging’s original purpose, in the form of an ‘afterlife’ additional value. From this, Boylston extrapolated three distinct categories by which packaging with additional value may be sorted in: reuse by default, reuse by innovation and reuse by prescription. The last category of ‘re-use by prescription’ is precisely what a packaging product stands for, but Boylston has not clearly formulated further details about this approach – even though he emphasised on its exciting possibilities and potentials for designers. Apart from these two authors, no further evidence for the principle of packaging products was found in academic literature, which included accredited sustainable movements of Packaging and the sustainability awareness in the history of Product Design. This chapter presented a clear gap regarding the integration of Packaging and Product Design in the academic context,

which enforces the relevance of this research, as it tries to formally introduce the approach of Packaging Product Design and address this gap.

In Chapter 3, an embedded single-case study was conducted with three main objectives: to detect and identify existing packaging products in the context of contemporary design developments; to better understand the current situation of packaging products; and to determine how a viable packaging product can be deliberately created. These objectives were met by performing a triangulation of the following methods: secondary research, survey and visual analysis.

The case study's secondary research involved various resources, which helped detect twenty existing packaging products in contemporary design developments. The key information of these packaging products was collected and sorted into outlining tables (Section 3.2.1). Though scarce, these findings collectively indicated that packaging products already exist in contemporary design developments, achieving the objective of detecting and identifying potential packaging products. A first hand survey with the creators of the found packaging products was also attempted to enhance an understanding of their inspirations and design process. However, due to insufficient responses, no substantial data could be gathered at this point. Nonetheless, from the few received responses, some information could be incorporated with the overall collected data, to provide the basis for the visual analysis.

The case study's visual analysis consisted of two separate analyses. The first analysis focused on detecting prominent correlations between the earlier gathered packaging products' information. From the different correlations, statements were established to gain a better overall understanding of existing packaging products. The findings of the analysis served the purpose to gain a better understanding of the current situation of packaging products and are meant to help creators to better understand what features and circumstances would increase this likelihood. As a result, most existing packaging products in the market are created by companies, created to pack exclusive goods, target perishable groceries or are created as collectible merchandise for children. The reasons for these outcomes is elaborated on in Section 3.2.2. Additionally, a niche was discovered, particularly within existing packaging products, which involves the use of internal packaging materials as packaging products. Altogether, the analysis also helped to create a scope for the later implementation of Packaging Product Design in Chapter 4.

The objective of the second analysis was to determine how viable packaging products can be created. Through the analysis, two different approaches were discovered and established, present in all found packaging products: form specific approach and

function specific approach (Section 3.2.3). Furthermore, by studying how existing packaging products follow these approaches, different categories were identified. These findings helped to understand how packaging products were created, and delivered a foundation to conceptualise an initial design framework for Packaging Product Design, which was further elaborated in Chapter 4.

In Chapter 4, Packaging Product Design as a new, valuable and valid design approach for any design process was proposed with two final objectives: to create and introduce a conceptual framework for Packaging Product Design and establish assessment criteria to verify its sustainability; and to test the introduced framework and assessment criteria through the development of a conceptual packaging product prototype.

Figure 5.1: Packaging Product Design framework - created by the author

The conceptual framework of Packaging Product Design is based on the outcome of the second visual analysis, conducted in Section 3.2.3, and consists of its two earlier found main approaches and their distinct categories, displayed in Figure 5.1 and elaborated in Section 4.1.1. Extrapolating from existing packaging products, an essential requirement for a packaging product is to deliberately follow one category of each approach. Additionally, to consolidate the design framework, assessment criteria were introduced, inspired by contemporary qualities of Democratic Design (IKEA, 2016; Stoll, 1999). These qualities were adapted and further enhanced through the findings of the case study in Chapter 3, leading to the assessment criteria established in Section 4.1.2, which encompass: functionality, aesthetic appeal, high quality, affordability and sustainable materials. These criteria are to be considered as an initial standard of Packaging Product Design, which helps to evaluate the feasibility of any packaging product and a successful implementation of Packaging Product Design.

Finally, to verify and test the suggested conceptual framework and assessment criteria for Packaging Product Design, a conceptual packaging product of a smartphone docking station was created. This design was supported by the introduced framework and assessment criteria and explored the detected niche of employing internal packaging materials. The Packaging Product Design framework helped to efficiently streamline a combination of the following categories:

- Form specific approach – packaging products where the packaging’s original form is rearranged
- Function specific approach – packaging as an optional part of the packed product

Once the approach was formulated, a conceptual packaging product was designed and modelled, as seen in Figure 5.2 to Figure 5.6.

Figure 5.2: Entire packaging including all accessories packed in the box; exploded view

Figure 5.3: Restacked and interlocked packaging product with smartphone; position 1

Figure 5.4: Upside down packaging product with smartphone; position 2

Figure 5.5: Main accessories packed in the box; top view

Figure 5.6: Collapsed packaging product ready for transportation

Through the deliberate creation of the conceptual packaging product, the overall approach of Packaging Product Design, its framework and assessment criteria were evaluated and corroborated (Section 4.2.3 – Evaluation of Prototype). The design framework by itself was found constructive in designing an item which could qualify as a packaging product. However, the design outcome should also fulfil most assessment criteria to follow the principles of Packaging Product Design and create a sustainable, viable and successful packaging product.

Through the final implementation of Packaging Product Design and the thorough analyses from previous chapters, all the objectives of the study were found to be met. The outcomes managed to answer the research question by consolidating and integrating Packaging and Product Design in the novel form of Packaging Product Design, by incorporating them through an additional value. Furthermore, through the conceptual framework and assessment criteria, Packaging Product Design is presented as a feasible and sustainable alternative to current design practises in Packaging and Product Design, while enabling an interdisciplinary and exciting design approach for product and packaging designers alike.

With this study, the gap regarding the integration of Packaging and Product Design in the academic context is addressed through the introduction of the interdisciplinary and integrated approach of Packaging Product Design. While the presented research might not completely fill this gap, the constructive significance of this study with its repercussions are elaborated in the next sub-chapter.

5.2 SIGNIFICANCE OF STUDY

In this study, a novel feasible alternative to current sustainable design practices in Packaging and Product Design is established. The two fields of Packaging and Product Design were integrated, to develop packaging with additional value, designing a solution where the packaging is either part of the packed product, an individual product or an optional complement to the packed product – by retaining or rearranging its original form. This alternative comprises the approach of Packaging Product Design, including its conceptual framework and assessment criteria to create viable and sustainable packaging products.

Conventional sustainable approaches towards Packaging and Product Design do not actively consider the integration of both fields. This may come as a surprise, considering how dependent both fields are on each other. There are very few products which do not require packaging during its lifecycle and any packaging would be purposeless without a product to protect and/or transport. This is why the introduced approach of Packaging Product Design is significant and worthy of greater exploration and extended studies. A design approach which involves and integrates both fields carries the potential to streamline their purposes and provides an enhanced compound value. The additional value of this novel approach may not only augment the product, but also the customers' experience-satisfaction and the product brand values itself – as this alternative sustainable solution could provide significant environmental benefit by reducing current packaging waste, while increasing overall perceived democratic value. Moreover, as an interdisciplinary solution between Packaging and Product Design, it enforces not just one, but two global disciplines and industries to take responsibility towards effectively reducing their environmental impact.

Singapore, as an economically leading country, has a critical challenge of unrecycled household waste, of which at least 65 percent is packaging waste (McDonough & Braungart, 2013). This pertinent problem needs to be resolved by 2035, due to its exhaustible landfill capacity (Boh, 2016). Other countries worldwide are also prone to excessive packaging waste, which highlights the global urge towards sustainable approaches. While the proposed approach of Packaging Product Design may not entirely solve this problem, it may help to reduce the amount of disposed packaging material, by

providing an additional value to the packaging. As more designers adopt Packaging Product Design in the future, a substantial contribution to resolve this issue becomes possible, as this unexplored design approach could inspire considerable ramifications for future applications and research. As Jason Ivey, the founder of Icon Packaging explains, “no longer is it merely about using green materials, but now it’s also important to put a secondary use or function into packaging design. This is the next stage in packaging evolution.” (Lingle, 2013).

While the work presented in this Master’s Thesis may only scratch the surface of Packaging Product Design and its potential, this study presents a considerable contribution by introducing a viable conceptual framework and assessment criteria, guiding future creators towards designing sustainable packaging products.

5.3 LIMITATIONS

The contribution and outcomes of the presented research may be promising, however, limitations are still present in the study which are briefly elaborated for future consideration:

- The search for evidence of packaging products in the academic literature, as well as in contemporary design developments is limited. Due to language barriers, the investigation was restricted to English and German sources. Therefore, though thorough, the conducted search of existing packaging products might still have missed other existing solutions, which have not been discovered and addressed in this study.
- The interviews, planned with the respective creators of the packaging products, could not be fully sought after, due to insufficient responses during the conduction of the email surveys, which served as a pilot study. Insights as such, from the creators' perspective about their respective design approaches, were limited. To overcome these issues in future, different channels may be required when reaching out to creators. More personal approaches such as calls and visits might arguably lead to more success, but there is still no guarantee of their willingness to share their experiences.
- The scaled down design brief did not involve a particular client or manufacturing requirements typically found in real-world design briefs. This limits but simplifies certain aspects of the creation and evaluation of Packaging Product Design as a desirable, effective and sustainable solution, which could be created on an industrial scale.
- The implementation and evaluation of Packaging Product Design could have also included multiple packaging products, following different categories of the presented framework. Due to the limited time of this study, it was only possible to consider one of the six possible combinations.

These limitations also present themselves as new opportunities for future and more extensive research, which is discussed in the next sub-chapter.

5.4 FUTURE RESEARCH

Packaging Product Design was introduced as new alternate design approach for sustainable Packaging and Product Design. As such, the research presented in this document could only scratch the surface of this integrated approach along with its potential applications and sustainable benefits. This opens significant opportunities for further and future research in various ways. As the framework is further tested and evaluated, all possible combinations of the Packaging Product Design approach can be implemented, further exploring its potentials and improving upon this initial stage. The assessment criteria can also be polished based on experience gathered. More importantly, this unexplored design approach could offer exciting and different solutions for future applications in real-world scenarios. Incorporating thorough design briefs, creating solutions for real clients and manufacturing packaging products at an industrial scale will grant further experiences which can contribute significantly towards Packaging Product Design.

A comprehensive customer survey collecting experiences with packaging products would grant better understanding about the user needs and desires, which would help to create better and targeted packaging product solutions. By reiterating and adapting to the customer demands, an overall shift towards packaging products in the consumer product section and mainstream industry could be stimulated, which would then harvest the sustainable benefits of Packaging Product Design and significantly reduce the amount of packaging waste. Once the production of a packaging product is to be pursued, international standards, regarding packaging and product regulations will need to be studied and followed in detail, to ensure a successful production and launch, in the respective markets.

Including sources found in other languages, different cultures and countries would enhance the study of Packaging Product Design, adding new contextual perspectives towards its design approach, the framework and the assessment criteria. This would add to the vast opportunities for further research in this field, impacting the potential sustainable applications and making Packaging Product Design a global future field of research.

5.5 CONCLUDING REMARKS

Packaging Product Design presents significant unexplored potential, which could add and inspire further sustainable alternatives towards the integration of Packaging and Product Design. The conceptual framework developed through this study is meant to guide future creators along the design process of a packaging product, by effectively choosing a form and function specific approach for their design. The assessment criteria direct the design process towards a democratic and sustainable packaging product design solution and help evaluate a successful implementation of Packaging Product Design. The implemented conceptual packaging product corroborated the practicability of both, the developed framework and assessment criteria. This study will hopefully inspire future designers to creatively include Packaging Product Design within their various design toolboxes, fundamental operating design values and philosophy.

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APPENDIX

APPENDIX A: PILOT STUDY QUESTIONS

1. In which year did you design [respective name of packaging product] exactly?
2. Where did you get your inspiration from?
3. Have you seen a packaging that can be transformed into a product before? Where?
4. Would it be ok if I were to contact you again for further research matters (e.g. interview, survey, etc.) in order to possibly elaborate a case study for my research?

APPENDIX B: GENERAL PILOT STUDY EMAIL SENT TO CREATORS

To whom it may concern,

my name is Henriette and I am currently a student at Nanyang Technological University (NTU) in Singapore, attending the Product Design Masters Programme by Research.

Previously, I did my Bachelor's Degree in Packaging Technology at the Stuttgart Media University in Germany.

I am writing you because I am very interested in your [respective name of packaging product], and was wondering if I could ask you a couple of short questions about it. They won't take long to answer and I would highly appreciate if you could find the time to answer them and help me gather some information and experiences on it. I would also specifically feature your product and contribution unless you prefer otherwise.

First of all, I would like to give you an overview of my current research topic, in order to understand why I am so curious about [respective name of packaging product].

My research is about packaging that can be part of their packed product or/and even the product itself. That is, packaging with an intended, planned added value to its original purpose (protect, transport, display, etc.).

I seriously love packaging, but I want to raise awareness on the pollution it involuntarily causes and the different solutions to deal with it; especially ways that not many people have thought of yet. Therefore, the aim of my research is to help designers be aware of their responsibility, not only to think about recycling, but to think ahead on possible added value for their products that the packaging could provide. This would enable designers like us to approach packaging with an intended, planned added value with a solid background on previous experiences and lessons learnt.

I started to research on products and concept works following the approach of an included and planned added value in order to find some pioneers that I could contact to exchange experiences. After a long search for products which follow this approach, I finally ended up on your homepage. Your [respective name of packaging product] is one of the very few records I found of a packaging with a planned added value.

All of this makes your [respective name of packaging product] very special to me and my research. And this is exactly why I am writing you.

I hope you don't mind me asking these questions right away. I would be very happy though if you could take some time in order to answer them or forward this email to the correct person who could answer such questions at your company:

- In which year did you design the [respective name of packaging product] exactly?
- Where did you get your inspiration from?
- Have you seen a packaging that can be transformed into a product before? Where?
- Would it be ok if I were to contact you again for further research matters (e.g. interview, survey, etc.) in order to possibly elaborate a case study for my research?

I would highly appreciate a reply in any kind of format. It would be really great though, if you could answer some of the questions in order to support me, as your product and these answers are essential for my research.

Thank you in advance for your help, I look forward to hear from you soon!

Best regards,

Henriette

Henriette PETER (Ms) | M.A. Student | Nanyang Technological University
School of Art, Design and Media | Office Address, 81 Nanyang Drive S(637458)
Tel: (65) 82449786 GMT+8h | Email: henriett001@e.ntu.edu.sg | Web: www.ntu.edu.sg/adm

APPENDIX C: RECEIVED REPLIES FROM CREATORS

1. Received reply from Celery Design Collaborative on April 18th, 2015:

#PETER HENRIETTE STEPHANIE#

From: Stephanie Welter <stephanie@celerydesign.com>
Sent: Saturday, 18 April, 2015 4:11 AM
To: #PETER HENRIETTE STEPHANIE#
Subject: Re: Packaging Research

Follow Up Flag: FollowUp
Flag Status: Completed

Hi Henriette,

Its fascinating to find people are still really moved by the Lemnis box! I joined Celery when we had just developed that idea and helped to much refinement to it. Below are answers to your questions, not sure how helpful they'll be. Good luck in your studies!

Thanks,
 Stephanie

Begin forwarded message:

From: #PETER HENRIETTE STEPHANIE# <HENRIETT001@e.ntu.edu.sg>
Subject: Packaging Research
Date: April 12, 2015 at 10:09:50 PM PDT
To: "info@celerydesign.com" <info@celerydesign.com>

To whom it may concern,

my name is Henriette and I am currently a student at Nanyang Technological University (NTU) in Singapore, attending the Product Design Masters Programme by Research. Previously, I did my Bachelor's Degree in Packaging Technology at the Stuttgart Media University in Germany.

I am writing you because I am very interested in your Lemnis Light Bulb packaging (that can be turned into a lamp shade), and was wondering if I could ask you a couple of short questions about it. They won't take long to answer and I would highly appreciate if you could find the time to answer them and help me gather some information and experiences on it. I would also specifically feature your product and contribution unless you prefer otherwise.

First of all, I would like to give you an overview of my current research topic, in order to understand why I am so curious about the Lemnis Light Bulb Packaging.

My research is about packaging that can be part of their packed product or/and even the product itself. That is, packaging with an intended, planed added value to its original purpose (protect, transport, display, etc.).

I seriously love packaging, but I want to raise awareness on the pollution it involuntarily causes and the different solutions to deal with it; especially ways that not many people have thought of yet. Therefore, the aim of my research is to help designers be aware of their responsibility, not only to think about recycling, but to think ahead on possible added value for their products that the packaging could provide. This would enable designers like us to approach packaging with an intended, planed added value with a solid background on previous experiences and lessons learnt.

I started to research on products and concept works following the approach of an included and planned added value in order to find some pioneers that I could contact to exchange experiences. After a long search for products which follow this approach, I finally ended up on your homepage. Your Lemnis Light Bulb Packaging is one of the very few records I found of a packaging with a planned added value.

All of this makes your packaging very special to me and my research. And this is exactly why I am writing you.

I hope you don't mind me asking these questions right away. I would be very happy though if you could take some time in order to answer them or forward this email to the correct person who could answer such questions at your company:

- In which year did you design the Lemnis Light Bulb Packaging exactly?

The package was designed in 2007

- Where did you get your inspiration from?

Not sure exactly - this was a while ago. Mainly, the idea was to find ways to create a second life for the package itself. Often times the packaging experience is overlooked and is an afterthought. So, it could bring great brand value to think holistically on how the user interacts with the brand and its products through the packaging. Also, giving a package an afterlife results in producing less waste.

- Have you seen a packaging that can be transformed into a product before?
Where?

No, don't recall any examples that were known at the time. Now it may be more common, though no commercial examples come to mind.

- Would it be ok if I were to contact you again for further research matters (e.g. interview, survey, etc.) in order to possibly elaborate a case study for my research?

Sure.

I would highly appreciate a reply in any kind of format. It would be really great though, if you could answer some of the questions in order to support me, as your product and these answers are essential for my research.

Thank you in advance for your help, I look forward to hear from you soon!

Best regards,

Henriette

<image001.png>Henriette PETER (Ms) | M.A. Student | Nanyang Technological University
School of Art, Design and Media | Office Address, 81 Nanyang Drive S(637458)
Tel: (65) 82449786 GMT+8h | Email: henriett001@e.ntu.edu.sg | Web: www.ntu.edu.sg/adm

Stephanie Welter

Celery Design Collaborative
510.649.7155
www.celerydesign.com

1718 San Pablo Ave.
Berkeley, CA 94702

9 rue Delambre
75014 Paris, France

2. Received reply from Kühne, including attached documents on April 22nd, 2015:

#HENRIETTE STEPHANIE PETER#

From: Wottawah, Irmy <Irmy.Wottawah@Kuehne.de>
Sent: Wednesday, 22 April, 2015 00:00
To: #PETER HENRIETTE STEPHANIE#
Subject: Forschungsarbeit
Attachments: Senf Verpackungen gestern und heute - April 15.pdf; Senf und die Geschichte vom wiederverwendbaren Glas Quelle www.loosersenf.de.pdf; Senf Chart.pdf

Hallo Frau Peter,
wie versprochen – nun endlich – alles zum Thema Senfverpackung, was ich Ihnen zukommen lassen kann.
Ich hoffe, da können Sie ordentlich was draus herausziehen und wünsche Ihnen von hier viel Erfolg.

Wenn Sie uns Ihre Arbeit – rein zur Lesefreude – zukommen lassen können, würden wir uns sehr freuen.

Mit besten Grüßen aus dem sonnigen Hamburg

Irmy Wottawah
Carl Kühne KG (GmbH & Co.)
Kühnehöfe 11
22761 Hamburg
www.kuehne.de
www.facebook.com/kuehnedeu
Phone: +49.(0)40.853.05.201
Fax: +49.(0)40.853.05.376
E-Mail: irmy.wottawah@kuehne.de

Das Kühne Senfglas – oder das sog. „Kühne-Kristall“

(Anfrage Henriette PETER – Student, Nanyang Technological University 5.3.15)

Seit 1896 produziert Kühne Senf.

In den 30er Jahren des letzten Jahrhunderts wurde erstmals von Kühne ein wiederverwendbares Senfglas beim „Deutschen Reichs-Gebrauchsmuster“ angemeldet.

Dies war ein kleines Pressglas mit Henkel, das sich, einmal geleert, als Trinkglas weiter verwenden ließ.

Kühne fand zahlreiche einfallsreiche Nachahmer. Die bekannteste Verpackung dieser Art dürfte der allgegenwärtige Glasbecher der 50er/60er Jahre sein, den es aber in Abweichungen auch früher schon gab.

Seit den 1930er Jahren kann man den Kühne-Senf im Eimer, Steinkrug oder Glas erwerben beziehungsweise sich daraus kleine Portionen abfüllen lassen. Für den Verkauf im Einzelhandel werden den Ladenbesitzern sogenannte Verkaufsapparate zur Verfügung gestellt, dabei handelt es sich um große Keramik-Töpfe mit Zapfhahn, aus denen in kundengerechte, kleine Hartpapierbecher die gewünschte Senfmenge abgefüllt werden kann (Abb. 1)

Senf gehört auf jeden Tisch – daher gibt es für den Kühne-Senf auch kleine, elegante Tischdöschen mit Deckel und Löffel.

In den späten 1950er Jahren taucht im Sortimentskatalog das „Eigerglas“ auf, dass als Trinkglas verwendet werden konnte, aber nicht mit einem solchen Hinweise versehen ist (Abb. 2) (*Recherchen zu Eigerglas waren meinerseits erfolglos – I. Wottawah*)

Seit den frühen 60er Jahren finden sich in den KÜHNE-Sortimentskatalogen Gläser (genannt Kühneglas (Abb.3) oder explizit auch Becherglas (Abb. 4) oder Kühne Becherglas), die sich zur Weiterverwendung als Trinkgläser eigneten (siehe Anlage Kühne-Senf-Produkte-Geschichte). Sie werden in der Kühne-Fibel auch entsprechend beschrieben: „180-g-Glas für den großen Haushalt, das dann als später zu verwendendes Trinkglas einen sehr beliebten Zweitnutzen bietet“ (Abb. 4).

Ende der 1950er gab es schon ein sogenanntes „Eigerglas“ Abb. 4, dass den nachfolgenden Trinkgläsern sehr ähnlich ist, ob man damit schon eine Zweitnutzung verband ist unklar.

Die Formen haben sich immer wieder verändert und es wurden immer mehrere Glasformen parallel angeboten.

In den 1950er waren Senfgläser, die als Trinkgläser weiter genutzt werden konnten, noch kein Thema. Der „Verpackungsstar“ Ende der 50er und zu Beginn der 60er war die Tube, die vielfach beworben wurde.

Ab den 80er Jahren finden sich in den KÜHNE-Sortimentskatalogen Abbildungen von leeren Gläsern, was als deutlicher Hinweis auf die intendierte Weiterverwendung zu verstehen ist.

Ab Mitte der 1980er wird als besondere Form der Bierseidel angeboten:

- Altbayerischer Hausmachersenf würzig-süß, mit Meerrettich Im Bierseidel (365g, nur Süd)
- Mittelscharfer Senf würzig, nach altem Hausrezept Im Bierseidel (360g)

Bei Kühne finden sich nunmehr jedoch im normalen Sortiment **keine** mit bunten Bildern bedruckte Gläser.

Weitere Verpackungen, die in den letzten 80 Jahren für Senf von Kühne verwendet wurden: Schraubglas, Glas mit aufgesetztem Deckel aus weicher Plastik (Prellverschluss), Tube, große und kleine Portions-Beutel (siehe Sortimentskataloge), dekorative Porzellan-Gefäße, Becher aus Karton, die im Laden gefüllt wurden (siehe Seite aus *Buch der Sauren Arbeit*, 1938)

Abb. 1: Senfverkauf in den 1930er Jahren (*Buch der Sauren Arbeit*)

Abb. 1: Das „Eigerglas“, Ende 1950er

Abb. 3: Das „Kühneglas“ um 1961

Abb. 4: Das „Becherglas“ um 1963

Eines der frühesten, wenn nicht das erste Glas, das ausdrücklich als Trinkglas beworben wurde. *Anlage: Senf und die Geschichte von der Verpackung / Glas* www.losersenf.de

Kühne Senf mittelscharf – wie er heute auf dem Markt ist.

Der klassische mittelscharfe Senf, mit der Kühne-typischen Würzung und besonders cremiger Konsistenz. Ideal zum Würzen und Verfeinern aller Speisen. Erhältlich im 250-ml Glas, als Kopfstandtube oder in Tuben zu 100 oder 200 ml.

Das renommierte Verbrauchermagazin Öko-Test hat unseren Kühne Senf mittelscharf 2014 mit der Bestnote "sehr gut" ausgezeichnet.

Senf (Produktentwicklung seit 1958)

Jahr	Abbildung	Produktvarianten und Größen
1958		<p>Kühne Senf (würzig scharf/ würzig mild) Tube 90g Klarsichtbeutel 100g Schraubglas 100g Eigerbecher 150g</p> <p>Kühne Senf (mittelscharf/scharf/ würzig scharf) Bleicheimer 10kg Plastikeimer 5/10 kg</p> <p>Düsseldorfer Senf Tube 60g Spezial-Glas 100g Hotelpackung Emaille-Eimer 2,5/5/10 kg</p>
1961		<p>Kühne Senf (würzig/ scharf/ würzig scharf) Tube 90g Klarsichtbeutel 100g Kühnegläser 150g Bleicheimer 10kg Plastikeimer 5/10kg</p> <p>Kühne Senf Düsseldorfer, feurig scharf Tube 90 g Spezialglas 100g Hotelpackung Eimer 2,5/10 kg</p>
1963		<p>Kühne Senf würzig nach altem Hausrezept Tube 90g Becherglas 180g Beutel 100g Blech- und Plastikeimer 5/10kg</p> <p>Kühne Senf feurig nach Düsseldorfer Art Tube 90g Kühne-Schraubglas 100g Blech- und Plastik-Eimer 2,5/10 kg</p> <p>Kühne Senf nach bayrischer Art Tube 90g Becherglas 180g Beutel 100</p>
1965		<p>Senf würzig nach altem Hausrezept Tube 90g Kühne-Becherglas mit Vacuum-Verschluß 175g Beutel 100g Blech- und Plastikeimer 5/10kg</p> <p>Senf feurig nach Düsseldorfer Art Tube 90g Kühne-Schraubglas 100g Blech- und Plastikeimer 5/10kg</p> <p>Senf süß nach bayrischer Art Tube 90g Kühne-Becherglas 175g Beutel 100g</p>

1. SENF

zählt zu den ältesten Gewürzen. In erster Linie wurde er jedoch viele Jahrhunderte lang als medizinisches Mittel geschätzt.

In Deutschland mußte die Hausfrau noch bis ins 19. Jahrhundert hinein in die Apotheke gehen, um Senf einzukaufen.

Die erzeugnistypische Verpackung, die es beispielsweise für Wein längst gab, war für Senf bis dahin die seltene Ausnahme.

2. DIE ÄLTESTEN SENF-VERPACKUNGEN

sind eigentlich Apothekengefäße, die frühesten Senftöpfe als Lebensmittelverpackung orientieren sich noch deutlich an der in Apotheken gebräuchlichen Albarello- oder Fässchenform. Sie sind aufs einfachste getöpft oder – selten – aus Glas mundgeblasen.

3. TYPISCHE FORMEN

von Senfverpackungen sind - neben den traditionellen: Zylinder („Albarello“) und Fässchen - während der vergleichsweise sehr kurzen Geschichte der Senfverpackung zahlreich entstanden. Man erkennt sie auch ohne Prägung oder Etikett meist mühelos.

Der Senftopf wurde früher zugebunden oder mit Kork verschlossen. Es gab weder die dicht schließenden Verschlüsse noch die Konservierungsstoffe der heutigen Zeit.

Da der Senf dazu neigt, an der Oberfläche einzutrocknen und so seine Schärfe zu verlieren, musste der Topf oben eng sein.

4. IMPORTWARE

aus Frankreich und Großbritannien hat den frühen deutschen Speisesenffabrikanten lange Zeit das Leben schwer gemacht. Gegen auch heute noch klangvolle Markennamen wie Moutarde de Maille, Dijon oder Colman war nicht leicht anzukommen. Dabei war der Senf als Speisewürze frühzeitig bekannt und geschätzt: in China, in Ägypten, im Mittelmeerraum... Der Römer Columella hat uns im 1. Jahrhundert die erste Rezeptur für Speisesenf hinterlassen. Im 5. Jahrhundert war Senf bereits zu einer klassischen Würze im Römischen Reich geworden. Nahezu 1000 Jahre dauerte es noch, bis er sich nach Mitteleuropa ausbreitete.

5. BESONDERHEITEN UND KURIOSITÄTEN

stehen oft im Zusammenhang mit dem Konkurrenzdruck auf dem europäischen Markt etwa seit Anfang des 19. Jahrhunderts.

So findet man u.a. Senftöpfe, deren Hersteller eine bekanntere Marke einfach kopierten oder sogar deren Töpfe überglasieren und mit dem eigenen Logo versehen ließen.

Da der Qualitätsunterschied der einzelnen Senfmarken verhältnismäßig gering und der Preis für ein Töpfchen niedrig war, wurde für den Absatz eine werbewirksame Verpackung immer wichtiger.

6. DIE WIEDERVERWENDBARE SENFVERPACKUNG

wurde in den 30er Jahren des 20. Jahrhunderts erstmals von dem **Berliner Unternehmen Carl Kühne** zum „Deutschen Reichs-Gebrauchsmuster“ angemeldet: ein kleines Pressglas mit Henkel, das sich, wenn der Senf gegessen war, als Trinkglas weiter verwenden ließ. **Kühne** fand zahlreiche einfallsreiche Nachahmer. Die bekannteste Verpackung dieser Art dürfte der allgegenwärtige Glasbecher der 50er/60er Jahre sein, den es aber in Abweichungen auch früher schon gab.

7. SONDEREDITIONEN

zu besonderen Anlässen, Jubiläen etc. sowie ausgesprochen extravagante Formen sind selten. Sie sind praktisch nur bei großen Betrieben zu finden, wie Kühne (Berlin) oder Frenzel (Düsseldorf).

Einige ältere Exemplare, die sehr aufwendig gestaltet sind, gehören wohl nicht in diese Rubrik: sie könnten durchaus die „normale“ Verpackung eines Produzenten sein, der „etwas auf sich hielt“ und dann schnell wieder vom Markt verschwand.

8. TRADITIONSREICHE DEUTSCHE SENFFABRIKEN

sind hier beispielhaft mit einer Auswahl ihrer Töpfe vertreten:

Aschinger - München • Bergrath – Düsseldorf • Born – Erfurt • Develey - München •
Eisenhardt – Düsseldorf • Frenzel – Düsseldorf • Hengstenberg - Eßlingen • Klemm - Bautzen
• Kühne – Berlin • Leman - Schwerin • Sallier – Berlin

9. NACHKRIEGS- UND BEHELFSVERPACKUNGEN

sind besondere Raritäten (wie überhaupt alle älteren Gläser mit Papieretikett und Deckel schwieriger zu bekommen sind als die schön bemalten und bedruckten Tontöpfe). In der Not musste Senf in Honiggläser oder in Gläser verschiedener Hersteller und Formen abgefüllt werden.

10. TUBE, PLASTIKBECHER, TÜTE & CO.

sind heute die typische Senfverpackung. Kaum jemand stellt noch ein gediegenes Töpfchen oder originelles Glas her. Auch die Keramikguss-Gefäße anspruchsvollerer Senfhersteller sind meist billige Massenware.

Aber: zumindest der Senf in der Tube ist keine Erfindung unserer Tage. Sie wurde ungefähr zur gleichen Zeit wie sein Glas-Henkeltöpfchen von Carl Kühne erfunden.

Quelle: Auszug aus: <http://www.loosersenf.de/main/sammlungenNeu.html>

3. Received reply from Eggs Posure A/S on June 18th, 2015:

From: [Mette Due Andersen](#)
To: [#PETER HENRIETTE STEPHANIE#](#)
Subject: VS: Packaging Research
Date: Thursday, 18 June, 2015 4:38:24 PM
Attachments: [image001.png](#)
[image003.png](#)
[image004.png](#)

Dear Henriette

Thank you very much for your mail. We are very pleased that you have noticed our packaging and like it ;o)

The idea behind egggyplay[®] came approximately three years ago in the summer time 2012. As a food company we are very aware that we have a responsibility to contribute to the reduction of the increasing volume of wasted packaging from the food industry. This was our first objective. With the new egggyplay[®] box we have managed to think outside the box and be the first packaging company in the world to develop a unique range of multi-functional egg boxes in moulded plastic. The box can be reused as packaging and more than 95 % of the material of the box can be recycled as plastic. But what's even more interesting is the fact that besides protecting and storing eggs, the box can be reused as a toy for children. When washed in the dishwasher, children can use the boxes as building blocks. So, egggyplay[®] offers as many as three solutions for reuse. Today the concept is sold to 14 countries and hopefully more will follow.

You are more than welcome to contact me again if you have further questions.

Best of luck with your thesis.

Kind regards,

Mette Due Andersen

Marketing Manager

Hedegaard Foods A/S
Glerupvej 5 / 9560 Hadsund
T + 45 98 57 30 55 / www.eggs.dk

M +45 51 97 97 12
mda@eggs.dk

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