

**UTILISING ORIGAMI FOR PACKAGING DESIGN:
A SURVEY FOR ANALYSING USER
PREFERENCES**

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ABSTRACT

UTILISING ORIGAMI FOR PACKAGING DESIGN: A SURVEY FOR ANALYSING USER PREFERENCES

In this thesis, origami is studied from the packaging design's point of view. One of the main objectives of this thesis is to show the usage of origami in packaging design. It is aimed to analyze the packaging preferences of consumers. It is evaluated how behaviors of consumers for multifunctional origamic packaging and it is measured what percentage of them would reuse those origamic packaging samples.

In brief, this study particularly focuses on the incorporation of origami in industrial design for a less consumption-driven design practice. Accordingly, introduction presents the aim of this as well as identifying research method and tools.

Then, consumption trends and material culture along with the history of consumption are examined. The interaction between play/game activity and consumption is explored. Packaging design is explained in detail. In this context, the relationship between packaging and consumption is analyzed. Following a detailed analysis of consumption on environment, green design is discussed as a form of solution to this problem. For the purposes of this thesis, environmentally friendly packaging design prove important, therefore, the concept is explored thoroughly.

History, types and usage areas of origami are explained in the fourth chapter. Origami in daily life objects and packaging is sampled. Finally, the thesis includes a case study applied at Karşıyaka Universal Child Museum and Education Campus which measures how museum consumers would react to multifunctional origamic packaging. The origamic multifunctional package samples are viewed and questionnaire are analyzed. The results of statistical data are interpreted for each criterion.

ÖZET

AMBALAJ TASARIMINDA ORİGAMİ KULLANIMI: KULLANICI TERCİHLERİNİ ÖLÇMEYE DÖNÜK BİR ARAŞTIRMA

Bu tezde origami çevreci ambalaj tasarımı çerçevesinden incelenmiştir. Bu tezin en önemli amaçlarından biri origaminin ambalaj tasarımında kullanımını göstermek ve origamik ambalajların çevre dostu bir yaklaşımı olduğunu belirtmektir. Katlama tekniklerinin ambalaj tasarımını nasıl etkilediğini belirlemek amaçlanmıştır ve bu çalışma tüketimin zararlı etkilerini azaltmak için origami ve endüstriyel tasarım etkileşimine odaklanmıştır. İlk bölümde çalışmanın amacı, problem tanımı, araştırmada kullanılan metotlar ve çalışmanın literatüre kazandırdıkları tartışılmıştır.

İkinci bölümde tüketim trendleri ve maddi kültür tanımlanmıştır, ayrıca ikinci bölümde tüketimin tarihçesine, oyun teorisine ve çevre dostu tasarıma yer verilmiştir. Üçüncü bölümde ambalaj ve tüketim ilişkisi analiz edilmiştir. Ambalajın tarihçesi, elemanları ve fonksiyonları tanımlanmıştır. Ambalajın çevre dostu tasarıma kazandırdıkları analiz edilmiştir.

Dördüncü bölümde origaminin tarihçesine, türlerine, kullanım alanlarına ve günlük hayatta kullandığımız objelere yansımalarına yer verilmiştir. Son olarak origami teknikleri kullanılarak tasarlanmış çevre dostu ambalajlarla ilgili bir uygulama yapılmıştır.

Beşinci bölümde tezin uygulaması anlatılmıştır. Uygulama için tasarlanan çok fonksiyonlu, origamik çevre dostu ambalaj örnekleri gösterilmiştir ve anket soruları analiz edilmiştir. Yapılan anket sonucunda elde edilen istatistiksel veri doğrultusunda her bir kriterin ambalaj tüketimi üzerindeki etkisi analiz edilmiştir.

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CHAPTER 1

INTRODUCTION

1.1. Definition of the Problem

Consumption as widely understood today is not only a tool for fulfilling needs, but it is also the way consumers satisfy their desires. Members of modern societies are impatient other people. Since people tend to identify other people as fast as possible, mostly by artificial parameters such as their appearance, what people possess constitute the first step of identification. Individuals appear to identify themselves, and thus, differentiate themselves from the others on the premise of what they consume and how they consume it. As a result, consumption becomes inevitable for the members of modern societies, regardless whether it fulfills basic needs or not. The question then should be if we cannot consume less, how can we consume more sensibly? To this end, the second (reuse) and third (recycle) steps of environmentally friendly consumption behavior are important. How can designers help with sensible consumption? How can they contribute to the life cycle of a product?

Packaging design is one of the most important factors to define the features of a product, and subsequently, to persuade people to consume it. A consumer interacts with the package to begin with, and basically what a consumer knows about the product is derived from the package. Packaging, in addition to conveying the basic information about the product, functions to lure people towards the product by its color, shape, material etc. As soon as people consume products, they also consume packages. Unless the package is recycled and/or reused for another purpose, in other words, unless the package is multi-functional, the package turns into waste immediately after use. This constitutes a very key issue, encouraging new research for alternative packaging design options within wider contexts of environmentalism, sustainability, green design etc.

Within the scope of this thesis, origami is suggested as an alternative way of designing packages. It strives to explore the role of origami as a likely tool for

packaging design and to investigate whether origamic packaging design can really offer a more environmentalist alternative to the standard packaging. Accordingly, the criteria of environmentalist approach (reuse, reduce, recycle, disposal and waste in packaging) guide this study. The ultimate purpose is to measure whether users would change their consumption attitude and behavior when given an alternative packaging design utilizing origami. The following research questions constitute the starting point of this thesis:

- Is origami a useful tool for packaging design?
- Is it possible to argue that origamic packaging design is environmentalist in the sense that it eliminates the use of glue, tape or heavy chemicals etc.?
- Is it possible to reduce non-recyclable packages by origamic packaging design?
- Can origamic packaging reduce waste by offering multifunctional and therefore reusable packages compared to standard packages?
- Can origamic packaging trigger positive behavior in users/consumers?
- Can origamic packaging motivate users/consumers consume more sensibly?

1.2. Objectives

The fundamental aim of this thesis is to argue that origamic packaging design has the potential to dramatically reduce non-recyclable packages. In contemporary world, which is shaped by ever-increasing consuming trends as a result of growing number of objects of desire, consumption proves unavoidable. This inevitably leads to an excessive waste of packages. Thanks to origami, it becomes possible to produce packages without glue, gum, etc. Thus, the packages designed by utilizing origami techniques can be recycled more easily and efficiently. Moreover, as most of the origamic packages are multifunctional, they can be reused in various environments for different purposes, which also ultimately reduces the waste. All in all, by providing multi functionality and recyclability of the package, origamic packaging design potentially serves to reduce the damage of consumption on environment. Consequently, this study strives to explore whether an origamic packaging alternative to the

conventional packaging could create an attitude and behavior change in users/consumers.

1.3. Method of the Study

In this thesis, environmentally harmful effects of consumption are analyzed and origamic package is offered as an alternative to the traditional packaging as a solution. In order to find the root of the problem, I have done a detailed literature review on consumption, material culture and consumerism. I have also searched for game theory and play activity approaches, as both play/game activity and consumption are used as a tool for self-expression in modern societies. In addition, since consumers have adopted consumption as if it is a play activity. I have proceeded literature review with green design concept. In that, literature review of consumerism has revealed that the inevitability of consumption causes environmental issues. The literature review of green design is aimed to explain how this concept was emerged, why people are harmful for environment and what kind of measures should be taken. It is obvious that manufacturing a product damages environment. However, this process is unavoidable to satisfy consumer and a manufactured product has a value for consumers and producers both.

On the other hand, package of the product does not have a value for consumer and producers directly. Therefore, literature review of packaging design is needed for this study. What is expected by a package and how can a package be more environmentally friendly are questioned, and environmentally friendly approaches have been searched. The last section of literature review is about origami, since I have suggested origami as an environmentally friendly tool for packaging design.

Finally, I have conducted a case study focusing on origamic packaging design. The origamic packaging prototypes are the basis of this case study. Questionnaire as a quantitative method is used to analyze whether the origamic packaging serves the purpose of environmentally friendly solutions and whether it would change user/consumer behavior. In order to analyze the gathered data, statistical data analysis as a quantitative research method is done.

1.4. Contribution to Knowledge

This thesis includes theoretical debates about the interaction of consumption and green design, and the impact of packages on environment. In this study, I have defined an environmentally friendly approach to packaging design by using origami techniques. With reference to this approach, my main contributions consist of:

1. Focusing on the results of consumption within the frame of environmental issues, and as a result of social insisting of modern societies, arguing the unavoidability of consumption.
2. Analyzing the elements and functions of packaging design and criticize them to reduce the harms of packages on environment.
3. Suggesting an origamic packaging solution for environmental issues resulted by consumption and packaging wastes, providing multi functionality and recyclability to the package by using origami techniques.
4. Gathering statistical data of people who consumed origamic packaging in order to find out whether they are sensitive to environmentally friendly packages. According to gathered data, argument of validity of origamic packaging suggestion.

A literature review has been done and Council of Higher Education Thesis Center has listed 24 thesis about origami. 18 of thesis are about education, 1 of them is about Science and Technology; Bioengineering; Biotechnology, 1 of them is about Biochemistry; Biotechnology, 1 of them is about Architecture, 1 of them is about Oncology, 1 of them is about Fine Arts and 1 of them is about Industrial and Industrial Engineering. 3 of these thesis are for doctorate graduation, 20 of them are for master graduation and one of them is for minor specialization in medicine. Thus, this thesis is the first thesis which studies origamic packaging design in view of industrial design.

CHAPTER 2

CONSUMERISM AND MATERIAL CULTURE

This chapter strives to comprehensively review how and why consumption has got to overwhelm our lives, how and when it has become the focal point of our social lives and what value and/or meaning we attribute to consumption. In this respect, concepts of consumerism and material culture are investigated in order to provide a theoretical framework for the analysis section of the study. Members of modern societies have used both play/game and consumption as tool for self-identification. Interaction of material culture and play activity in daily life is analyzed.

Furthermore, this chapter draws attention to the common effects of consumption on the environment and seeks solutions to reduce the possible harms of consumption. Consumption is at the core of modern societies' lives, and even consumers might not be able to reduce the harms of production on environment, however in case of preferring environmentally friendly packaged products can reduce the harms of consumption on environment.

2.1. A Brief History of Consumption Trends

Consumption is a continuously developing term; it, therefore, seems necessary to analyze the history of consumption in order to develop a better understanding of contemporary consumerism trends. The early patterning of consumption, owing to the impact of capitalist structure, occurred in England during the post-Civil War in the second half of the seventeenth century. Puritanism, with its Calvinist form, influenced the agricultural and productive activities of the early bourgeois, reinforcing capitalism. By the impact of Puritanism, the early capitalist families increased their wealth because they re-invested what they earned instead of spending them on luxurious products (Bocock 1993, 11).

Calvinism was one of the four principle forms of ascetic Protestantism. The other three were Pietism, Methodism and Baptist movement. These four approaches are

not completely different from each other (Weber 1971, 53). Calvinism can be described as a religious system which had an impact on some of the most developed countries such as the Netherlands, England and France, which struggled with the political and cultural structures of the sixteenth and seventeenth century. The most characteristic dogma of Calvinism was the doctrine of fatality (Weber 1971, 56). The most popular definition of Calvinism is known as TULIP: *The Five Points of Calvinism*. TULIP is the composition of the first letters of five rules as seen below (Dally 2009, 17-19):

1- Total Depravity: what should a man need to be saved and why?

2- Unconditional Election: what makes a man saved?

3- Limited Atonement: who should be saved/who deserves salvation?

4- Irresistible Grace: can the plan of God be eliminated ever?

5- Perseverance of the Saints: can the person who is saved by God lose his/her salvation?

British Puritanism contained ascetic values such as avoiding spending money on unnecessary products as requested by Calvinist principles (Bocock 1993, 12). According to Puritanism, wasting time was the most dangerous sin. Socialization, chatting, luxurious lifestyle, even sleeping more than necessary was absolutely immoral. Time had infinitive value, because each lost hour was a refusal of duties for God (Weber 1971, 104). Weber explains that "...asceticism turned with all its force against one thing: the spontaneous enjoyment of life and all it had to offer" (Weber 1971, 111). These cultural values deeply influenced the way British capitalism evolved. However, Puritanical lifestyle was revised after the Restoration of the monarchy in England in 1688 (Bocock 1993, 13). Extravagancy was not a sin any more. Even if people kept spending their money mostly for essential necessities and luxurious objects were not the focus of their lives, asceticism lost its powerful influence on people.

During the eighteenth century, consumer products such as clothing and jewelry were produced by small-scale enterprises (Bocock 1993, 13). New production methods inspired a new class who worked for heavy industry, and thanks to these workers' industrial revolution took place. Mass production, which became possible due to industrial revolution, supported mass consumption (Bocock 1993, 14). Mass production

was an important improvement for producers since it enabled them to produce all products at the same time, not one by one. Because each production stage was generated serially. It meant to produce more with less investment and made people to consume more. Consumption goods reached to every segments of societies by these improvements. Consequently, consumption patterns changed in three phases in the eighteenth century: 1) consumer revolution, 2) consumer goods revolution, and 3) mass consumption revolution (Flacher 2005, 5-6). . The first revolution regarding consumers occurred in the United Kingdom, in the Thirteen Colonies, between the end of seventeenth century and the eighteenth century, but also in France and in a few Germanic regions simultaneously. During consumer revolution process, people did not only consume for the most elementary needs such as feeding, clothing, but they were also after certain level of comfort in the household, meaning they would buy decorative items like mirrors, curtains and so on (Flacher 2005, 6). This change in consumer behavior can be explained as the entry of luxury into ordinary people's lives. Consumption eventually became a tool for people to show their wealth and status in society; for instance, people who used decorative items and people who only consumed basic furniture were particularly members of different social classes. Means of consumption, therefore, functioned to establish a social hierarchy.

During the second phase, that is the consumer goods revolution phase, consumer behaviors changed depending on regions. A considerable increase in the income of people affected their decisions in relation to consumption habits. Prices were decreased, innovations encouraged consumption. Travelling became easier, and consumers had a chance to visit foreign markets (Flacher 2005, 7). Until this phase, ruling classes were familiar with the idea of consumption for pleasure, however low levels only consumed for essential needs. Developments generated during the second phase made consumption ordinary for all social classes. Access to foreign markets advanced research and development and subsequently innovations. Consumption products were diversified, and this diversity encourage people to consume even more.

The last phase of the shift in the consumption patterns in the eighteenth century had an impact upon the life styles, leading to ever-increasing consumption of commercial products and services. This was mainly resulted from, as Flacher argues, the concomitant rise of non-commercial services such as administration, health, culture and education (Flacher 2005, 8). The increase of commerce in last stage of consumption

development can be addressed as the reason for competition between producers. In order to gain competitive advantage, producers tried to attract the potential consumers' attention not only by means of manufactured goods, but also by offering services. It can be argued that from the producers' point of view, the emphasis shifted towards consumers' preferences and behaviors in the third phase of consumption patterns.

The Second Industrial Revolution, also known as the Technological Revolution, took place in the nineteenth century and was characterized by a large scale of iron and steel manufacturing. Production of iron and steel in the last decades of the century led to building railroads and railroads meant a large-scale distribution of consumer goods (Hull 1999, 81-90). Much of the increased output of developed countries was sold to less developed regions such as India. Thus, more consumption was unavoidable as a result of more production. Middle class people and workers too became consumers (Goodwin, Nelson, et al. 2008, 5). Furthermore, companies developed new packaging technologies such as bottling, covering, which allowed distribution of goods to distant regions. In addition, technological developments provided that *brand names* would be known nationally and internationally. Consumption was the focus of consumers' lives.

This increased level of consumption based on technological developments also meant that people were interested in having a social identity premised on what they consume (Bocock 1993, 15). Up until the nineteenth century, advertising was a tool for simply giving information about goods and services, however, following the changes of consumption habits in the nineteenth century, advertising started corresponding and catering to emotional needs and desires of people (Goodwin, Nelson, et al. 2008, 7). Producers realized how important emotions and desires of consumers were for consumption. The way they increased the profitability was to sell to consumers more than they actually needed. To this end, advertisements proved to be a very useful and effective tool. Advertisements were widely used to activate the emotions and desires of consumers.

In the twentieth century, new production methods like moving assembly lines as well as specialized machinery were designed by an American car manufacturer Henry Ford (1910-1914). Hence the name Fordism, describing these methods. Producers paid high wages to workers, but also demanded extreme work-force. (Bocock 1993, 20). Thanks to low-cost products and new production methods, mass production became

common. The combination of mass production and high wages resulted in even more excessive mass consumption.

Consumption was the phenomenon of the twentieth century and during this century advertisements had an important role to play in determining the trends of consumption. Advertisements established brand images for consumer goods. Young people who had high-waged jobs and still lived with their families were the consumers that were affected by advertisements the most.

Consumption structures at the time were shaped by two main factors: namely, income and social classes (Bocock 1993, 22). Social classes, as listed below, were categorized according to occupation types (Bocock 1993, 26):

Table 1. Social Classes

Social Classes	Occupation
Social Class A	Higher managerial, administrative or professional
Social Class B	Intermediate managerial, administrative or professional
Social Class C1	Supervisory or clerical and junior managerial, administrative or professional
Social Class C2	Skilled manual workers
Social Class D	Semi and unskilled manual workers
Social Class E	State pensioners, widows (no other earners), casual or lowest grade workers or long-term unemployed

This categorization was created by the Institute of Practitioners of Advertising in the late 1980s. Advertisers shaped their strategies based on these categories to sell products to well-defined social groups. High-status occupational classes did not mean high income. However, generally close social classes had similar life-styles and they desired similar types of products. The proportion of these classes was as follows:

- Social Class A: 3%
- Social Class B: 15%

- Social Class C1: 23%
- Social Class C2: 28%
- Social Class D: 18%
- Social Class E: 13% (O'Brien and Ford 1988, 289-332).

This statistical data indicates that social classes became less important when it comes to consumption patterns (Bocock 1993, 27). At the end of the twentieth century, a new consumer pattern emerged, and accordingly, consumption was the most important thing in people's lives. Criteria defining consumption trends became more diverse, including age, gender, ethnicity as well as socio-economic classes. These criteria ultimately configured identity concept. Consumption became a tool for having an identity for new consumers (Bocock 1993, 27-28). New consumer patterns categorized people due to life stages: granny power, grey power, older silver power, younger silver power, platinum power, and golden power (Bocock 1993, 29). Granny power refers to people aged 55-70, have no children and no dependent relatives, no non-working teenagers live with them. Grey power refers to people aged 45-60, have no children, and no dependent family members. Older silver powers refer to married people, have older children aged 5-15 years. Younger silver power refers to married people who have children aged 0-4. Platinum power refers to married people, aged 40 or under, with no children. Golden power refers to single people, aged 40 or under and with no children (O'Brien and Ford 1988, 298-299).

It can be concluded from the statistical data that less than half of the society work as management staff, and only 3% of them have higher managerial occupation. It might be argued that those who work as managers, have higher income than other members of the society and they can consume more. Yet, it can be illusive, because having high income may not be enough to consume. Consumption also depends on the life style of consumers: whether they live alone or with their family or whether there is someone under their guardianship. In addition, age also is an important factor on consumption. For example, people who aged 55-70 and have no one that they have to guard are thought to consume most because of their income and minority of costs, however they may not prefer to consume because of their ages. As it is mentioned above, people consume for self-identification, and because elderly people do not need self-expression as much as younger ones, they consume less than younger people although they have higher income.

2.2. The Age of Material Culture

Twenty first century is simply characterized by consumerism as a phenomenon. Consumerism can be defined as the equation of personal happiness acquired by consumption and buying materials (Stearns 2006, 72). It can be interpreted as if a person has money and s/he uses it for consumption, it means there is no reason for him/her not to be happy. The happiness caused by consumption may have different reasons such as having a new object, consuming the desire itself and having new desires to reach as a result of consumption.

Baudrillard explains consumption by comparing Melanesians and Caucasians. Melanesians thought that planes on sky were charming. However, those planes never came to Melanesia, only Caucasians were able to catch them. The reason was simple: Caucasians have already got something like planes and they have suitable places for planes. Thus, Melanesians created a plane simulacrum by brushwood and they lit a special place carefully. Then they started to wait for planes patiently. Today's consumer has almost similar feelings. A standard consumer buys something and waits for happiness by artificial displays. People do not experience consumption as a result of production process; rather, they experience consumption as a miracle (Baudrillard, *The Consumer Society* 1970, 32). The similarity between Melanesians and today's consumers shows that consumer is a kind of dreamer who just becomes happy with the dream of happiness. Melanesians were waiting planes and this waiting was enough to make them happy as if planes really landed there. Consumers have almost same feelings. They consume to be happy and just the idea of happiness makes them happy artificially. The way they express their happiness is having more products. It is possible to conclude that consumers think that the reason for unhappiness is the lack of consumption because consumption is possible if you have high income and high income leads to a comfortable life.

Consumption can basically be defined as the usage of good/services which are manufactured to fulfill needs. According to Maslow; needs can be listed hierarchically: 1) physiological, 2) safety, 3) sense of belonging and love, 4) esteem, 5) self-actualization and 6) self-transcendence. Physiological needs are essential for life, such as air, water, sleep. Safety needs include physical and emotional satisfaction:

living in a safe area, job security, etc. Social needs such as having friends, family and love become important provided that people have already met their physiological and safety needs. Esteem needs are related to self-respect and achievement. Self-actualization needs refer to truth, justice and meaning (Maslow 1943, 370-396). On the other hand, consumption does not depend on this needs list, but it depends on desires, which means needs are explained by happiness equation: if you fulfill your needs, you are happy. Happiness is a powerful concept in modern societies that corresponds to equality. To claim that ideology, happiness must be measurable. Thus, happiness must be defined by objects, signs and comfort to measure the equality (Baudrillard, *The Consumer Society* 1970, 48). This viewpoint does not overlap with the classical definition of consumption. However, we can experience what Baudrillard wrote about consumption almost every day. For instance, when a newer model of our mobile phone is launched in the market, although we already have a running mobile phone, we desire the new model. If we are able to buy the new one, we think that it made us happy. However, it is only a kind of illusion, and what we call happiness is indeed, the relaxation of stopping our desires temporarily.

Modern life provides a wide range of products, services, packages and designs to make people consume. Companies develop their strategies and innovations to ensure competitive advantage and make people consume more. However, it does not only depend on what producers do to sell more, but also it depends on consumer behavior: do consumers need new consumption goods, ideas, and function of a product (Ksenia 2013, 29)? It might transpire into a paradox since ideas of consumers can be changed by producer strategies such as advertisements. For example, junk food brands mostly use a slogan like “haven’t you tasted *X* yet?” and this slogan makes people feel obliged to consume it in order to get involved to the group who use that product. Even if the consumer does not need it, a simple slogan can make s/he consumes it.



Figure 1. Coffee Shelf & Cezve and Tooth Paste & Brush

Figure 1 is taken at a supermarket, and they are simple strategy samples of supermarkets. They put the coffee and cezve (traditional Turkish pot for cooking coffee) on the same shelf. It is a way to remind us to buy a cezve, if we buy a packet of coffee, we should cook the coffee and it is cooked with cezve. Both cezve and coffee should be purchased to consume the coffee. Figure 2 is also taken on the same shelf, and there are tooth brushes and tooth pastes on the shelf next to beverages such as coffees and hot chocolates. It is well known that these beverages are harmful for our teeth health, and they yellow our teeth. Facing with tooth brush and paste especially whitener paste is a kind of warning. If you decide to consume coffee, you should also have a tooth brush and a whitener tooth paste, otherwise you lose the brightness of your teeth.



Figure 2. Checkout Counter & Snacks

Figure 2 shows a checkout counter of a supermarket, and as it can be seen there are snacks and beverages next to the checkout counter. Layout is designed carefully, the shelves of chocolates and crisps are low enough for a child can see and reach effortlessly. Beverages that are consumed by both children and adults are put frontally to checkout counter. This layout aims to make people consume even while they are queuing. Lury indicates that “the layout of stores, the location of goods in relation to others, and their display are deliberately intended to become part of the meanings of commodities” (Lury 1996, 129). According to this aspect, the layout does not only interact the selling and consumption, but it also creates the marketing strategies.

Consumerism often forces us to consume some products and/or services simultaneously. These products and services are like two peas in a pod, and predictably, supermarkets use this to arrange the layout planning of products on shelves. For example, most of the supermarkets put snacks on the beverage shelves. The samples of snacks on beverage shelves are pictured below (Figure 3):



Figure 3. Beverages Shelf, Cinema & Popcorn and Crane Toy Machines

Cinema and popcorn couple sampled with Figure 3 is another example. Cinema is a service which is not necessarily or directly related with food; nonetheless, it cannot be conceived without a bucket of popcorn. Popcorn producers use this association as a strategy; they often use cinema symbols on their packages as a background image.

There are crane toy machines pictured on Figure 3 for children at supermarket and they mostly are put in front of checkout counters. The machine works by inserting a coin and once the child pays the fee, s/he tries to catch a toy with iron claw by using the console. In order to make the machine works, user should spend his/her money, and although the machine commits to give a toy in return for the money, it depends on chance and the ability of user. It can be interpreted that this process is similar to shopping of adults. Adults pay money to purchase a product, however the thing which they purchased is nothing more than a package at the time they paid the fee. The package commits that the product will satisfy the consumer, and just like toy machine sample it is not obvious.

We consume without considering our needs. *Does consumption make us happy or not?* is the main question and the answer to this question can explain the real reasons for consumption. For instance, you want to eat a pineapple. You go to a supermarket which takes at most 20 minutes from your home. There are pineapples in grocery department of supermarket. You can buy it anytime you want. There are pineapples in grocery department 12 months a year. You do not have to remember the taste of pineapple or you do not have to appreciate the value of pineapple. You can buy pineapple when you want, not the time of the pineapple season. Modern society we live in today does not know the concept of absence or deficiency. Thus, the members of modern society demand everything at their own perfect time. Just like the pineapple.

Today you do not want to eat pineapple, thus it will be thrown away as trash. In brief, it is up to what you want, not what you really need.

Things can be defined as objects and artifacts, and sociologists call these objects and artifacts as material. Things are to be produced and to be bought, thus they are part of consumerism. Archaeologists, anthropologists and many other social scientists are interested in material culture, because objects give information about how people live and what people desire (Berger 2014, 16). The term ‘material’ refers to objects made or modified by humans in material culture and it does not include natural objects such as rocks, fossils, skeletons (Prown 1982, 2). As Berger succinctly puts it, “cultural values and beliefs take form or are manifested in artifacts and objects- that is, in material culture” (Berger 2014, 17). In other words, it is possible to analyze cultures by reading materials (Berger 2014, 17). For instance, Japanese people do not use mugs having a handle for tea, since they have a traditional tea ceremony in their culture and according to this ritual they make the drinking tea duration as long as possible and they do not drink tea until they can touch the mug without feeling pain or disturbance because of heat.

Things can be categorized as those we already have, those we want to have, and those we think we need to have. Modern societies in the twenty first century do not need only basic requirements such as housing, clothing, food, but they also desire things (more than basic needs) such as automobiles, computers, television sets, tablets, smart phones, accessories for clothing, etc. (Berger 2014, 15). It can be said that life standards are not only measured by satisfying basic needs any more, but also by how much significance luxurious objects have in our lives. In the past, satisfaction derived from the objects what we really need was a sign of being affluent, however today, if a person who already has a car is not able to buy the car s/he desires, s/he might think that s/he is not able to handle an ordinary life.

Figure 4 is taken from the traditional Turkish bazaar, in Izmir, Turkey. It shows us how consumption is inevitable for society. There are shorts for men, vests for elderly people, skirts for women and so on. Products are not sold by considering a layout planning, however they might not be placed randomly. For instance, a woman who will buy a vest for her mother, might also buy a short for her husband impromptu, since the layout of stands encourages her to consume more. All the products are ready to be

purchased, there is no procedure, consumers just gives the money to seller and take the product, it is as practical as to take a shirt from the wardrobe of our homes. The sellers are not dependent to companies, and they do not have advisors for marketing strategies. They do not have warehouses, and do not need to forecast the number of customer, and they do not need material requirement planning and/or enterprise resource planning.



Figure 4. Traditional Turkish Bazaar



Figure 5. Special Coca Cola Bottles for Izmir

Figure 5 shows the Coca Cola bottle designed for people of Izmir, Turkey. Form of the bottle is same with other Coca Cola bottles, additionally there are signs of Izmir: clock tower and palm trees. In addition, there is an empty space to write the feelings and give the bottle as a gift to someone. It is apodictic that Coca Cola is already a bestselling product, nevertheless the cultural and emotional value provides an affective attachment to the product.

Until industrialization, things were not completely specialized for functionality because of undeveloped production methods which heavily depended on labor force and cultural structure. However, by the advent of material culture in the twenty first century, things are produced considering functionality and cultural values. For example, thirty years ago, a farmhouse table was only used as a table, however today people do not use a farmhouse table for that purpose, but also they use it because of the cultural value of

the table (Baudrillard 1996, 147). Through their cultural value, products take on a new significance. Today consumers do not only prefer to buy a product, they also decide to buy it in the interest of its cultural value. For example, when people go abroad, they mostly buy the magnets of the country they travelled. Consequentially there is no point in buying a magnet just because of its function. It is a known fact that everyone can obtain a magnet in his/her own country, however the key point of this case is cultural value. A simple picture which reminds there or just the name of the place make the magnet desired and consumed object. Objects such as magnet, mug which are purchased without considering the function mostly related with cultural and emotional feelings. Samples are as follows:



Figure 6. Mugs and Magnets from Different Countries

Members of modern societies work to own objects. In the twenty first century, consumers are able to own things which they did not pay for, and they think they can pay the fee later by working. In the other words, people consume things that were not produced yet (Baudrillard 1996, 172). According to morality of modern societies, consumption has priority against saving money, and people take risks to consume (Baudrillard 1996, 173). Credit card, bank cards or such sort of debit cards encourage us to consume more and more. When we use these plastic cards instead of cash, we feel like we do not spend money. In addition, brands compete to take advantage of this illusion. They offer consumers to postpone the payment to make them consume more. They damp for the second product which consumer buys.

On the other hand, consumers are already desirous of consumption. For instance, many fans of Apple queue for iPhone, iPad, etc. or they pay the fee of the device before it is launched to the market. Owning is not particularly satisfying, it is desired to preempt.

Peter Nock in *Consumerism versus Spirituality* (2014) supports that aspect "confidence that full employment could be taken for granted increased spending power

for consumers, as wage earners were encouraged to stretch the family budget" (51). Nock briefly explains consumerism as follows:

An aspect of stimulating consumerism, appeared through a proliferation of credit cards, issued by banks, suggesting that sensible controlled debt could be possible, without anxiety. Traditional views regarding prudence were further under threat, by advertising in newspapers, magazines, junk mail and television. The "must have" society began to concentrate the minds of those who felt and imperative to buy goods immediately (Nock 2014, 51).

Simply put, consumption appears to be an unavoidable phenomenon of contemporary life and people have limited time to explain themselves in the hectic modern lifestyles. Thus, consumption behaviors and consumerism appear to be the tools to have/construct an identity.

Identity can be defined as the presentation of ourselves and other people. Identity is to choose a suitable role in society. It is better to analyze identity with commonly agreed definitions, rather than as an absolute concept (Bartholomew 2010, 936). Instead of being natural, self is "made". Because identity is shaped by events, knowledge and relationships, identity is a dynamic term. Different needs and desires of people create different identities (Bartholomew 2010, 937). The complexity of identity term results from the necessity of multi-identities for an individual. For instance, a woman has an identity of manager for her inferiors at work, has an identity of wife for her husband and an identity of mother for her sons/daughters at home, and has an identity of friend for her neighborhood. She must perform different roles for each identity and needs and desires of each identity alter. Identity is a way to be more superior than the rest, as long as we shape our identities differently from the others, we can express ourselves better and in this case maybe we do not have to consume in order to self-expression.

Owning material is not the only cultural fact what we desire, but we also desire to be more outstanding than the rest. What make us outstanding is defined according to our identities, personalities. The way we show our difference from the others is ambiguous and might vary from person to person. However, facts which cannot distinguish us are explicit. For example, earning more money does not make us extraordinary. Since money is not a tangible concept, and only having money signifies nothing. The time we spent the money for expression of ourselves, it becomes

meaningful. One of the most frequent way to be distinguished is play activity or games. Play should be reviewed to analyze the interaction between culture, identity and play.

Huizinga indicates that “play is older than culture” (Huizinga 1995, 16). Humankind did not add an extra value or did not alter the play term, and the originality of play has not been spoiled until today (Huizinga 1995, 16). All kind of play activities include a meaning and according to Huizinga “if we call the active principle that makes up the essence of play, ‘instinct’, we explain nothing; if we call it ‘mind’ we say too much”. In any case, it is clear that underlying fact of playing is not materialistic (Huizinga 1995, 17). It might be deduced that it is not the results what make playing meaningful in our lives, the process makes people play. In this process, even there are rules, we maybe have a role, we have strategies; the way we play only refers id.

Baudrillard explains what playing expresses with a Disneyland example. According to Baudrillard, imaginarieness which Disneyland presents us neither real nor fake. Disneyland is a miniature universe which was established in order to hide that childishness is all-pervasive, and enables adults to behave like children temporarily, indeed tries to make adults believe that they are not children at all (Baudrillard 1998, 30). Much as Baurillard emphasizes that adults childishness is temporary and illusory, the time we spent for playing is a break to escape from our daily responsibilities, in this way during playing we are as free as children.

Psychologists and sociologists study for observation of play on animals, children and adults, and try to identify what play is. The main issue of these researcher is to define the function of playing, and indicate why this function is necessary or useful in our lives. In order to analyze the biological function of playing, countless scientists has worked in this title. Some of them agree with the results that assert people play to consume the excess of joy of life. Some of them believes that people satisfy the need of relaxation during playing, and prepare themselves for critical activities in real life (Huizinga 1995, 17).

Rest of them thinks that underlying reason of playing is either the desire of domination or need of competition (Huizinga 1995, 18). Although views of researchers vary, all of them concurs that playing process isolate players from the real life temporarily and relax people in a sort of way.

On the other hand, the position of a person also affects his/her opinion about playing. If s/he is involved to play, s/he is conscious of playing. People who are not involved to play, are not able to distinguish the real and playing. Baudrillard explains this case with a robbery sample: who knows that policeman will react differently for a real robbery and a simulated robbery, the difference between two activities has a meaning for the player, however it is meaningless and it evokes same feelings for the policeman. A real robbery tries to vandalize the current system, and simulated robbery directly assaults the reality (Baudrillard 1998, 40). What we perceive from playing depends on our roles. If we are the players, we are aware of playing and we know it is not real, on the other side if we are the ones who are played, then playing is nothing but reality.

In addition, gamification should also be defined to review how the play activity is involved in our daily lives. Gamification can be defined as “the use of game design elements in non-game context” (Deterding, et al. 2011, 2). This definition is explained in a diagram as follows:

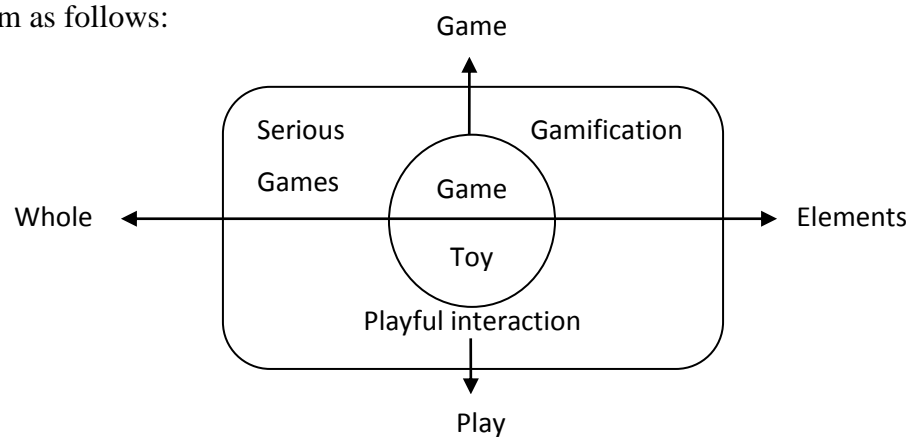


Figure 7. Gamefication
(Deterding, et al. 2011, 2)

Figure 7 does not only explain what gamification is, it also distinguish games and playful interaction (Deterding, et al. 2011, 2). The differences between game and play activity can be listed as follows:

- Games have rules, and rules characterize the game.
- Competition is in the nature of game.
- As a result of competition, terms such as goal, scoreboard, race and winner are keystones of game (Deterding, et al. 2011, 2).

Deterding and his partners recommend “not limiting the term gamification to specific usage context, purposes, or scenarios, while noting that joy of use, engagement, or more generally improving the user experience currently serve as popular use of context” (Deterding, et al. 2011, 3). It can be deduced that gamification is developed by itself, and it should be random to not to reduce joy.

As much as we play, we realize that the instinctual satisfaction is not the only function of play. If we experience playing for long time, we develop an ability to control the effects of playing. Winnicott explains as if we are riding a horse, we should not go where the horse brings away, we should go where we want to go. In this context, it is inevitable to mention about cultural experiences. Culture is the cumulative of taken over customs, and individuals attribute these cultural accumulations. The key point of culture depends on customs, and without customs culture cannot be genuine (Winnicott 1997, 125). Winnicott asserts that in order to analyze playing and culture; a baby, needs of the baby, love which the baby feels for needs, correlatively mother of the baby, and relation between all of them and the space should be analyzed (Winnicott 1997, 126). This example explains the role of playing in our lives. All of us have different needs which we hope playing can satisfy, and just as the baby needs they are fundamental and simple needs. As the need itself makes the baby happy, just the idea of playing makes us feeling satisfied. In addition, what we experience with playing adds value to our lives and our identities can be shaped by these experiences. As long as we experience playing, the society which we are member of, will enrich the culture. Briefly, playing is in a significant interaction with culture and both playing and culture are external factors which affect our identity creation process.

Other one of the most important external factors is advertising. Advertising has an important role to control the sense of identity. Scientists argue that we define ourselves by consumption rather than religion, family, geography, etc. We use logos and brand names to identify who we are and it does not necessarily depend on any reason (Bartholomew 2010, 941). Especially teenagers use brand names and logos in their social network profiles for personalization. This is an indication that the advertisements constitute a significant part of our everyday lives. Each American is exposed to more than three thousand advertisements per day (Bartholomew 2010, 942). Bartholomew concludes that “if human beings naturally build their identities from the

cultural materials available, the omnipresence of advertising must be influencing the formation of modern identities” (Bartholomew 2010, 942). Furthermore, consumers make advertisements of the brands they like involuntarily. Companies make promotions for the consumers who *check-in* and share it on their social networks and when consumer shows a *check-in* on their home pages, automatically makes the advertisement of the brand.

There are three key points that shows how and/or why advertising affects people’s identity (Bartholomew 2010, 938):

1. Definition of ourselves or chosen identities are constructed subconsciously (Bartholomew 2010, 938).
2. By the impact of popular culture, artifacts are the stakeholders of self-definition process (Bartholomew 2010, 938). One of the most common examples is clothing. Fashion is a way to express ourselves (Bartholomew 2010, 939).
3. Everybody has an identity, however identity is shaped by two processes: categorization and comparison. Each person categorizes other people by their social groups, and compares each group. People define themselves by being a member of a group (Bartholomew 2010, 939-940).

The popularity of advertisements become more and more, and this situation provokes companies to use advertisements in order to provide the protection of interest. In this context, company interest and consumer rights might contradict, thereby advertisements could be deceptive and give consumers inaccurate information about the product. This problem initiated regulations for relationship between consumers and producers. Thus, today’s consumerism focuses on the relation between the consumer and the producer company to clarify consumer rights (Stearns 2006, 81). In this context, consumer rights have become a serious and important matter. Thereby, in order to protect consumers, laws for consumer rights were emerged. Starting point of this activities for supporting consumer rights in other words consumer protection was depended on the Code of Hammurabi within a commercial view. Early patterns of consumer protection was emerged in United States (Corradi 2015).

So much so that March 15 of every year is defined as *World Consumer Rights Day* in the United States, for instance. Consumer rights are classified in four basic

classes: the right to safety, the right to be informed, the right to choose, the right to be heard (Stearns 2006, 63). It is expected from governments to protect consumers in the following areas:

- Physical safety
- Protection and promotion of consumer interests economically
- Standard for goods & services' safety and quality
- Specific areas such as food, water and pharmaceuticals
- Education of consumer (Stearns 2006, 64).

This sensitivity towards the protection of consumers' right is not particular to the USA or the first world. For instance, the 24th of December is observed as *National Consumer Rights Day* in India to provide consumers with a better protection. Consumers are defined as people who purchase or hire goods and services (Stearns 2006, 64-65). Protection and promotions for consumers offered by Indian authorities are as follows:

- Right to safety: the purchased goods and services should not only satisfy needs but also long-term desires, and the satisfaction should be measured by terms such as quality and guarantee.
- Right to be informed: information about product's quality, quantity, feature, purity, standards.
- Right to choose: variety of goods and services within the competitive prices.
- Right to be heard: non-political and non-commercial consumer organizations regulated by government to inform consumers.
- Right to Consumer Education: to provide consumers with knowledge and skills to make them informed through life (Stearns 2006, 66-67).

To understand how consumerism affected contemporary societies so profoundly one should pay attention to the reasons for its strength. They can briefly be divided into three categories the discontented consumer, problems in the marketplace, the activist consumer (Stearns 2006, 86).

- The discontented consumer: Complexity and multi-functionality of products might result in consumers' discomfort and discontent.

Production companies analyze the source of discontent to make the marketing environment better.

- Problems in the marketplace: current brands, their price strategies, and quality standards are characterized by relationship between consumers and companies' strategies to get competitive advantage. Main marketplace problem is the rate of technological changes. In order to adapt to these changes, companies should have standards, design-lives, and adjust their price policies. Consumers expect products to satisfy them, to provide functional performance, and to be safe.
- The activist consumer: this term is generated because of discontented consumers. The discontented consumers over time become activist consumers in order to reflect their feelings and press to change what caused their discontent in the first place. New product researchers can find out what bothers consumers, even if consumers themselves do not have a clue, and they can solve activist consumers' problems (Stearns 2006, 87-90).

Consumers thanks to laws and legislative regulations for consumer rights and protection, demand more than products and/or services from companies. They are more conscious and they know their consumption is harmful for environment, therefore they demand environmentally friendly products and services. Not only production process is harmful for environment, material of the product and package might be harmful. In addition, the consumption process of the product might be threatening for environment. As long as we consume products, we inevitably consume packages and if packages are not recycled and/or reused, they are simply waste. In order to analyze the impact of packaging on product, consumption and environment, packaging design is reviewed in the next chapter.

CHAPTER 3

THE IMPACT OF PACKAGING ON CONSUMERS

Packaging is a way to protect, transport, stock the product by using materials such as wood, glass, paper. In this context, packaging is the complement of the main product (Demircioğlu 2003, 1). Cliff argues that packaging is the most private and most emotional branch of design (Cliff 2002, 8). Because, packaging shows the content to the target users by visual communication, and it includes color, photography, illustration, and typography (Düz 2012, 21). Packaging is a bridge to connect the production and consumption by protecting, handling, delivering, and presenting the product. Packaging testifies the whole life cycle process of the product.

In this chapter, packaging and packaging design is reviewed inclusively, and this chapter has mainly five subtitles. Firstly, in order to explain the development of packaging an historical overview is included and this section does not only inform about historical development, but it also relate the material and areas of usage of them. Second section, analyzes the elements of packaging: packaging color, background image, packaging material, font style, printed information and innovation. Third section emphasizes the function of packaging, in other words this section is about what is expected from a package, in this context this section might be guideline for packaging designers. Fourth section approaches the packaging as a tool for providing consumption. In the last section, environmental perspective of packaging is underlined. Briefly, this chapter explains how packaging was involved our lives, what is it used for, why is it important in consumption, and how is it affects environment.

3.1. Historical Overview of Packaging

It is important to analyze the historical development of packaging since a historical overview shows us which material was suitable for which packaging in early times. It gives us the means to compare the type/usage of materials in the past and present.

Consequently, we can identify materials not only according to current usage, but also past usages and it makes us more conscious to material and packaging combinations.

Table 2. The History of Packaging

Year	Paper and Paper Products	Glass	Metal	Plastics
800BC	Woven grasses, soon replaced by clothes	Clay pottery and crude glassware		
1550BC	Poultry wrapped in palm leaves to protect against contamination	Bottle making is an important industry in Egypt		
200BC	Developed by Chinese from mulberry bark			
Greek and Roman Times	Wooden chests, kegs and barrels	Bottle for perfumes, jars; earthenware urns bottles		
750AD	Paper making reaches Middle East from there reaches Italy, Germany			
868	First evidence of printing from the Chinese			
1200	Paper making reaches Spain from there reaches France, UK in 1310		Tinplated iron developed in Bohemia	
1500	The art of labeling is created Jute sacks widespread			
1550s	Oldest surviving printed wrapper from Andreas Bernhardt, Germany			
1700	Paper-making reaches USA	Champagne invented by Dom Perignon only possible because of strong bottles and tight-fitting corks		
1800		Jacobs Schweppe started business in Bristol, England as a maker of mineral water- Schweppe's	Handmade soldered tinplate canisters in use for dry foods	
1810			Peter Durand devises cylindrical sealed container the can Aluminum isolated from ore	
1825	Druggists in the UK adopt regulations for the labeling of poisons			
1841	Paper boxes cut and creased by hand. Screw cap patented		Collapsible tubes first used for artists' paints	

(cont. on the next page)

Table 2. The History of Packaging (Cont.)

1890s	Printed paperboard cartons appear. Crown cap patented 1892	The first milk bottle appears; Scotch whisky appears in London and is exported; Coca-Cola appears in bottles- Pepsi Cola soon follows	Toothpaste invented- starts to appear in collapsible tubes	
1900s	Uneda biscuit package outs the tinplate biscuit barrel. MW Kellogg launches cereal packet	Mayonnaise is bottled in 1907	Aluminum covers made for Mason Jars	
1905s	Composite paperboard cans appear-some spirally wound. Fibre drums for cheese also designed		Steel barrels are designed to carry oil for standard oil; they replace wooden barrels. Oxo-design white lettering on red tinplate container appeared in 1900s	
1909	Wirebound crates appear for bulk packaging			Cellulose acetate developed for photographic use.
1900-30		Perfume bottles become more adventurous	Foil wrapper used (1913) for US Life Savers candy bar	
1924		The UK's United Dairies becomes Britain's first dairy to switch to bottles for its milk deliveries		Du Pont manufactures first Cellophane in New York
1927				PVC available as a commercial product. Expensive plastics caps are used in luxury items. Polyester- a British discovery- was bought by DU Pont and licensed to ICI for European distribution. Development of polyethylene terephthalate 12 years later
1928		The US baby food industry starts packaging products in glass jars		
1933				ICI- develops polyethylene; Germany develops polystyrene
1938				Du Pont introduced Nylon

(cont. on the next page)

Table 2. The History of Packaging (Cont.)

1940			Aerosol devised as DDT spray	A type of polyethylene used to pack Mepacrine tablets in WWII. First tubular bag blown in 1949
1947				Squeezy bottle designed for Stopette deodorant
1948				First shrink-wrapped product: turkeys for deep freeze storage
1950			First aluminum can is designed	High density PE developed in the UK and the USA, by Phillips Petroleum and Standard Oil Polycarbonates, developed by General Electric and Bayer
1959				Polypropylene developed in Italy, first appears as a film
1960				LDPE used for heavy duty sacks for fertilizers
1973				Stretch wrapping introduced in Sweden
1977		Glass starts to be used only for high-value products		PET becomes widespread as bottle material for carbonated drinks
1980s			Continued down gauging of tinplate as a nostalgic medium	PET used for foods and hot-fill products such as jams. High barrier, multi-layer containers increasingly used. Guy la Roche uses PET for perfumes
1990s	Increasing use as designers aim to cash in on the green revolution	Glass regains more attention as a recyclable pack medium		More designs incorporate biodegradable

(Sonsino 1990, 170)

The table above shows us the usage of materials for packaging historically. According to this table, until the 1200s metal and plastic were not used for packaging. During this period paper and glass was used mostly. Glass bottle was first used for

perfumes in Greek and Roman times, and it might be a sign which shows us packaging was not only used for the protection of essential products, but also for luxury. From the 1700s to the 1900s thanks to metal, a simple isolation of package was provided. Metal was laminated to paper and/or plastic and lamination proofed the package and product against external factors such as heat, moist, light, air, etc. In addition, glass bottles helped cola and mineral water industry to thrive. Metal tubes allowed products such toothpaste and artists' paints to be present in the market. 1909 is one of the most important dates because plastic was started to be used. From 1909 to the 1990s plastic was the most used material for packaging, and subsequently, the use of paper decreased during this period. Plastic was easy to produce and it was cheaper than other packaging materials. As long as the package did not need specific feature, plastic was used. However, from the 1990s once again paper became more common in packaging. It can be explained by several reasons. One of the most important reasons can be the changing preferences of consumers. Consumers became more conscious about environment and health. There is an apprehension such as paper is healthier than plastic, and paper can be more recyclable than plastic. It is most probably why people preferred to consume packages produced by paper.

3.2. Elements of Packaging

Basic elements of packaging constitute the independent variables of consumption. These basic elements can be listed as follow: packaging color, background image, packaging material, font style, printed information, and innovation. The dependent variable in this formula is the consumer's buying behavior (Deliya and Parmar 2012, 55). Independent variables are analyzed in detail below:

3.2.1. Packaging Color

Each color has different effect on the decision of consumer (Deliya and Parmar 2012, 55). Color can make a person feel calm, cool, excited, etc. (Ambrose and Harris 2013, 106). Red, pink, orange, yellow, brown, blue, green, purple colors play an important role in feelings. Red is the color of blood, danger, and anger. Red color

accelerates respiration and heartbeat. This color is the most exciting, dynamic, energetic, tempting, and provocative color. If red becomes darker, it turns into more authoritarian and elegant color and if red becomes lighter, it turns into more youthful and elegant color. Red color is used to take attention on a specific point, however red color is demanding. Thus it is difficult to use this color in design. In addition, red is not a relaxing color, and some societies think that red is a rude color (Ambrose and Harris 2013, 108). Pink is the color of love, romance and health. Pink is the reflection of exciting, entertaining, feminine feelings. Darker pink is more youthful and active and lighter pink is more mature. Thanks to feminine feature of pink, it is often used for fashion and cosmetic industry (Ambrose and Harris 2013, 110). Orange is one of the hottest colors. It is particularly attractive, striking, spectacular for children and teenagers. Even though orange color includes the passion of red, it is calmer than red, because of the cheerful pattern of yellow. Orange encourages feelings and desires, thus it is generally used for food packaging and the design of directional signs. Orange color reminds citrus, the change of seasons and health (Ambrose and Harris 2013, 112). Yellow is a bright and happy color, and it reminds summer. This color represents different feelings, it therefore is a versatile color. Bright yellow is associated with happiness, and greenish yellow is strictly associated with illness, sickness, and disease. Pale yellow specifies fear. The combination of yellow and black is the highest opposition, thus it is not coincidence that this combination is used for warning (Ambrose and Harris 2013, 114). Brown is related to organic materials such as wood and stone, and it is a neutral and humble color. In addition, it is massive and reliable, and it reminds warmth and natural goodness. Brown color is used to represent the peaceful home atmosphere. However, sometimes this color is associated with negative things such as dirt and mud (Ambrose and Harris 2013, 116). Blue is the reminder of mystery and power of the nature and it is the color of sky and ocean. Because of the water connotation of blue, it is associated with continuity, life savior, and reinforcement, which endows blue with a relaxing and calming effect. Universally, this color is perceived as cool and purifying. Dark blue makes people think consistently and conservatively, leading to its use as an institutional color, and it represents security and reliability. Pale blue has a young and calm impression. Greenish blue is associated with spirituality and mysticism (Ambrose and Harris 2013, 118). Green embodies goodness, nature, and environment. It reflects fields and forests, and it is the color of spring. As a result, green represents life, health, and new beginnings. It is such a peaceful color that

makes people feel balance, harmony, and consistency. Those who are environmentalist are called as green. Green is used for many packages, because it implies that the product is fresh and environmentally friendly. In addition, green is associated with Islam, thus green is used on the flags of Islamic countries. However, green sometimes represents jealousy, disgust, and inexperience (Ambrose and Harris 2013, 120). Purple is the color of kingdom. It combines the warmth of red and the coldness of blue. Purple is an authoritarian color that points out reign, spirituality, dignity, and ceremony. Positive connotation of purple is wisdom and enlightenment, however negative connotation of purple represents to cruelty and arrogance. People use purple on their cloths and/or interior decoration during meditation. Children like purple and purple improves the creativity of children (Ambrose and Harris 2013, 122).



Figure 8. The Psychology of Colors in Marketing, (Source: Ciotti 2013)

3.2.2. Background Image

Background image both informs consumer and makes the package more re-collective. Background image can be a photograph or an illustration considering product type. The important point is photograph and illustration are not interchangeable techniques. Functions of background images are as follows (Erdal 2009, 54):

- Indicate discrepancies of the product and give using advices.

- Show the phases of assembly for modular products and/or instructions for construction.
- Provide an emotional interaction. For instance, using flower pictures on a gift package.
- Show the final form of the product. For example, using a cake image for cake powder package, using the finished image of a puzzle on puzzle package (Herbert and Lubnier 2004, 36-37).

Both photograph and illustration need proficiency and experience. Deciding which one to use is a challenge for designer. For example, on food packages photograph is utilized. Since the real image of the food make the product more desired. Besides, on drug packages illustration of the drug is being used (Erdal 2009, 55-56). The product itself is not single criterion of packaging designer due to select photograph or illustration. Target user also helps the designer to decide. For example, illustration is being used on packages of kids product, and illustration corresponds to colorful and surrealistic lives of children.

3.2.3. Packaging Material

Paper and board, flexible material, plastic, glass and metal are used for packaging. There are different types and grades of papers and each of them are used for different purposes. Unbleached kraft or coarse brown paper, glassine and greaseproof papers, parchment papers, tissue, sulfites, foils, specialty papers textured with flock, glitter, foam and other materials are used for packaging design (Göktepe 2000, 35-37). Plain chipboard, white wat-lined chipboard, bending chip, white-lined 70 newsback, bleached manila-lined bending chip, clay-coated boxboard, solid manila board, extra-strength plain kraft-type boards, uncoated solid bleached sulfate, clay-coated natural kraft, ovenable paperboard (for microwave ovens) are the types of board which are used for packaging design (Göktepe 2000, 37-39). Paper and boards are inputs which are sheets and rolls, and after the design and production process, they turn into three-dimensional outputs. Flexible Packaging has three types: wraps and overwraps, preformed bags and pouches, form-fill-seal pouches (Göktepe 2000, 51-53). Polyethylene, Polyproplene, Polystyrene, Polyurethane, Polyvinyl-Chloride,

Polyethylene-Glycol Terephthalate, Acrylonitrile Butadiene Styrene, Acetal, Acrylic, Nylon, Phenolic Dihydroxydiphenylmethane, Polycarbonate, Polyethylene are plastics used for packaging. Some plastics have advantages such as low cost, clarity, sterility, etc. and some have disadvantages such as discolors, high cost, low impact, poor quality, etc. Blow molding, injection molding, extrusion, casting, thermoforming, foaming, and compression can be given as the examples of production methods. Plastics have different uses such as bottles, screw caps, boilable bags, aerosol bottles, etc. (Mosberg 1989, 52).

Paper, paperboard, plastic, metal, wood should be reviewed one by one, and area of use, advantages, disadvantages should be analyzed to clarify the selection of material for packaging. These materials can be combined due to necessity such as plastic coated carton. In this context, all materials used for packaging should be considered.

Paper is one of the most used material for packaging. Reasons of usage are as follows:

- Paper can represent the visual properties of the product.
- Information, background image, and other visual tools can be put on all three dimensions of the package.
- Transportation and waste of paper does not trouble to come for consumers (Erdal 2009, 118).

There are mainly three kinds of packaging paper: wrapping paper, cartons and corrugated board. Wrapping paper as it can be understood by its name is used for quick packaging processes (Erdal 2009, 119). These packages can be coated with another material such as plastic, metal. In order to increase the durability, impermeability, and the quality of heat sealing, packages can be coated with plastic (Erdal 2009, 121). Paper can be transparent or semi-transparent. The feature of material is decided by packaging designer by considering the product. Cartons are mostly used for food packaging. Cartons are preferred to use because of properties such as pliability, multifunctionality, easiness of transportation and stocking (Erdal 2009, 122). The European Carton Makers Association, ECMA developed a coding system to group the cartons (Erdal 2009, 125). This coding system is indicated as follows:

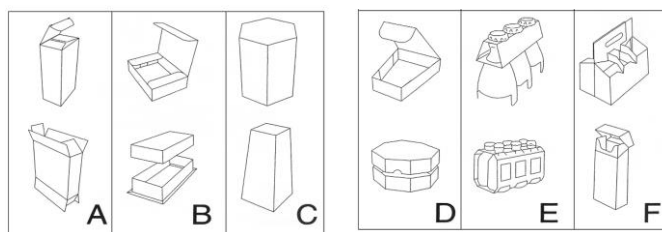


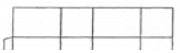












Figure 9. Carton Group

Table 3. Overview of the Variables Which Form the Codes

Group (Capital Letter)	Variable (1st Group of 2 Digits)	Variable (2nd Group of 2 Digits)	Variable (3rd Group of 2 Digits)	Variable (4th Group of 2 Digits)
A	Bottom closure type	Top closure type	Panel number	Panel number
B	Basic shape	Locking flaps system	Number of dust flaps	Type of cover
C	Body	Basic shape	Bottom closure type	Top of closure type
D	Glued/ not glued	Basic shape	Locking flaps system	Type of cover
E	Product	Closure system	None	None
F	List	List	None	None

Table 4. Closure Systems of Group A

01	without flaps		
10	full overlapping closure system		
11	closure system with reduced flaps size -1 flap fully covering		
12	closure system with 4 reduced flaps		
15	full overlapping closure system with extended back panel		
20	tuck in flap closure system		
21	tuck in flap closure system with extended back panel		

(cont. on the next page)

Table 4. Closure Systems of Group A (Cont.)


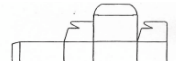







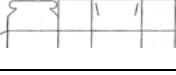

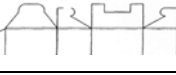



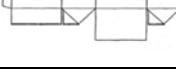







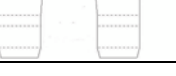

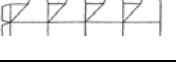

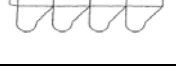





30	tuck in flap closure system with scissor lock system		
40	winged flap closure without dust flaps		
41	winged flap closure with dust flaps		
45	winged flap closure with dustproof flaps		
50	claw lock closure system		
55	Self-locking envelope closure system		
60	automatic (2P glued) closure		
61	automatic (2P glued) closure with covering flap		
70	sealed closure		
75	gable top closure with locking flap		
80	buffer closure with tuck in flap		
81	buffer closure without tuck in flap		
82	rosette closure system		
83	fold in closure system		

Table 5. Closure Systems of Group B

01	locking flaps system with fold over ends with nib locks		
02	locking flaps system with fold over ends with expansion piece		
03	locking flaps system with fold over ends with additional lock device		
04	locking flaps system with fold over ends with webbed corners		

(cont. on the next page)

Table 5. Closure Systems of Group B (Cont.)

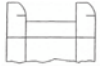
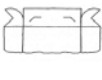
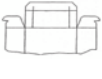
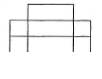
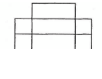



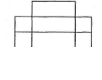




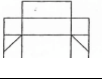
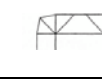
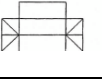








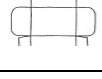

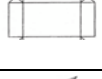




05	locking flaps system with scissor lock system		
06	locking flaps system with claw lock system		
07	locking flaps system with claw lock system and locked dust flaps		
08	locking flaps system with fold over ends		
10	not glued corner /panel & not webbed corner		
11	not glued corner/panel webbed		
20	glued corner/panel , not webbed		
21	glued corner/panel -webbed		
22	glued corner/panel , not webbed , down foldable inwards		
23	glued corner/panel , webbed down foldable inwards		
24	glued corner / panel , not webbed , down foldable outwards		
25	glued corner/ panel webbed , down foldable outwards		
50	tuck in flap cover system		
51	double walled tuck in flap cover system		
52	2 flap lid winged flap cover		
53	3 winged flap cover with open corners		
54	3 winged flap cover with webbed corners		
55	Cover closure with claw lock		
60	complete flap cover with closed corners		
61	complete flap cover 2 point pre-glued		

Table 6. Closure Systems of Group C



























01	no closure system				
10	full overlapping closure system				
11	closure system with reduced flap size / 1 flap fully covering				
15	full overlapping closure system with extended back panel				
20	tuck in flap closure system				
21	tuck in flap closure system with extended back panel				
55	Self-locking envelope closure system				
60	automatic closure (automatic bottom)				
90	rosette closure system				

Table 7. Closure Systems of Group D

01	locking flaps system with fold over ends with nib locks		
02	locking flaps system with fold over ends with expansion piece		
03	locking flaps system with fold over ends with additional lock device		
04	locking flaps system with fold over ends with webbed corners		
05	locking flaps system with scissor lock system		
06	locking flaps system with claw lock system		
07	locking flaps system with claw lock system and locked dust flaps		
09	locking flaps system with fold over ends		
10	not glued corner /panel & not webbed corner		
11	not glued corner/panel webbed		

(cont. on the next page)

Table 7. Closure Systems of Group D (Cont.)

20	glued corner/panel , not webbed				
21	glued corner/panel -webbed				
22	glued corner/panel , not webbed , downfoldable				
23	glued corner/panel , webbed downfoldable				
50	tuck in flap cover system				
51	double walled tuck in flap cover system				
52	2 flap lid winged flap cover				
53	3 winged flap cover with open corners				
54	3 winged flap cover with webbed corners				
55	Closure with 1 flap fully covering				
60	Complete flap cover with closed corners				
61	Complete flap cover 2 point pre-glued				
62	Separate cover plate				

(Source: The European Carton Maker Association 2014)

Tables above shows the types and features of the ECMA's coding. This coding and grouping system aims to generate standards, thereby helps designers to consider available packages and production methods of them. The system shows the open form of the package, how to transform it to a three dimensional form, and the features of the package. It enables to combine different types of different groups and decide which package should be used for the product.

Group A has rectangle form and the packages of Group A is produced by sticking longitudinal. Surface angles of the package are 90-degree. Group B has rectangle surfaces. As Group A, Group B packages is sticked longitudinal. Lid is open-close type. Group C has a different form from Group B and Group A. The packages of group C, has at least one non-rectangular surface. Surface angles are 90 –degree. Group D also has at least one non-rectangular surface. Edges are sticked longitudinal, and these boxes cannot be closed, since they do not have lid. Surface angles can be 90-degree or more. Group E does not have certain features, the packages of Group E are

folded according to form of the product. Group F includes the other foldable packages (Erdal 2009, 125). Packages are used according to the aim of packaging, and factors such as product type, form of the product, type of selling are decisive for the aim of packaging. For instance, an egg package is irreplaceable for egg, however it cannot be used for any other product. Even it is used for other products, it is not needed, in the other words it is an extra cost, and does not have a meaning.

For more strong packages and display stands, corrugated cardboard is used. Some samples are as follows Figure 10:



Figure 10. Japan Cardboard Display and Coffee Cup Package
(Source: Nishikata Film Review n.d.)

Another commonly used material for packaging is plastic. Mainly, plastic is a safe, economic and healthy material for transportation. At first, plastic was used only for food packaging, no longer it is used for medical and industrial product packages. The reasons of utilizing plastic are listed as follows (Erdal 2009, 144):

- Production of plastic is simple and economic.
- Plastic packages can be safely used for hot and cold injection.
- Plastic is not a weighty material.
- Plastic can be safely transported and shipped.
- It is feasible to apply all kind of designs with plastic. For instance, according design of designer, it can be thicker or thinner, it can be transparent.
- It can be recycled.
- It can be laminated with other packaging materials such as paper and metal in flexible packaging, and this lamination allows plastic to be used in food packaging (Erdal 2009, 144-145).

Mostly common plastics for package are PET (Polyethylene Terephthalate), PP (Polypropylene), PS (Polystyrene), and PE (Polyethylene). Difference between these plastics arise from the different chemical structures of them.



Figure. 11 PET, PP, PS, PE (Source: Packaging 2015)

Samples of the plastic types are shown above: Figure 11. Areas which are utilizing plastic in flexible packaging are listed as follows:

- Sugar, chocolate and candies
- Cheese and other dairy products
- Dry foods and breakfast cereals
- Bread, biscuit & cake (cooked bakery products)
- Powder and grain coffee
- Fresh & processed meat, chicken and fish
- Frozen products & ice-cream
- Fresh fruits and vegetables
- Cigarette and tobacco
- Medical and cosmetic products
- Cleaning products
- Pet formulas
- Other products such as trash bags, grocery bags, stretch films, shrink film, and band film (Erdal 2009, 147).

Plastic packages are being used by many producers, and plastic gives advantages to producers. It provides freshness until the consumption of the product. It is a barrier against air, oxygen, gases, moist, UV rays, light, therefore it provides the product stands on the shelf until the expire date. It keeps the product bodily, it prevents diffusion and affusion. Transportation, stocking and distribution of plastic packaging is practical for producers. It allows consumer to consume as much as s/he wants (Erdal 2009, 146). Plastic consumption rates are as follows (Figure 12):

Taiwan, Southeast Asia, Japan and Korea are the countries which consumes plastic at most. It can be explained with the square meter per person. People of these regions have less income and less time to consume products, thus they prefer fast

moving consumer goods. Plastic packages which are mass produced easily, with low cost allows to present fast moving consumer goods quickly and cheapishly.

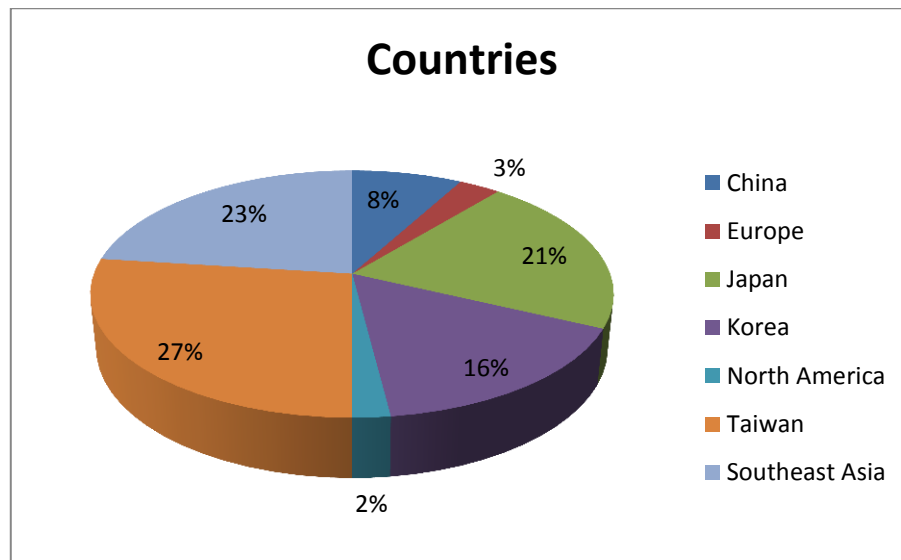


Figure 12. Regional Plastic Packaging Material Consumption
(Source: Tracy and Vardaman 2005)

Glass is another packaging material, and it is generated by three primary materials: sand, soda and lime. For packaging, proportionally broken pieces of glass are being used, it gives a technical and economic advantage (Erdal 2009, 149). Especially, it is used for food, medical, gassy and/or liquor packaging. Whereas consumers become more sensitive for environment, they tend to consume glass more day by day. It is available to recycle 100% of glass safely. Glass has a smooth surface, therefore it is possible to clean easily, and cleaning easiness prevents microorganisms to live. Glass does not contain a material which will interact with food. It is an economic material, since it can be used again and again. Lastly, new technologies make possible to light the glass (Erdal 2009, 150). Other features of glass which make it more popular are as follows:

- It is environmentally friendly.
- Primary materials of it are 100% natural.
- It is a healthy material.
- It does not chemical interact with the products inside.
- It has a long shelf life.
- It is transparent.
- It is resistant to heat and pressure.

- It is impermeable and it does not have pores.
- Glass packages such as boxes, bottles, etc. can be closed with lids which are produced by different materials such as metal, plastic, foil and cork (Erdal 2009, 150).
- The form of the glass packages can be designed according to the product (Erdal 2009, 151). For instance, a wine bottle can be in grape shape to clarify the content. In addition, the bottom of sample below has a form like the bottom of goblet. Goblet and grape combination reminds us wine, thus there is no need to write the content on the package (Figure 13).



Figure 13. Grape Shaped Wine Bottle and Glass Packaging (Source: Amazon 2015)

- Glass is impermeable against air, however it is not impermeable against light because of the transparency of it. Colored glasses solve this problem a little.
- If a processed glass is not suitable due to standards, the broken pieces of it can be processed again.
- Glass packages are reusable, unless they are remained dirty.
- Glass wastes are less harmful materials for environment, it can be easily picked up and recycled (Erdal 2009, 151).

Glass mainly has five types: calcareous and siliceous glass, potassium glass, leady glass, boron glass, and exclusive glass such as frosted glass, fibre glass, colored glass (Erdal 2009, 152-154). Convenience of the type for the product and the aim of package is decided by designer, accordingly designers should review the features of each glass and make a decision analysis to use the optimum material. Glass samples are figured as follows (Figure 13)

Wood is an organic material completely, and it is not as resistant as inorganic materials. On the other hand, wood is mostly preferred material because of the soft texture and heart-warming concept. Wood is used as material of furniture, cover-up

chests, cages of electronic items, and packages (Erdal 2009, 154). Because of the organism and heart-warming patterns of it, wood is used for packaging to emphasize the naturalness of the product. For example, dried fruit producers use wood packages to remind the organism, naturalness of food. In addition, since the wood is one of the oldest package material, they indicate that their products are as traditional and natural as a wooden box.



Figure 14. Wooden Package for Dried Fruit

Wood has both advantages and disadvantages. Advantages and disadvantages of wood are as follows on Table 8 (Erdal 2009, 155-156):

Table 8. Advantages and Disadvantages of Wood

Advantages	Disadvantages
It is a natural material.	It is not suitable for automation as its alternatives.
According to resistance per weight, wood is an economic material.	It needs high labor and material cost.
Making a box or a trunk from wood does not need a complex machinery and or equipment.	Since it is bulky, the transportation and stocking is not practical.
It can be produced with a less investment.	Attraction is not sufficient.
It is easy to stake.	It is not preferred in industrialized countries.

Metals are one of the mostly used materials in packaging sector. Metal packaging is preferred because of strength, safety, anti-bacterial structure and wide product range (Erdal 2009, 159). The features of metals are as follows:

- It protects the product against moist and light, and this feature does not depend on the thickness of the package.
- Since it is available for solder, welding and rivet, shaping of the metal is practical.

- Although it is a light material, it protects the product against hit and blow.
- Printing techniques enable to print color, text, images on the metal and it makes the package more attractive and it gives advantage to inform the consumer about product without an extra material.
- Although is not possible to see the inside of the package, it is possible to visualize the content by images.



Figure 15. Same Product With Different Packaging

- Metal packages enables mass production and selling.
- Metal packages protect the color, taste and aroma of the product.



Figure 16. Metal Packaging Samples
(Source: Packaging, Middle East & Africa 2013)

Products which used metal packaging are sampled above (Figure 16). It can be interpreted that wide range of target group both producers and consumers prefer the metal packaging. Consequently, materials are decided by designers according to product type, target user group, region, etc.

A material for packaging which is suitable for a product, might not be suitable for another product, or for the same product, it might not be suitable for different target users.

3.2.4. Font Style

Font style is a tool for taking the attraction of customers, and most of the consumers are not aware of the font style on the package. However, font style is one of the most powerful weapons of successful companies, they create innovative font styles for packages to make people consume. It can be said that font style affects buying behavior (Deliya and Parmar 2012, 55). Packaging designers should consider how consumers react font styles and should generate standards. The standards generated by consumer reactions sampled as follows:

- Font style of definition of the product, name of the brand and logo of the product should be different from each other. Name of the brand and logo of the product should be brought into to the foreground.
- Color of the text and background should be contrasting to each other.
- Font size of selling text, promotion messages, etc. and brand should be noticeably. However, none of them should be as small as unreadable. An sample is shown below:

Table 9. Font Size Samples

Font Size Samples
Font size of this text is five.
Font size of this text is six.
Font size of this text is eight.
Font size of this text is ten.
Font size of this text is eleven.
Font size of this text is twelve.
Font size of this text is fourteen.

- The biggest font size should be the brand on the package. The hierarchy of font size is sequentially brand, product identity, production and expiry date, nutritional values, and explanation about product.
 - Font style should be simple and legible.
 - Dark and san serif typography makes the package more attractive.
- However, serif fonts mean high quality. Long and slim fonts reminds softness and feminine values.

- Text should be as short as possible. Generally, people do not condescend to read long texts.
- Texts should be as simple as possible. Even only one unnecessary word on text is a waste for package. As a result, except from legal requirements, each word should be criticized.
- Packaging designers should test the legibility during the design process (Erdal 2009, 44-45).



Figure 17. Font Styles of Different Brands
(Source: Wikimedia)

Considering the standards written above font style should be decided during design process carefully. Akio Morita the founder of Sony explains that his company firstly used an italic *s* as their logo, however he later realizes that in order to provide brand recognition, font style should be as legible as possible, and since that time the company has been using same classical font style: SONY (Morita 1989, 84). Font style might be the only element of the product which is reminded by the consumer's mind. Seasonally, brands make promotion and present something such as t-shirt, scarf, etc. to regular consumers and on the present there is the name of consumer which is written with the font style of brand and even only font style of brand under consumer's eyes will remind consumer the brand and the product itself, and s/he will the product once more.

It is clear that each product has a target consumer group, and packages are not only designed to transport, protect the product and to give information, but also packages are designed to activate the desires of consumers. Therefore, packaging consumers should consider the target group and should choose a proper font style and colors. The key point of the interaction between the consumer and the package is duration. Package has only a few seconds to take attention of consumer.


3.2.5. Printed Information

Packaging does not only play a significant role in protection, but it also describes the content and the features of the product. Packaging is a tool for creating a brand identity, increasing the recognition of the company name, optimization of layout on shelves. Packaging, with the printed information on it, is able to change the decision of consumer (Deliya and Parmar 2012, 56). Printed information basically include what the package contains, what are the features of the product, what should consumer learn from the package (Erdal 2009, 45-46). Besides, numeral values such as weight, quantity, etc. might be important for customers. In addition, information which are legal obligation are as follow (Erdal 2009, 46):

- Information about how will the consumer open the package, how to use the product, how to install it and how to keep it.
- Package should enlighten consumers about nutrition and information about nutritional values of foods and beverages.
- Information about instructions, warnings, side effects and dosages should be given on the drugs' packages.
- Transportation texts and warnings should be written on the chemical products' packages.
- Weight, volume and quantity of content should be printed on package (Erdal 2009, 46).






Furthermore, symbols are used to represent feature of the package and/or the product. Some of these symbols are listed in a table as follows:

Table 10. Symbols for Packaging and Their Meanings

Name of the symbol	Symbol	Meaning of the symbol
CE		Ce symbol assures that the product within the package does not jeopardize the humans, animals and is not harmful to the environment (Caner 2007, 44).






(cont. on the next page)

Table 10. Symbols for Packaging and Their Meanings (Cont.)

TSE		<p>TSE is a symbol which ensures that the product is proper according to Standards of Turkish and these standards expresses that the product provides the assurances written on the package (Caner 2007, 44).</p>
Quality Standard		<p>ISO is the shortened of the <i>International Organization for Standardization</i> and it refers to international standards of quality management. ISO 9000 document explains how to establish an effective quality management system (Caner 2007, 44).</p>
Registered Symbol		<p>This is an international symbol and this symbol makes the consumer feel confidence to the brand and the product (Erdal 2009, 64). Registration of brand increases the recognition of brand and in order to become an institutional company, first of all brand should be identified and registered. It is a way for consumer to decide the producer of the product which s/he buys is institutional or not.</p>
e		<p>“e” symbol on the package refers to fill rate and means that the difference between volume of the product and volume of the package is caused by the filling technique (Erdal 2009, 64). This symbol affects reliability of the brand, since it shows the honesty of the company.</p>
Organic Agriculture Symbol of Turkey and USA		<p>It is legal obligation to use organic agriculture logo on their packages for producers who sells organic agricultural products or materials. Unless they are not able to supply their products to the market (Erdal 2009, 65).</p>



(cont. on the next page)

Table 10. Symbols for Packaging and Their Meanings (Cont.)

<p>Radora</p>		<p>Results of irradiation as follow:</p> <ul style="list-style-type: none"> • Increases the shelf life • Provides disinfection • Prevent sprouting, etc. (Erdal 2009, 65). <p>Producers who use irradiation technique for production have to use this logo on their product packages (Erdal 2009, 65).</p>
<p>Recycling</p>		<p>These symbols are mostly used recycling symbols, and companies who use ÇEVKO logo, are supported by ÇEVKO (Çevre Koruma ve Ambalaj Atıkları Değerlendirme Vakfı), a foundation which has activities to protect environment and use the packaging wastes (Erdal 2009, 66).</p>
<p>Food & Beverage</p>		<p>This symbol (Figure 42) is an international pictogram which means the package is in touch with food. It is legal obligation to use this symbol on food packages (Erdal 2009, 66).</p>
<p>Not Reusable</p>		<p>This symbol is used in which product packages that cannot be use twice. Mostly it is used for chemical products and emphasizes that using the package more than once can jeopardize health (Erdal 2009, 66-67).</p>
<p>Fragile</p>		<p>These symbols show that the product in the package might be fragile and/or it should be handled with care. The usage of this symbol changes according to regions. For instance, in Japan broken glass refers to fragile symbol, however unbroken glass is being used in order to tell fragile packages in Europe (Erdal 2009, 67-68).</p>

(cont. on the next page)

Table 10. Symbols for Packaging and Their Meanings (Cont.)

Keep Dry		This symbol as it can be understood from pictogram, refers to “keep dry”. Both keep dry and fragile symbols can be very regionally and culturally. In addition, colors of keep dry and fragile symbols can be changed according to color of the package.
Shelf Life		This logo refers to shelf life of the product. It means the product can be used until the date written below this symbol safely.

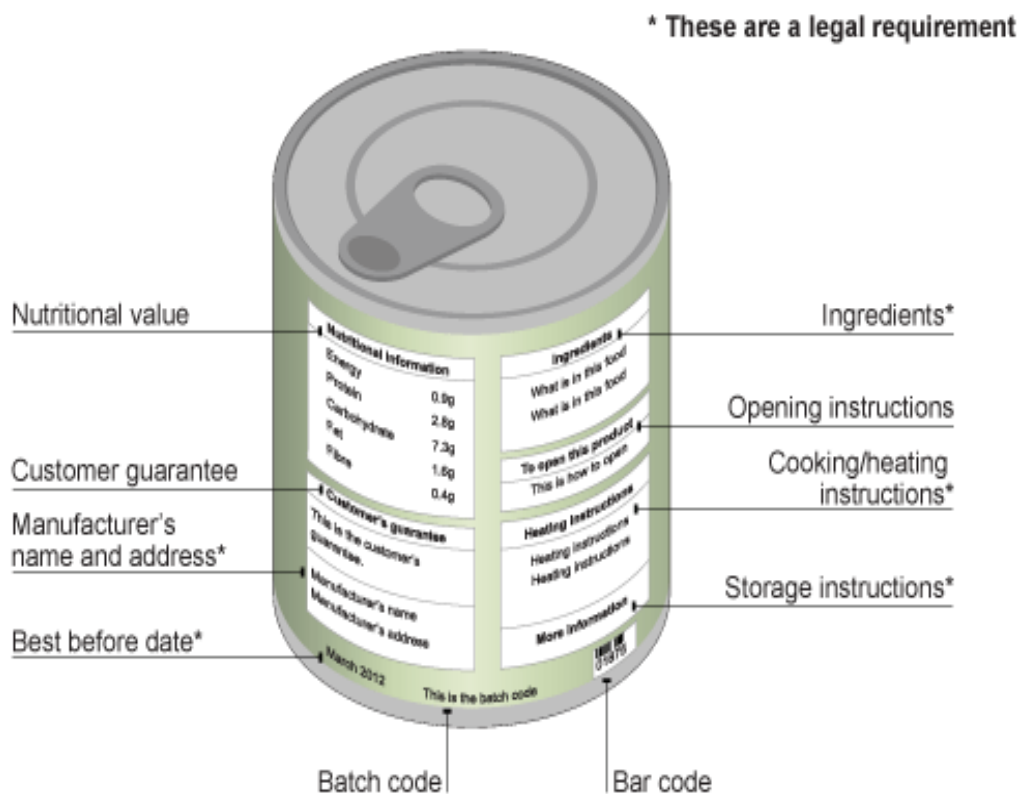


Figure 18. Legal Obligation on Packaging
(Source: Packaging Labelling n.d.)

It is a challenge to include all of these information legally required on a package because of the limited space. However, a package does not include all kinds of products at once, since the package does not have to include all the information legally required. For instance, for a toy package warning about usage, age restriction, and allergy is adequate and there is no need to inform about side effect, dosage, etc.

3.2.6. Innovation

Innovation on packaging is an extra value that will satisfy the needs and desires of consumers, provide recyclability, easy-open, easy-use, easy-store, control, child-proofing, and non-breakability. Innovative packaging is a bridge that links the producer and consumer (Deliya and Parmar 2012, 56).

Innovation for packaging does not only aim to solve physical, ergonomic and environmental issues, but it also aims to change the perception of consumers. Subconscious of consumers can transformed a powerful weapon by a professional packaging designer or marketing staff. In order to design an innovative package, consumer perception should be taken into consideration. One of the most important partner of packaging due to affect the perception of consumers is advertising.

Consumers might deduce inadequate knowledge by watching only beginning of the advertisements. Therefore, it is suggested to show the persuasive messages at the end of the advertisement. The best way is to benefit from the package and advertisements both. Packaging factors which affect the perception of consumer are signs and symbols. For instance, leaf sign reminds us environmentally friendly products, cowboys make us imagine Marlboro cigarette. Thus, our perception makes an inference from the signs and symbols on the package. By considering the perception of consumers, packaging designers and/or marketing staff develop their strategies according to three components of marketing message: object, sign (symbol) and meaning (Odabaşı and Barış 2002, 136). Relationship between these three components is as follows:

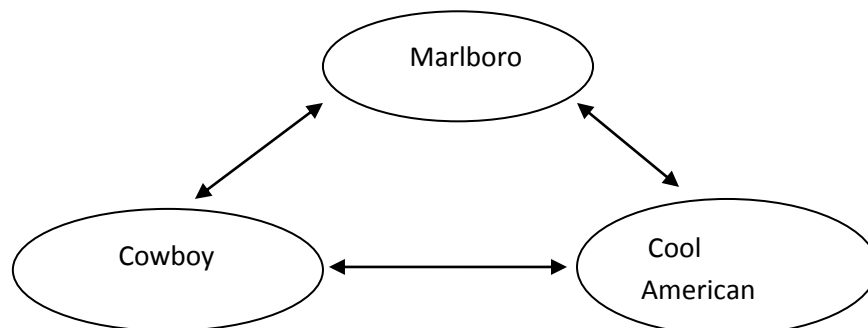


Figure 19. Relationship Between Marketing Components

It can be concluded from Figure 19 that consumers interpret the meanings of symbols subconsciously, depending on their life styles, education, habitat, gender, etc.

In this figure, Marlboro refers to object, Cowboy refers to sign, and consumers ultimately understand this sign as Cool American. That is how meaning is constructed.

In order to analyze the interaction of object, sign (symbol) and meaning, semiotics should be reviewed. Since consumers use the products (because of the meanings) to express their social identity (Odabaşı and Barış 2002, 137). Semiotics is the science which analyzes the signs, and in order to understand the meaning of semiotics, the meaning of sign should be explained. Sign can be defined as all kinds of form, object, fact, etc. which represents something other than itself, and substitutes the one which is represented. In this case; words, symbols, signals are acknowledged as signs (Rifat 2014, 11). Thanks to semiotics, it is benefited from the advantage of signs, features of product is communicated to consumers (Odabaşı and Barış 2002, 137). In the 1995, when the mobile phones became popular gradually, there were devices to message each other which were mostly used by teenagers in Japan, and NTT Docomo (a telecom operator of Japan) added a heart sign in addition to alphabet, teenagers adopted this innovation immediately, and used this sign instead of alphabet characters (Daşkiran 2015, 75). Today, all of us use emoji instead of writing the status and/or feeling, and this innovation also reflects to packages. Packaging and/ or graphic designers utilize emoji on packaging to identify the features of the product /package, and they struggle to encourage the desire of consumption.

Following the World War 2, as a result of industrial developments, packaging industry has developed day by day, and packaging has innovated. Innovation of packaging contributes the development of chemical and physical structure and multi-functionality of the package. Developments on chemical and physical structure is listed as follows:

- Oxygen scavengers
- Carbon dioxide absorbers and emitters
- Moisture control agents
- Antimicrobials
- Ethylene absorbers and absorbers
- Temperature control: self-heating and cooling
- Advances in Controlling Volatile, Flavors and Aromas
- Flavor and odor absorbers

- High chemical barrier material innovations
- Sustainable food packaging (Broody, et al. 2008, 108-111).

All of these developments above which provides new features to packaging protect the product against the external factors such as moist, air, etc. and protract the shelf life of the product. The features of sustainable packaging are as follows:

- Consumers utilize it beneficially, safely, and healthy.
- It is preferred by markets because of the performance per cost.
- Renewable energy enables production, transportation and recycling.
- Renewability and recyclability of the materials are increased.
- Clean manufacturing technologies are used.
- Healthy materials are used for the process, therefore it is less risky for human health and environment (Sustainable Packaging Coalition 2007).

Broody and his partners defines sustainability as “initiatives led by global legislation, retailers, and corporations guide package material choices, design, and food packaging sales for food packaging professionals” (Broody, et al. 2008, 111). It can be deduced that sustainability outlines a food packaging stakeholders to choose the material, design and sale strategies.

In addition to the innovations which develop the physical and chemical structure of the packaging, innovation makes the package multi-functional, in the other words, it adds an extra value on packaging by providing a new function. On the other hand it solves the packaging problems. Some samples are as follows (Figure 20):



Figure 20. Innovative and Multi-functional Packaging Samples
(Source: Innovative Packaging 2015)

In addition to these elements, stakeholders of packaging design should be analyzed in order to understand what affects packaging and packaging affects what. Stakeholders of packaging are product, company, consumer, and market. Product is the decision-maker element which constitutes form, dimension, type, material and such sort of product –based features of the packaging. These features are not negligible part of packaging design. Company affects the packaging design, by reason of the dependency of package and the identity of company. Design of packaging cannot be irrelevant with the image of the company. For example, a company which is famous with its herbal shampoos, will probably use a background image with leaves, herbs, natural oils, etc. on their package. Consumer is the stakeholder which is affected from package and affect package both. Packaging designer should not only consider about legal obligations and the product features, but also consider what kind of package makes consumer buy the product. In addition, consumer is affected by package during the buying decision. In long term, packaging can also change the behaviors of consumer. For instance, a consumer who likes the taste of a biscuit, however has difficulty in opening the package, may give up consuming that biscuit. Market is also critical stakeholder of packaging design. Although packaging designer is free to design due to his/her priorities, in order to design a preferred package, designer does not digress from the framework which market constructed. In addition, designing within the pattern of market, might reduce costs. Since, materials will be available and production will be feasible in that case.

With the interaction of stakeholders, packaging designers should answer the questions below to use the packaging elements efficiently:

- How will the package be filled?
- What kind of precautions will be taken to ensure freshness of the product (sealing, moisture, fermentation, handling, shelf life, storage)?
- How will the consumer use the package?
- Is this design economic?
- Is this design ergonomic (harmony with the product, ease of usage, aesthetics, etc.)?
- Is this package unique (Erdal 2009, 9-10)?

Briefly, a package should be designed considering both consumer and producer. Consumer is not the only person who deals with product. Package is also a tool which producers also utilized, and it should be conceived as the package will be filled, transported, stocked, etc.. Therefore packaging should satisfy producer and consumer with its usage and cost.

3.3. Function of Packaging

According to Stewart, package has three main functions: contain, protect, claim an identity. As a container, package should provide the maintenance of current form and features of the product regardless of external factors. During the whole life cycle, from production to consumption, the package should improve the confidence of consumer. As a protector, package should not only protect from physical factors such as transport, but also it should perform against environmental factors such as moisture, gases, light, temperature. Protection is the key function of packaging.

Identification function of package is to inform consumer about the product. This information includes the content of the product and it is legally required. This function has an important role on encouraging consumer to increase their desires to make them buy (Stewart 2004, 3-5). Inadequate and/or incorrect information, gives the impression of poor quality for brand. Quality is defined as the ability of the product to satisfy the customers' demand. The first thing which was seen by customer about the product is packaging, accordingly quality of the product is defined by customer within the frame of information which was given by package.

Packaging is designed inspiration of nature. One of the most perfect packaging sample is orange. Orange has a peel outside to protect the fruit. Packaging is not only a tool for packaging, but also it should be opened easily, and orange peel provides this feature. In addition, orange peel has a specific color which reminds us orange. When we see an orange peel, we do not expect an apple in it (Göktepe 2000, 2). Hine argues that packaging guarantees that the product is untouched, because once the package is opened, it is not possible to restore it (Hine 1995, 4). An untouched product makes people think that the product is hygienic, however if a consumer shops from hawker, bazaars, outdoor markets, etc., since the product is not sold with packaging, the

consumer will doubt about how many people have touched the product before s/he buys. In addition, untouched product makes the consumer feel privileged.

Main objectives of packaging can be enlisted as follows:

- Physical Protection: Protection from shock, vibration, compression, temperature, etc.
- Barrier Protection: Against oxygen, water vapor, dust, etc.
- Containment or Agglomeration: Opportunity for transport and handling small objects in one package.
- Information Transmission: Information about usage, transportation, recycling, or disposing of package.
- Reducing Theft: Non re-closable packages show signs of opening and it prevents theft.
- Convenience: Packages verify distribution, handling, display, opening, re-closing, use, and reuse.
- Marketing: Packages are tools that encourage the customers to buy the product (Deliya and Parmar 2012, 53-54).

As it is explained above, packaging have many functions. However, all packages should provide three essential functions: transportation, protection and information (Erdal 2009, 12). It is accepted by producers and consumers that the most important function of packaging is transportation. Transportation is a kind of examination for packaging: at end of transportation, if the packaging could protect the product as it covenants or not.

Transportation process starts with the production of the product and ends with the presentation of the product within the package to the consumers and the arrival of the usage place of the product (Erdal 2009, 13). During the transportation process, packaging should be able to protect the product and minimize the transportation cost.

When the consumer starts to use the product, and does not need the package any more, it means the transportation process is over. At that time, there should not be any sign on package that shows it was transported. The product and the package should be arrived to consumer, as if they were not transported.

Protection function of packaging is as important as the transportation. Since this function affects life cycle of the product directly. Protection process proceeds until the package becomes waste in land-fill (Erdal 2009, 14). Retarding the end of this process decreases the harms of packages on environment. As soon as the packages are being used as package or another object, they are not wastes and not harmful as packaging wastes. It should be suggested to design in order to recycle and/or reuse.

Packaging that was thought as an unimportant stakeholder of a product, is a developing necessity of companies and consumers nowadays (Erdal 2009, 15). This situation makes more important the third function: information. Information of package constructs a bridge between the package and the consumer. Informative packages inform consumers about how to use the package, how to transport and store it. In addition, packaging information includes quality and quantity of the product and producer information (Erdal 2009, 17). Packaging thanks to its informative function, expresses itself to the consumers, and it makes the consumers more conscious about shopping and changes consumer behaviors (Erdal 2009, 18). Unless the package informs as quickly and honestly as possible, consumers will be able to compare similar products (Erdal 2009). The reaction of consumers is sudden and this fuzziness, makes packaging role crucial. In this case, packaging designer should consider about giving information and the emotions of consumers both. Packaging information should include as follows:

1. Brand identity
2. Name of the product
3. Definition of the product
4. Taste or type properties
5. Benefits of the product
6. Selling text
7. Promotion messages
8. Usage descriptions
9. Ascription to other products or other types of the product
10. Nutritional values of food products
11. Warnings on chemical and medical products
12. Dimension and content (Herbert and Lubnier 2004, 28).

Functions of the packaging analyzed and listed by different researcher. They define these functions according to experiences and ideas about what consumers might expect from a package or what makes the package necessary. ASD (Ambalaj Sanayicileri Derneği), an association of packaging in industry makes an interview with more than 400 people, in order to find out what is the most significant feature of packaging for consumers. Results are as follows (Er 2006, 73):

Table 11. Consumer Percentages for Priorities of Different Packaging Features

	Feature	Percentage (%)
1	Package which can be opened easily	16,8
2	Package which can provide the freshness of the product	14,0
3	Package which enables the usage of product easier	13,2
4	Environmentally friendly packaging	9,8
5	Package which can be opened without an extra device	8,9
6	Package which does not have enormous material	6,8
7	Package which does not jeopardize consumers' health	4,9
8	Package which has adequate instructions to open it	4,8
9	Package which can be re-closed after the use	4,6
10	Package which is safe for children	4,4
11	Package which has high quality features	1,9
12	Light packages	1,6
13	Package which is easy to hold and carry	1,4
14	Multifunctional and reusable packages	1,4
15	Packages which were produced with low-costs	1,4
16	Packages which does not show the product bigger than it is	1,1
17	Packages which shows the product "amusing"	0,2
18	Packages which has outstanding colors and forms	0,2
19	Packages which gives a fine sense by touching it	0
	Valid Responses	97,4
	Invalid Responses	2,6
	Total Responses	100

Table 11 can be used as a guideline for a packaging designer or a marketing staff. This research shows what are the priorities of consumers in packaging preferences. According to research of ASD, opening simplicity is the most significant priority of consumers. For instance, people do not prefer a yoghurt brand, if its package cannot open easily, since they have to re-open the package more than once. In addition, they demand explicit information and re-closable packages. On the other hand, according to consumer sense of touch, color and the form of the package, and capacity of amusing is not valid reasons to prefer a package.

However, what consumers say might be deceptive, in that consumers might prefer a package because of the feature listed above involuntarily. A consumer who says the color of package is not a significant feature, might prefer a package because of the effect of its color on subconscious.

It is technically possible to provide all features listed above in a package. Basically, the package should be produced by an appropriate material. It should present the product to consumer with a low cost/price, it should be practical (Erdal 2009, 12). In order to, interaction between consumers, periodically customer satisfaction surveys should be done and advices and/or complaints of consumers should be analyzed carefully.

3.4. Packaging As Means to Encourage Consumption

When a person decides to buy something, his/ her world changes, because s/he becomes consumer. During the thirty minutes in the supermarket, about thirty thousand different products aim to win consumers' attention (Hine 1995, 1). The way products win the attention of consumers is packaging. Packaging is like the cloth of product, and it can either show the product better than it indeed is or disturb the consumer. For instance, most of the consumers must have experienced eating a chocolate with an ordinary package at the recommendation of their friend and give a reaction like: wow...how delicious it is, I would never buy it, if you were not advise me. This example simply shows how packaging affects us.

Basic visual packaging elements such as color, size, shape affect the decision of consumers. Packages are the part of consumer lives. Hine says “during most of your waking moments, there are one or more packages within your field of vision”. During shopping we are confronted to packages: expressive packages which encourages our feelings, ingenious packages which make the product more useful, and informative packages which lead us about what we want and what we purchase. Hine argues that “now a world without packages is unimaginable” (Hine 1995, 2). There are hundreds of packages in our homes, and most of them are in the bathroom and kitchen. Because bathroom and kitchen are body centered rooms of homes. These packages point out our life styles, careers, etc. (Hine 1995, 3). Haruki Murakami appraises a product by evaluating its package in *The Wind-Up Bird Chronicle/Zemberekkuşu'nun Güncesi* novel: “There was a Christian Dior box in the trash can. I opened the box: there was an empty space shaped a perfume bottle. Even just appearance of the box was enough to realize there was a luxurious object in it” (Murakami 1997, 152). Packaging is a tool as marketing campaign for companies (Hine 1995, 3). Hine says “advertising leads consumers into temptation. Packaging is the temptation” (Hine 1995, 3). It is possible to judge package itself and decide that the product in it will satisfy our demand or not (Hine 1995, 4). Most women might visualize that how will the perfume bottle will look like at their dressing table. It is a sign of how discriminating they are. Key point of this sample is not perfume, what consumer desires is the box, not the product itself. It is possible that they even did not try the perfume on their skin, and purchased it without experience.



Figure 21. Harajuku Perfume Bottles
(Source: Design Review: Harajuku Perfumes 2011)

The perfume bottle above (Figure 21) are figures of Harajuku Girls and Gwen Stefani, the bottle part is as little as it contains a little perfume. It can be interpreted that consumers do not only buy Harajuku Perfumes to use it, but they also purchase it to

collect them. It also reminds the dolls called Momiji, which are popular for the adults who enjoy collecting toys. What the consumer desires is not the perfume but the bottle of the perfume.

On the other hand, a brand design different packages which are produced by same material for the same product. Differences are caused by the font style, background image or the color of the package. It also affects the buying decision of the consumer.



Figure 22. Coffee Package of Same Brand

Figure 22 shows the same coffee of the same brand. Packaging material is laminated plastic. On the other words both content and the package type is same, however consumer prefer to purchase the frosted package. It gives the impression of quality.

Brand identity also affect the behaviors or desires of consumers. A consumer might purchase a product, since the brand of the product is popular. Murat Ihlamur, the founder of Netsis Software Company explains the import of brand with an example: he asks the questions in sequence as follows:

1. How much is the price of one kilogram cotton?
2. How much is the price of one kilogram cotton yarn?
3. How much is the price of one kilogram cotton fabric?
4. How much is the price of one kilogram dress produced with cotton fabric?
5. How much is the price of one kilogram Kelvin Klein?

The answers of these questions are the objectified form of adding value to product. As it can be deduced by the answers the big leap becomes on the answer of last question. That shows us the impact of brand. The price of a cotton fabric dress

extremely increases with just a brand label of Kelvin Klein. Key point is that Kelvin Klein does not add a value on product directly, it only uses its brand identity, and the power of brand identity is not negligible.

Walton Landor is the first designer who use the packaging design as a marketing tool, identifies the brand identity as “Products are made in the factory, but brands are created in the mind” (Meyers and Lubnier 2004, 42). It is indicated that brand generation does not only depend on producer, but it also depends on consumer perception. In order to generate a brand identity, a person is exposed to several visual communication tools, and these tools as follows:

- Definition of the product and the benefits of it
- Graphic design of packaging
- The form of the packaging
- Colors
- Brand name
- Logo
- Symbols (Erdal 2009, 90).

Especially with the impact of environmentalist perspective packages play an important role on changing the life-styles of consumers. According to companies, packaging is part of sale promotion and it affects buying behavior and encourages people to consume. The perception of consumers about the product is shaped by brand and packaging is the reflection of brand (Deliya and Parmar 2012, 49). Packaging color, background image, packaging material, font style, design of wrapper, printed information, innovation influence the consumer buying behavior (Deliya and Parmar 2012, 54). Some new brands use almost the same packaging design with a well-known brand. These new brands aim to trick the consumers: if the consumer is preoccupied, s/he might purchase the new brand as s/he reckons that s/he purchase the well-known brand.

Cultural and emotional factors also are utilized by packaging designers and it affects the consumer. Hine argues that “packaging is a cultural phenomenon, which means that it works differently in different culture” (Hine 1995, 6). A package which has cultural value for an American consumer, might have no meaning for a Japanese

consumer. The opposite view is valid. For example, almost all producers in Japan use a crane figure on their packaging, and a simple crane figure might completely change the decision of consumer. Additionally, wrapped packages are considered as an elegant art. No wonder, both two cultural value does not affect an American consumer's buying decision.



Figure 23. Japanese Traditional Packaging and Nostalgic Packaging

Nostalgia is another concept which producers and packaging designers utilize. Producers launch an old product which has not been produced for several years, since the consumers have an emotional relation with a nostalgic product. In addition, packaging of this nostalgic product should be same with the old one. In that, packaging designers do not design a new package, but they use the old design. The old packaging design which the consumers are familiar makes them feel “it is my youth product” and it makes sense as if the consumer returns those years. A sample of nostalgic packaging is shown above (Figure 23).

In this context, the main mission of packaging is to help the decision of consumers and to make the usage of product as easy as possible. Packaging reflects the product features and provides the communication between the product and the consumer. Thus, packaging makes the consumer to desire the product (Ksenia 2013, 43). It can be interpreted that firstly what consumers desire is the package, until the package is opened consumers do not know that the product inside is what they desire or not.

Briefly, packaging is the first component which consumer meets about the product. It is as powerful as enable to change the buying decision of consumer. The reason of this decision might depend on emotions, nostalgia, culture or the function of the package, all in all package is what makes consumer desire. Package is the common

area of production and consumption both. Since the packaging is such inevitable for producers and consumers, an environmental perspective of packaging should be reviewed to reduce the harms of packaging on environment.

3.5. Packaging and Environmental Concerns

This section primarily gives information about green design also known as sustainable design, environmentally friendly design and eco-design, also explains the interaction between consumption and environmentally friendly production. Firstly, green design is defined: meaning, consistence, and the factors and or elements, relation with consumption. After these definitions environmental perspective of packaging is analyzed. As it mentioned in previous sections and previous chapters, consumption of the product and correlatively the consumption of the packaging is indispensable for modern societies. If an environmentalist approach is not developed, the harmful impacts of consumption cannot be prevented. In order to encourage consumers to prefer the environmentalist friendly packaging, advices for companies are reviewed.

Green design, namely sustainable development is defined as "... development that meets the needs of the present without compromising the ability of future generations to meet their own needs" by United Nations Environment Commission, chaired by Gro Harlem Brundtland (Edwards 2010). This definition emphasizes that green design is a kind of overall strategies in order to remove harmful effects of the production and consumption process on environment, in this way nature will be protected for future. Briefly, mass consumption is a result of mass production and both jeopardize environment. As long as people consume, wastes are increased.

Green design, develops strategies such as long life guarantee and product satisfaction, product attachment and emotionally satisfying design, and services for intensive and longer utilization (Niinamaki ve Hassi 2011, 1879-1880). Long life guarantees and product satisfaction directly extends the life cycle of product. Long life cycle of a product has two beneficial effects on environment: delay of turning into waste and delay of production. Long life assures that the product will turn into a waste which is particularly harmful later than expected. In addition, as long as life cycle is longer

than usual thanks to green design, consumers will not need the product which have not ended the life cycle yet, and since there is not a demand for it, production will be later than expected. It can be asserted that green design strategies need collaboration of consumers. Unless the consumer does not care about environment, there is no point in long life cycle. In that, the consumer will buy the product although s/he already has without thinking of harms the production and the consumption on environment. In order to handle this issue, consumerism is approached within the perspective of environmentally friendly consumption.

Consumerism as conceptualized and perceived today deals with issues of environmentalism, feminism or peace movements (Stearns 2006, 70). Consumers have become more and more conscious and now they can even define what they want by decision analysis. In order to make a decision analysis, consumers should observe the following steps (Goodwin, Nelson, et al. 2008, 4):

1. Problem definition
2. Information search
3. Evaluation of alternatives
4. Purchase decision
5. Post-purchase behavior (Goodwin, Nelson, et al., Consumption and the Consumer Society 2008, 4-5)

These steps are not only important for consumers, but also they are also utilized by marketing professionals (Goodwin, Nelson, et al. 2008, 5). Practicing the steps of decision analysis provides consumer to compare alternatives and show the results of buying for each alternative.

For instance, we want to buy a liquid soap, our problem is to purchase the most efficient liquid soap with lowest price. First of all, we review all liquid soaps on the market shelf. Some of them are cheaper than other liquid soaps with same quantity. However, this criterion is inadequate for decision. In order to choose the best option, we should consider each condition. How many times can we use the liquid soap? If we are able to use the expensive liquid soap 5 more times than the cheaper one, it might be optimum to purchase the expensive one. We should calculate benefit cost ratio to decide the optimum. Sample table for liquid soap is as follows:

Table 12. Liquid Soap Decision Analysis

Liquid Soap	Price	Quantity	Adequate Soap Quantity per 1 use	Number of Use	Cost per 1 Use
A	15 ₱	150 ml	3 ml	50	0,30 ₱
B	12 ₱	150 ml	6 ml	25	0,48 ₱
C	12 ₱	150 ml	5 ml	30	0,40 ₱

According to table, it is easy to compare Liquid Soap B and Liquid Soap C, since their price and quantity is same and there is only one criterion to compare. The one which is used more than the other one is optimum decision. However, more than one criterion of Liquid Soap A is different with Liquid Soap B and C. We have two independent (for consumers) criteria for decision: price or cost and number of use. In order to decide considering both of them, cost per 1 use is compared. According to calculation, minimum cost per 1 use is paid to Liquid Soap A. Firstly, Liquid Soap C gives the impression of optimum alternative because of its price and number of use. However, decision analysis results that Liquid A is a better alternative than Liquid Soap B. This decision analysis also helps people to consume within the frame of environmentally friendly behavior. A consumer who purchases Liquid Soap A, will consume less packages than others in the other words will be less harmful on environment for the same quantity of liquid soap. Since while consumers who purchase Liquid C are buying 5 times to use the liquid soap 150 times, consumers of Liquid Soap A buy 3 times to use liquid soap 150 times. Liquid C consumer consumes five packages, at the time Liquid A consumer consumes three packages. It means the consumer who decides on optimum alternative is more harmless for environment.

On the other hand, decision analysis of consumption as Goodwin, Nelson et al. assert, indicates the marketing strategies of companies. Companies are aware of consumption decision analysis, and their marketing staffs demonstrate their strengths on advertisements. For example, coffee brands use slogans as “if you buy this you can drink more cup of coffee in comparison with other brands. And your coffee keeps its freshness for a long time” in their advertisements. They realize that consumers will decide considering not only price, but also advantages of the product. Consequently,

both producers and consumers behave economic, and unfortunately their priority is profitability, not environment.

Current structure of consumption and production are often regarded as unsustainable. Design for sustainability, also known as *d4s*, is expected to develop efficiency, product quality and market opportunities and additionally improve environmental performance (Crul and Diehl 2006, 4) Among the benefits of design for sustainability are cleaner manufacturing, eco-efficient industrial systems and the management of lifecycle. The next stage of design for sustainability is the prevention of pollution (cleaner production and eco design). Design for sustainability aids how to produce a 'green' consumption good and to satisfy the needs of consumers through sustainability (Crul and Diehl 2006, 4). In this context, it should also be evaluated how much consumers are sensitive in environmental issues. In order to encourage consumers for consumption of sustainable products, companies and government should make promotions. Domestic wastes should be recycled and or reused, and consumers should be supported for this issue. For instance, there is a machine (Figure 34) which gives coins to people who pour waste oils through the machine in the office of mukhtars, in Balçova and Çankaya, Turkey. This project is arranged by the municipalities of Balçova and Çankaya, and becomes more widespread day by day. These machines have 60 liters capacity and a machine give 50 Kuruş (half of 1₺) for a liter. It is a symbolic payment; on the other hand, this payment might remind people that they did something to reduce the harms on environment. No one carries a liter waste oil to gain 50 Kuruş, the key point is that their effort is supported.



Figure 24. Waste Oil Machine
(Source: Hürriyet 2015)

Generally, the main difficulty of the process is to improve efficiency and to improve environmental performance at the same time. "Concerns for poverty alleviation and rapid environmental degradation underscore the potential in developing economies

for integrating d4s into business development" (Crul and Diehl 2006, 5). Design for sustainability supports the protection of environment and the decrease of poverty especially in developing economies. Design for sustainability is one of the international key points which will be able to change current unsustainable consumption and production structures (Crul and Diehl 2006, 5). Briefly, sustainability directly influences the life cycle of the product. When the life cycle ends, it means the life of product end and metaphorically the product dies, turns into waste. Life cycle process continues from the start of production to end of consumption. In order to reduce harms of this process on environment, duration of production should be decreased and duration of consumption should be increased. This is what design for sustainability works on.

Product innovation is a strategic decision for companies in developing economies due to global competition. High quality demands of customers and strategies to get competitive advantage between companies create an obligation for product innovation. In developing economies small and medium-sized industries should focus on product development regarding the importance of product innovation (Crul and Diehl 2006, 15). Innovation is a challenging decision, since entrepreneurs are afraid of non-admission. Akio Morita, the founder of Sony, hardly convinced his engineers for producing a device called *walkman*, in that they thought consumers would not prefer to carry a music player with them (Morita 1989, 92). His father who also had a big company, thought that listening music with earphones in a crowded place was completely impudence and Akio Morita also worried that people would react as his father (Morita 1989, 93). Walkman was an environmentally friendly innovation indeed, since the sound was directly accessing the ear, thus the device needed less energy to work. At the present time, it is encouraged to innovate environmentally friendly products, and companies use their eco-friendly products as a tool for marketing in their advertisements.

Pollution, biodiversity loss and social problems related to poverty, health, working conditions, safety and security trigger sustainability approaches for industry. Design for sustainability is then a more limited concept of eco design. It is aided to review decisions about how to design and manufacture consumption goods to reduce costs and get competitive advantage by design for sustainability approach. In other words, sustainability is the way to satisfy consumer needs or desires with less resource. How to produce a 'green' product and how to satisfy consumer needs is the main subject

of design for sustainability. Briefly, design for sustainability can be defined as the key element of long-term product innovation strategy to solve environmental and social problems (Crul and Diehl 2006, 16-17). Development of tools and approaches are organized to make companies rethink how to design and manufacture consumer goods to increase profitability and competitiveness and to decrease environmental impacts of consumption and production at the same time.

Three key elements of sustainability are people, profit and planet (Crul and Diehl 2006, 21). Especially, white goods companies arrange their strategies considering environmental and social issues. They design machines which works with less energy, and they promise for sustainability, in the other words they assert that their machines can be used everlasting. In addition, refrigerator companies claim that foods and beverages will save their freshness for long time.

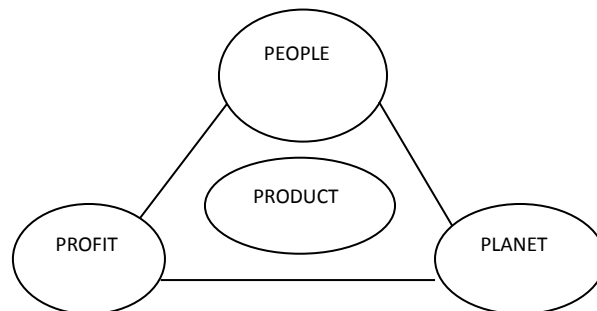


Figure 25. Key Elements of Sustainability

They are linked to the product innovation. Product innovation is related with creating new products and services and it directly depends on sustainability: both of them are concerned with change and future. "To be sustainable, product innovation must meet a number of challenges and an equitable distribution of value along the global value chain and the innovation must work within the carrying capacity of the supporting ecosystems (Crul and Diehl 2006, 22)". Requirements of people, planet and profit for developed and developing countries are listed below (Crul and Diehl 2006, 22):

Table 13. Requirements of People, Planet, and Profit

	Developed Economies	Developing Economies
People	<ul style="list-style-type: none"> • Increase urban and minority employment • Improve safety and well-being • Acceptation and integration of minorities 	<ul style="list-style-type: none"> • Enhance number of skilled workers • Reduce income inequity • Improve working conditions • Abolish child labor • Reduce illiteracy • Basic health services • Clean drinking water • Reduce population growth • Improve status of women • Abolish large scale dislocation of people

(cont. on the next page)

Table 13. Requirements of People, Planet, and Profit (Cont.)

Planet	<ul style="list-style-type: none"> • Reduce fossil energy use • Reduce use of toxics • Clean contaminated sites • Improve level of prevention, recycling, reuse 	<ul style="list-style-type: none"> • Reduce industrial emissions • Waste water treatment • Stop overexploitation of renewable resources, water • Stop deforestation, soil loss, erosion, ecosystem destruction • Reduce dung and wood burning
Profit	<ul style="list-style-type: none"> • Profitability • Value for company, stakeholder • Value for customer • Fair business model 	<ul style="list-style-type: none"> • Fair share of and linkage to global value chains • Industrialization of production, economies of scale • Fair price for commodities and raw material • Ownership and credit opportunities for entrepreneurs

It does not seem possible to implement many product innovation ideas if it is required to meet all the criteria above. Thus, the objectives of design for sustainability should be defined clearly. Sustainability requirements are increasingly built by large companies, governments and international organizations into their supply chains. Investing for sustainability and product innovation strategies can have immediate and long-term benefits. During the development of a new product or the re-design of an existing consumer good, the product developers are confronted with a variety of design criteria like quality, ergonomics, safety, aesthetics, etc. With the design for sustainability approach, environmental and social criteria are integrated into the product development process (Crul and Diehl 2006, 22). In order to adapt sustainability to their design, production, turnover and post-sales services process, companies are in cooperation with governments, and re-order their innovation strategies.

Ecosystem which defines the relationship between the between humans and environment and structures an outline for the stakeholders: producers and consumers who involved the life cycle of a product, and enables them to develop their strategies by considering this relationship.

Figure 26 shows the relationship between people and the earth. Sustainability does not only depend on people or earth, but also it affected with the relationship between people and the earth. There are physical, biological, social and ecological elements of sustainability, and these elements organize the interaction between human and environment (Selman 1996, 6). According to figure, human system comprises of human condition in the other words quality of life, human response such as decisions, actions, etc. and intrinsic social pressures. Human condition is affected by ecosystem

response. For instance, in spite of the technology and power, quality of life in Japan is affected by tsunami. Human responses such as decisions, actions, research, etc. is affected by people- ecosystem pressures such as population, resource use, waste, etc. For example, a consumer who decides to use an environmentally friendly product, affects the resource use and waste. Ecosystem condition affects ecosystem response, people-ecosystem pressures and intrinsic ecosystem pressures both. Intrinsic social pressures affect the quality of life.

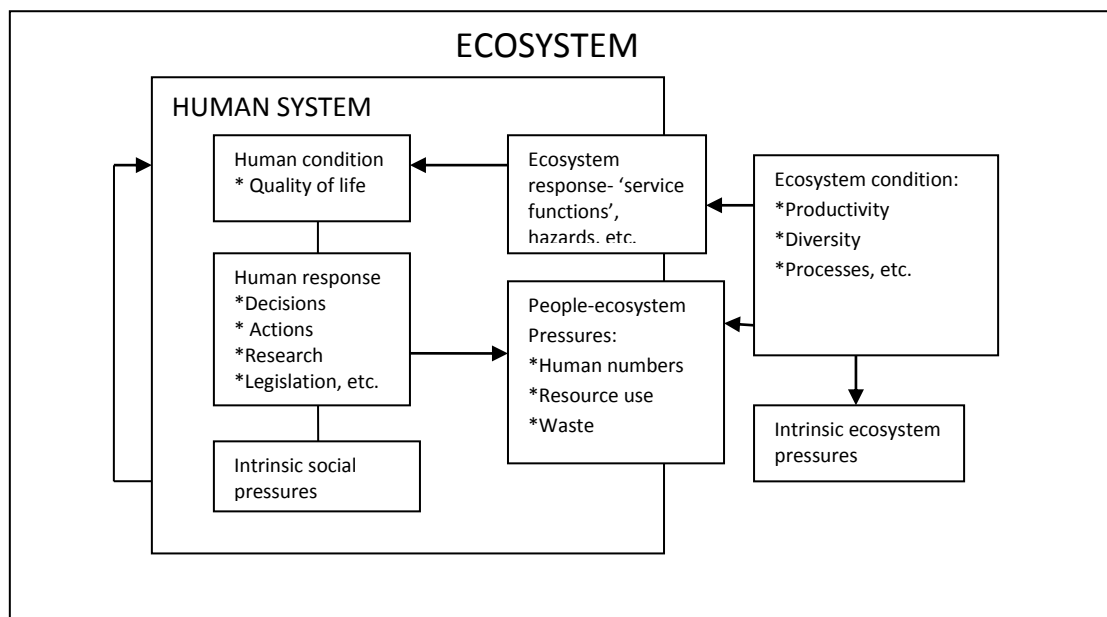


Figure 26. Ecosystem
(Carew, et al. 1994)

Sustainability is supported by governments and organizations. For instance, an enterprise called Greenwill (<http://greenwill.org/>) supports companies for sustainability strategies and prepares a guideline for companies, official and unofficial organizations and/or individuals which confirm the engagement. This enterprise emphasizes that sustainability provides benefits for companies, consumers and planet both (Greenwill, For a Green Globe n.d.).

Thanks to sustainability, companies reduce their waste and energy use. Consumers is informed in order to make them consume the products which are produced by companies adopt sustainability. Thereby, planet becomes greener with the interaction of companies and consumers. The results of sustainability become firstly

appreciable in companies. Production is improved via such concepts as clean technology, cleaner production and eco-efficiency.

Most of companies and organizations who struggles to create awareness, explain the benefits of sustainability in order to persuade all companies, stake holders of these companies and consumers. On the other hand, it might be an efficient way to show the harms of production and consumption process in order to make all stakeholders of production and consumption convince the necessity of sustainability. Ecological impacts of production/consumption are categorized below (Crul and Diehl 2006, 23):

Table 14. Ecological Impacts of Production and/or Consumption

Ecological Damage	Human Health Damage	Resources
<ul style="list-style-type: none"> • Global warming or climate change • Ozone depletion • Acid rain • Water eutrophication • Habitat alteration • Ecotoxicity 	<ul style="list-style-type: none"> • Smog and air pollution • Health damaging substances • Carcinogens 	<ul style="list-style-type: none"> • Fossil fuels • Fresh water • Minerals • Topsoil

Life cycle of a product is the base of design for sustainability approach. Milestones of the product life cycle are extraction, processing and raw material supply, energy (needed for the product), production, distribution, use (possibly reuse and recycling) and dispose



Figure 27. Life Cycle

Life cycle contains both production and consumption. Production is not only relevant to plant, but it also depends on stakeholders of the company such as supplier of

material, counsel, blue and white collar workers, managers, machinery, transportation, stocking inventory, etc.. Consumption does not only depend on consumers, but it also depends on marketing, promotion, salesroom, price policy, post-sales services, shelf-life of the product.

Key factors of product life cycle are listed below:

- Consumption of input materials
- Production of output materials
- Factors such as noise, vibration, radiation, electromagnetic fields.

The supply of raw material and manufacturing are only two steps of the life cycle, however, the main difficulty of environmental protection occurs in distribution, use and disposal phases (Crul and Diehl 2006, 24). Packaging is a significant factor of distribution. A well designed package can reduce the costs of distribution. For example, if there is no emptiness between juxtaposed packages, the product can be transported and distributed with less number of transportation. In addition, if high-strength material is used for packaging, the product can be transported and distributed without an extra protection. Use of the product phase depends on consumer, as long as consumer uses his/her product consciously, the duration of use increases. For example, if a mobile phone user charges its battery regularly, it is asserted that battery life becomes longer, and this kind of practices delay the harms of consumption and/or reduce these harms. Harms of disposal stage on environment can be reduced with the collaboration of companies and consumers. Consumers should be promoted in order to make them throw their recyclable wastes to recycle bins. For instance, Migros, a shopping center makes deduction to consumers who bring recyclable wastes to the shopping center.



Figure 27. Migros and Waste Collection

For sustainability, needs of future generations should be taken into account. In order to guard future generations, current environmental impacts should be reduced. In this case, population which defines the quantity of consumption for each person, affects global environmental pressures. Level of consumption is measured with the materials and energy efficiency to generate each unit of consumption (Crul and Diehl 2006, 26). In order to be able to take precautions for protecting the environment and future generations, firstly the level of harmfulness of each company, organization and individual. There is concept which measures how much harmful we are for environment: carbon footprint (Figure 30).



Figure 28. Carbon Footprint
(Source: Metcalf n.d.)

Carbon footprint is defined as the harms of human activities with regard to greenhouse gases, with the measurement of carbon dioxide. Carbon footprint has mainly two resources: primary footprint and secondary footprint. Primary footprint refers to carbon dioxide emission which is emerged by burning of fossil fuel as a result of transportation via car, plane, etc, and the consumption of domestic energy. Secondary footprint refers to carbon dioxide emission which is emerged by the whole life cycle of the product which we consume and process of breakdown of the product (Karbonayakizi 2015, 1). Reasons of carbon footprint for an individual are listed as follow on Figure 31 (Karbonayakizi 2015, 1):

Each individual should be informed about how much harmful s/he is for environment. Each slice of the cake refers to harms of individual should be analyzed and reduced. Graphic shows that most harmful factors are in order of their harm degree natural gas, petrol and coal, entertainment and holiday, public services and electricity.

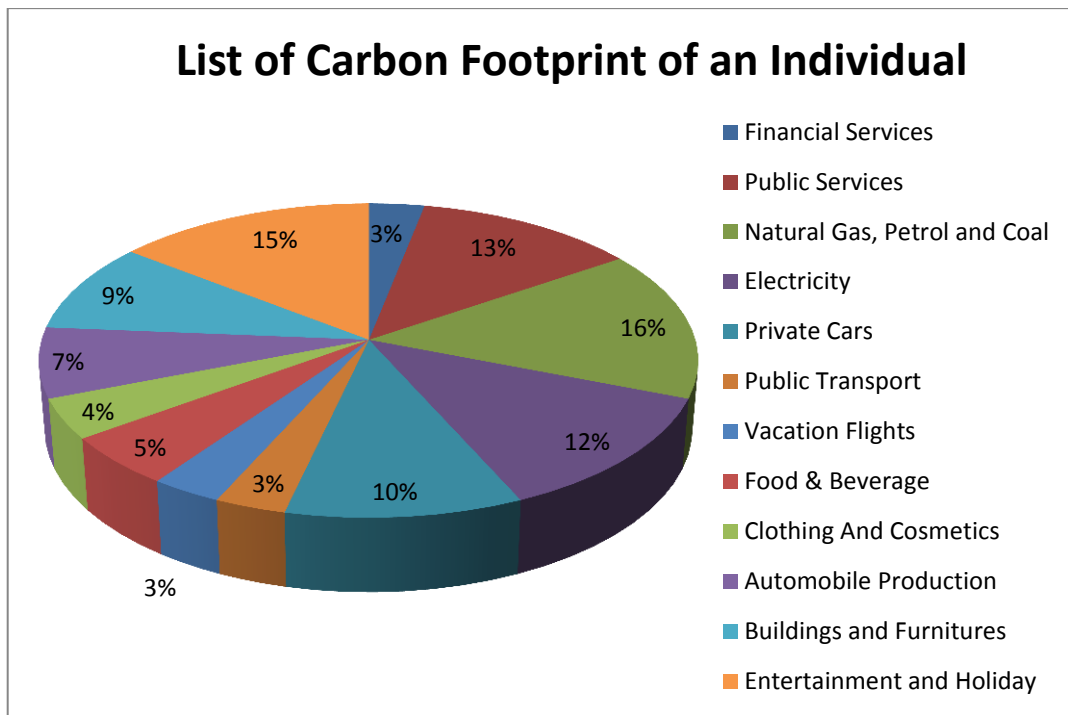


Figure 29. List of Carbon Footprint of an Individual

It might be a challenge to find alternatives of natural gas, petrol, coal, public services, and electricity, however each individual can reduce the costs caused by entertainment and holiday. In addition, each individual should decide the necessity degree of the factors cause carbon footprint and should try to use these products and services less.

Solid waste affects environment and relatively human health, and in order to keep waste under control, packaging is required to be produced according to guidelines: source reduction, recycling composting, combustion/incineration, land-filling (Marsh and Bugusu 2007, 44). These guidelines are explained as follows:

3.5.1 Source Reduction

Source reduction is to decrease the quantity and/ or toxicity of the waste which is a result of design changes, production, supply chain and material and product use. It is also defined as “waste production” by Marsh and Bugusu. The quickest effect of source reduction, is observed as the decrease of the effects of solid waste on environment. Source reduction has mainly two stages: light-weighting and reusable and refillable containers. Light-weighting refers to design packaging as can be produced thinner materials (Marsh and Bugusu 2007, 44). Reusable and refillable containers are

glass and as plastic, PETE (Marsh and Bugusu 2007, 45). Lean Production, also known as Toyota Style Production also has strategies to reduce sources. Lean production defines everything which does not add value for customer as waste (muda). For instance, producing a product with ten workers or producing the same product with eleven workers does not affect the gain of customer.

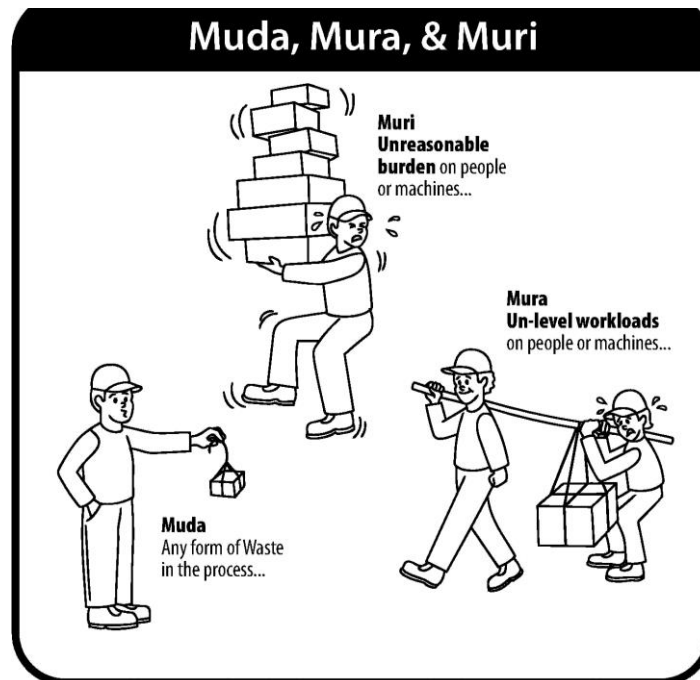


Figure 30. Muri & Mura & Muda
(Source: Toyota Production System 2013)

All of the wastes listed as muri, mura, muda occasions overuse of resources directly or indirectly. These wastes are sampled by production, however the creators of lean production emphasize that these wastes are also in our daily lives and we should make a list of items and operations in our lives and we should eliminate unnecessary ones. Namely, we should reduce resources we use as much as possible.

Factors which are defined as waste by lean production concept are as follows (Liker 2005, 52):

1. Over-production: producing which has not been demanded by customers yet. Consequently, increase of inventory, over-stocking and waste of transportation causes extra cost.
2. Wasted Time: the duration that workers wait while automatic activated machine is working. Thanks to lean production, workers do not wait any more, but they

get prepared for the next stage of the production. For example, they take required materials from stocks.

3. Unnecessary Transportation or Transfer: as a result of careless scheduling results in unnecessary transportation and/or transfer. For instance, bringing a material from warehouse, realizing that material is not necessary at that time, and taking it back to the warehouse.
4. Unnecessary Operations During Production Process: inefficient operations, producing more than necessary and producing with a quality more than demanded.
5. Over-stocking: over-stocking does not only cause extra cost, but it also hides problems such as imbalance of production, delay of supply delivery, defective product, broken machines, long set-up durations.
6. Unnecessary Motions: motions which do not add value directly on production process are waste according to Taiichi Ohno, Shigeo Shingo ve Eiji Toyoda who are the leading engineers of Toyota. As for that, walking is also a waste.
7. Defections: producing defective items, and as a result of it; repair and/or re-produce, and extra workforce is become necessary in order to compensate the defections.
8. To Not Benefit From the Creativity of Workers: underestimation of workers, therefore lose the opportunity of learning the ideas, abilities, improvements under favor of experiences (Liker 2005, 52-53).

Toyota Style explains the reasons of wastes in 3M: mura, muda, muri. Muda as mentioned before means waste of materials. Muri means expectation of over work force. Muda means, the chaos caused by frequently changeable production schedules, which results waiting without working or working very precipitately to raise the product which has to be produced earlier.

3.5.2. Recycling

It is a way to utilize the material which were used once and/or to utilize the materials processed defectively. As Marsh and Bugusu highlight, “recycling diverts materials from the waste stream to material recovery. Unlike reuse, which involves

using a returned product in its original form, recycling involves reprocessing material into new product” (Marsh and Bugusu 2007, 45), recyclable wastes are not less harmful on environment than ordinary wastes, unless they are recycled.

Materials such as glass, metal, thermoplastic, paper, paperboards which are used for packaging are mostly recyclable (Marsh and Bugusu 2007, 45). This material diversity renders meaningless of companies’ excuses for not using recyclable materials for their products and packaging. In order to prevent the using non-recyclable materials, consumers should be promoted by companies, shopping centers and governments to make them consume recyclable product. Unless consumers consume non-recyclable products, producer will not use non-recyclable materials any more. In spite of incentive pays of government for utilizing recyclable materials and high costs of non-recyclable materials, if companies still use non-recyclable materials, products of these companies should not be consumed at all. There are lots of well-known popular brands such as McDonald’s and Starbucks who are sensitive about material choice.

Although it is thought that McDonald’s is one of the most harmful company which jeopardize human health because of obesity, it is indeed one of the leading brands which is sensitive for environment and does a study about green design. Ray Kroc, the founder of McDonalds cooperated with Stanford Research Institute for this study. The aim of the study is to compare non-recyclable paperboard packaging and polystyrene (PS) packaging. According to study results, “PS was found to be recyclable, easier to manufacture, and considerably less polluting than its rival” (Blumer 2010, 3). Quick adoption to PS for packaging, revealed a slogan as “if there is a better package...we’ll use it” (Sterling 2006, 1). Another research of a company called Jamba Juice results as “paper cups use six times more raw material, 36 times more electricity to manufacture, two times the cooling water, 58 times the waste water, 33 times more chemicals, and three times the air pollution that PS requires” (Blumer 2010, 3-4). Either production or use of the product is harmful for environment, McDonald’s and Jamba Juice approach the environmental issue within the frame of production.

On the other hand, Starbucks, known as the most active company due to green design also researches how to be less harmful on environment. Starbucks collaborates sustainability researches with support of its supply chain, and thanks to 10% post-consumer fibers, develops a coffee cup which is able to be in direct contact with the

beverage and/or food. Blumer indicates that “post-consumer fiber cups were issued to Starbucks locations worldwide, and the door was open for the food packaging community to follow suit and produce their own recycled products” (Blumer 2010, 4). The sustainability approach of Starbucks depends on recyclability, and also today Starbucks is one of the most sensitive company for environmental issues. Therefore, it struggles to be less harmful, during people consuming the company’s products.

3.5.3. Composting

It can be mainly defined as another type of recycling. Marsh and Bugusu identify composting as “the controlled aerobic or biological degradation of organic materials such as food and yard wastes” (Marsh and Bugusu 2007, 45). Composting process is completely natural and it is generated by the degradation of organic material (Yıldız, Ölmez and Kiriş 2009, 2).



Figure 31. Composting Process
(Source: Greenaway 2015)

As it is visualized on Figure 33, composting begins with the composition of suitable materials, and at the materials are composed, adequate air for the process initiating is provided by itself. At the next stage, oxygen is used with microbial activity, and from the pore gaps air which included carbon dioxide is emitted. Ventilating is

procured by air blow devices such as blower and fan (Yıldız, Ölmez and Kiriş 2009, 2). During this process heat of material increases and active composting in the other words quick fermentation stage is finished, and conditioning phase starts. Composting process never stops at a certain extent, continues until all organisms are destroyed and turns in to carbon dioxide (Yıldız, Ölmez and Kiriş 2009, 3). Compostable materials can be listed as follows:

1. Food wastes
2. Papers
3. Paperboards, corrugated cardboards
4. Wastes of parks and gardens
5. Wood
6. Various organics such as textile products, plant and animal wastes (Yıldız, Ölmez and Kiriş 2009, 3-4).

As it is explained above, composting is a way to benefit from the wastes. Materials listed above can be composted and composting does not only provide to recycle these materials, it also delays the harms of them on environment.

3.5.4. Land-filling

Landfill is an area which we embed the wastes. Marsh and Bugusu defines as “landfills provide environmentally sound disposal of any remaining municipal solid waste and the residues of recycling and combustion operations”. The location of landfill and the operation of land-filling regulated by governments (Marsh and Bugusu 2007, 46). After the land-filling operation the landfill area can be covered up and greened.

The table of municipal solid waste types show the generation recovery and discards of materials in municipal solid waste and it involves the values of 2013. Materials which generates solid wastes mostly are paper and paperboard, glass, metals and plastic. Percentages of recovered amount of material sequence is paper, metal, glass and plastic. These materials are both used for packaging and it can be interpreted that packaging is one of the most harmful factor for environment, unless the wastes of packaging are not recycled. Another deduction from the table is 34.3% of municipal

solid wastes can be recovered. More than half of the wastes remain as waste and cannot be recycled or reused in a way.

Briefly, packaging is an important factor which causes wastes, and these wastes generate a major part of municipal solid wastes. Namely, packaging design should be managed mindfully, in order to reduce the harms of these wastes on environment. Materials should be used as less as possible and recycled as much as possible.

There are different types of consumers today: consumers who have impact on market, global consumers, and green consumers. Each of them influence the companies and societies in different ways (Ksenia 2013, 29-30). For example, green consumers feel responsible for environment and social issues (Ksenia 2013, 30). Nature is the most powerful factor which allows people to experience the environment. And the perception is shaped by sights, sounds, and smells (Solomon, et al. 2010, 118). The perception of consumer impacts the his/her preferences, priorities, and viewpoints, briefly the action of consumption. The consumption decision of consumers is shaped by several factors like package and product. Steps of consumption or purchasing activities are listed below;

- Problem definition: difference between the owned and the desired.
- Research for information: gathering data to make rational decisions.
- Evaluation of alternatives: comparison of alternatives against the decision criteria.
- Choice: consideration of all alternatives carefully for the right choice (Solomon, et al. 2010, 209-210).

The result of consumption decision implies the satisfaction of consumers. The relationship between producer and consumer is necessary for a company's competitive advantage. Therefore, consumer behaviors should be predicted by producers in order to develop the partnership of producers and consumers (Vrontis and Thrassou 2013, 798). The relationship between consumer's choice and packaging design help companies develop their marketing strategies. Nowadays companies develop their marketing strategies based on environmental issues. The marketers features that how eco-friendly they are, they utilize from the sensitivity of consumers about the environment. The main objective of environmental package is figured as follows on Figure 34 (Fennell and Gosnell 2011, 2):

**REDUCE
REUSE
RECYCLE**

Figure 32. Objective of Environmental Approach

Fennell and Gosnell indicates that “packaging plays an essential role in protecting, delivering and presenting our product and brands to our consumers around the world” and they add “our goal is to minimize the environmental impact of our packaging by advancing a sustainable packaging strategy, whereby, our packaging is seen as optimally designed for use by consumer whilst minimizing its impact on the environment” (Fennell and Gosnell 2011, 2). The way they construct their strategies relies on reduce, reuse and recycle. These terms are explained in the “Green Design” section of this thesis. The harm degree of packaging waste differentiates according to the material of package.

Table 15. The Comparison of Materials

Material	Environmental Issues		Cost
	Advantages	Disadvantages	
Glass	*Reusable *Recyclable *Often contains recycled content	*Heavy and bulky to transport	*Low cost material but somewhat costly to transport
Aluminum	*Recyclable *Lightweight *Economic incentive to recycle	*No disadvantages in rigid form *Separation difficulties in laminated form	*Relatively expensive but value encourages recycling
Tinplate	*Recyclable *Magnetic thus easily separated	*Heavier than aluminum	*Cheaper than aluminum
Tin-free steel	*Recyclable *Magnetic thus easily separated	*Heavier than aluminum	*Cheaper than tinplate
Polyolefin	*Recyclable *High energy source for incineration	*Easily recycled in semi-rigid form but identification and separation more difficult for films	*Low cost
Polyester	*Recyclable	*Easily recycled in semi-rigid form but identification and separation more difficult for films	*Inexpensive but higher cost among plastics
Polyvinylchloride	*Recyclable	*Contains chlorine *Requires separating from other waste	*Inexpensive
Polyvinylidenechloride	*Recyclable	*Contains chlorine *Requires separating from other waste	*Inexpensive but higher cost among plastics

(Marsh and Bugusu 2007, 52)

Table 15 compares the materials according to environmental issues and cost of them. A material is not able to ensure advantages for all criteria. The material should be decided according to objective of the package and demand of stakeholders of production and consumption. If it is aimed to reduce costs polyolefin should be used. If we do not prefer limited shapes material, we should not use aluminum. However, regardless the objective of the package, environmental issues should not be ignored.

Tetra Pak, a packaging company which is renowned worldwide regulate their design strategies according to environmental issues. Their environmentalist perspective mainly depends on three phases: initiative and white paper, embracing renewability, consumer education. The initiative and white paper is designed due to answer “What is Renewability in Packaging, and Why Should We Care?” (Tetra Pak 2015), the way they provide renewability for their packaging materials. The second phase also aims renewability and Tetra Pak explains this phase, “as the global population grows and demand increases for consumer packaged goods, global supplies of clean air, water, oil, natural gas, and minerals are under greater pressure potentially impacting entire supply chains” and in order to handle this issue by choosing renewable materials. The last phase aims to educate consumers about renewability and tries to make renewable term as popular as recyclable (Tetra Pak 2015). Briefly, the strategy of Tetra Pak is to use renewable materials and resources, and educate consumer to explain how renewability reduce the harms of consumption on environment.

CHAPTER 4

ORIGAMI

Origami, like music, permits both composition and performance as expressions of the art

Robert J. Lang

In this chapter, origami is reviewed from the particular perspective of industrial design.

4.1. A Historical Overview of Origami¹

Although the origin of origami is unknown, it is approximated that origami is originated in China almost 2000 years ago (Hatori, K's Origami n.d.). This is based on two assumptions: 1) the invention of paper in China in the second century; 2) origami started after the invention of paper (Hatori 2011, 3). Hatori asserts that both assumptions are incorrect and he further explains that “it is widely believed that paper was invented by the Chinese eunuch Chai Lun (also alphabetized as T'sai Lun) in 105 CE. However, much older paper has been unearthed from some tombs of the Western Han Dynasty (206 BCE-8CE)” (Hatori 2011, 3). Also he indicates that the oldest piece is estimated to have been crafted in the middle of the second century (Hatori 2011, 3).

Origami historians who are against the opinion which argues that origami is originated in China, such as Hatori, claim that origami was started in Japan in 794-1185 CE, also known as Heian Period. These historians give reference to the most well-known onmyoji (specialist of a Japanese traditional spiritual cosmology) of the tenth century, Abe no Seimei (Hatori 2011, 4). Hatori summarizes the story as follows: “he took a piece of paper and turned it into a real heron to search his most formidable rival Ashiya Doman” (Hatori 2011, 4). This anecdote implies that Japanese people has attributed origami a mystic meaning for centuries.

¹ A modified version of this sub-chapter is published in *Hanabi Magazine* 2016, No:3, page 14-17

On the other hand, Masao Okamura argues that the story of Seimei does not have a part including origami at all. According to Masao Okamura, he might have bended a piece of paper to create a knot, he might have cut the paper to shape it as a bird, he might have drawn a picture of heron on the paper, however there is no exact reference stating that he folded the paper. Figure 35 exemplifies the earliest origami book *Hiden Senbazuru Orikata* (1797, author unknown) pictures.

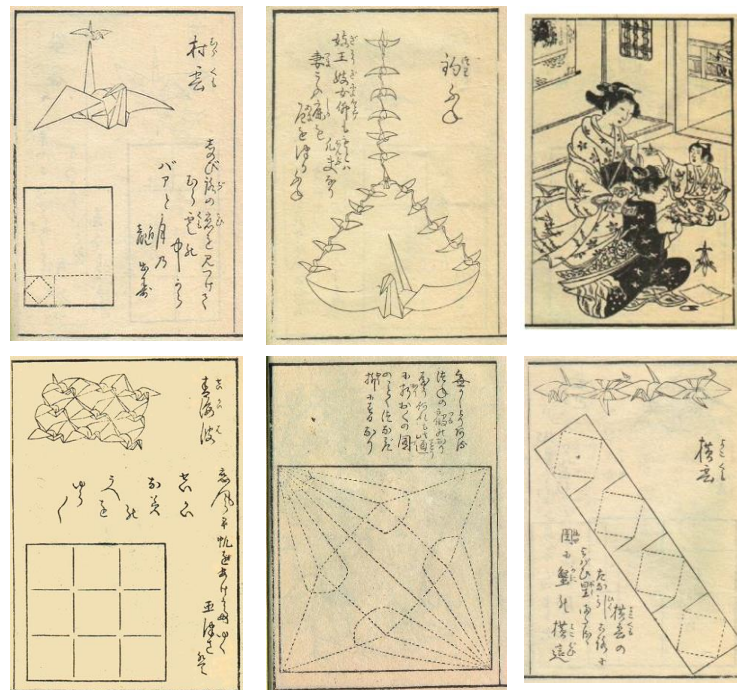


Figure 33. The First Records of Origami
(Hiden Senbazuru Orikata 1797)

Except from the tale of Seimei, one of the most ancient samples of origami is *shide*, a kind of paper which was cut and folded to create a zigzag shaped paper, and was used in Shinto rituals. Hatori interprets *shide* as “pieces of cloth offered to the gods” (Hatori 2011, 4). This sample also shows that origami is a ritual like prayer. Origami is written as 折り紙, 折り; (ori) is derived from 折る (oru), meaning “folding” and 紙 (kami/gami) means “paper”. In addition, 祈る (inoru) means “to pray” in Japanese. The symbols (called *Kanji*) of 折-*oru* and 祈-*inoru* are similar. Japanese people make a wish, during folding paper.

There are also origami historians who think that origami is originated from ceremonial wrappers which are represented by *noshi*. Hatori defines *noshi* as “a form of folded wrappers for *noshi-awabi*, or stripped and dried abalone meat, although today it

is just attached to or printed on wrapping paper as a token of good fortune” (Hatori 2011, 4). Figure 36 is a sample of noshi.



Figure 34. Noshi
(Source: Leboutillier 2013)

Two kinds of paper butterflies named as ‘ocho’ and ‘mecho’ are other samples of ancient origami applications. These paper butterflies are used as a wrapper of sake bottle and mostly used in wedding ceremonies since one is the symbol of female whilst the other of male. There are arguments asserting that this kind of wrapping was first applied in Heian period, yet, it is not proved (Hatori 2011, 4). Although nowadays Japanese teenagers prefer church wedding (even if they are not Christian), they still use sake bottles adorned with ocho and mecho like in traditional Japanese weddings. A few samples of ocho and mecho can be seen in figure 37:



Figure 35. Ocho and Mecho
(Source: Origami Resource Center 2015)

Samurai warriors were supposed to fold the paper in the period of Edo (1603-1868), and the way they folded was specific to the gift they put inside (Hatori 2011, 4). He remarks that “it is a part of the etiquette of the samurai class, which was carried down from generation to generation in some houses” (Hatori 2011, 4) and Ise Sadatake,

who wrote a book about ceremonial origami named *Tsutsumi-no Ki* (1764), asserts that paper folding was applied in Muromachi period (1333-1573) (Hatori 2011, 5).

Although the stories regarding the origin of origami vary, and origami historians argue that origami was originated either in Japan or China, it is certain that the spread of origami was possible thanks to Japan; hence this ancient art is known as *origami*, a Japanese phrase that means paper folding.

Even though the traditional folding art was presumably originated and spread from Japan to Europe, it is known that the first samples of Western origami were based on a baptismal ritual. In the seventeenth and eighteenth centuries, baptismal certificates were folded twice as blintz base (quod vide Table 17 Folding Bases in the “Origami Types and Usage Areas” section), which was mostly popular in Central Europe (Hatori 2011, 5).

Whether a coincidence or not, folding was used for spiritual rituals in Europe as in Japan. Despite the usage of the folding technique for baptismal certificate, Europe was not aware of this traditional Japanese art at the time because Japan was a culturally closed country, not allowing border crossing with any other country till Meiji period (1868-1912; also known as Restoration).

As a result, Europe only met with origami “when Japan opened its borders and started cultural exchange with Europe” (Hatori 2011, 6). What Japan worried about was to lose domestic cultural values because of the spread of Christianity. If Japan did not close its borders, Europe might have realized that the technique they used for baptismal certificate was indeed origami.

The eventual cultural interaction of Japan and Europe encouraged the further development of origami across the world. The samples of European traditional models can be seen in Figure 38.

Hatori indicates that David Lister compared the pattern of baptismal certificate and the ancient European astrological horoscopes which were used in the twelfth century in Spain (Hatori 2011, 5). Yet, Hatori points out the probable inaccuracy here; “I must, however, point out that there is no evidence that horoscopes in either Spain or Germany were folded” (Hatori 2011, 5). The sample of German baptismal certificate from the eighteenth century can be seen in the Figure 38.

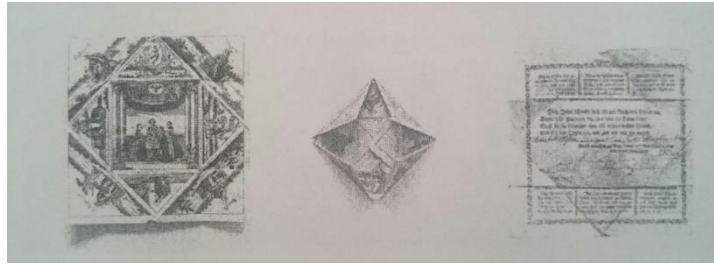


Figure 36. German Baptismal Certificate from the Eighteenth Century

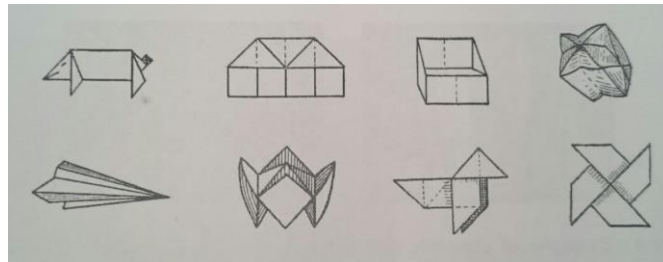


Figure 37. Examples of European Traditional Models

Hatori explains the development of origami in Europe in the context of education. He indicates that origami activities were incorporated into education system by Freidrich Wilhelm August Froebel.

Freidrich Wilhelm August Froebel was a German educator who founded the first modern kindergarten in 1837. His education system contained a set of toys called “Gifts” and a set of plays called “Occupations”, and one of the most important Occupations was origami. Maria Kraus-Boelté recorded nearly one hundred origami models in her book *The Kindergarten Guide*. Many of European origami models contained in Kraus-Boelté’s book are not included in contemporary Japanese records (Hatori 2011, 7).

These traditional European origami models (Figure 39) have a common feature: all of them have simple creases such as rectangle grids or diagonals (Hatori 2011, 7). These models can easily be folded in a few stages, and they are both suitable for children and adults. Although both the Eastern and Western origami are aimed at awakening spiritual feelings, they have discernible differences:

The Japanese origami models before the nineteenth century were made of sheets in various shapes: squares, rectangles hexagons, octagons and even many eccentric shapes. They are folded with many cuts as well as with many sophisticated folding techniques, and often were painted. Their European counterparts were made mainly from squares, sometimes from rectangles, and have a few cuts. The difference has its root in the origin of origami—ceremonial wrappers of the fourteenth century in Japan and baptismal certificates of the eighteenth century in Europe. The crease lines for wrappers run at different angles, whereas the folds in baptismal certificates were the double blintz (Hatori 2011, 10).

To conclude, owing to the ever-increasing cultural interaction between Japan and other countries, origami is no longer a peculiar ‘Japanese’ art. Consequently, more origami types are generated, and usage area of origami is significantly expanded. In this

respect, origami types and various usage areas of origami will be reviewed in the following section.

4.2. Origami Types and Usage Areas of Origami

Origami is basically defined as the paper folding art (Hatori n.d.). Origami can be categorized into several types: 1) action origami, 2) golden venture origami, 3) pure origami, 4) modular origami, 5) strip folding, 6) candy wrapper origami, 7) business card origami, 8) toilet paper origami, 9) crease patterns, 10) origami tessellation, 11) wet folding origami, 12) dollar bill origami, 13) palm weaving. The differences between these types are based on criteria such as paper type, number of units and purpose of model. Most of the time it is the initiative of origami designer to decide which type to work with, however, some origami models require specific papers and/or folding styles.

In order to categorize the types of origami, aspects of origami and constraints should be analyzed.

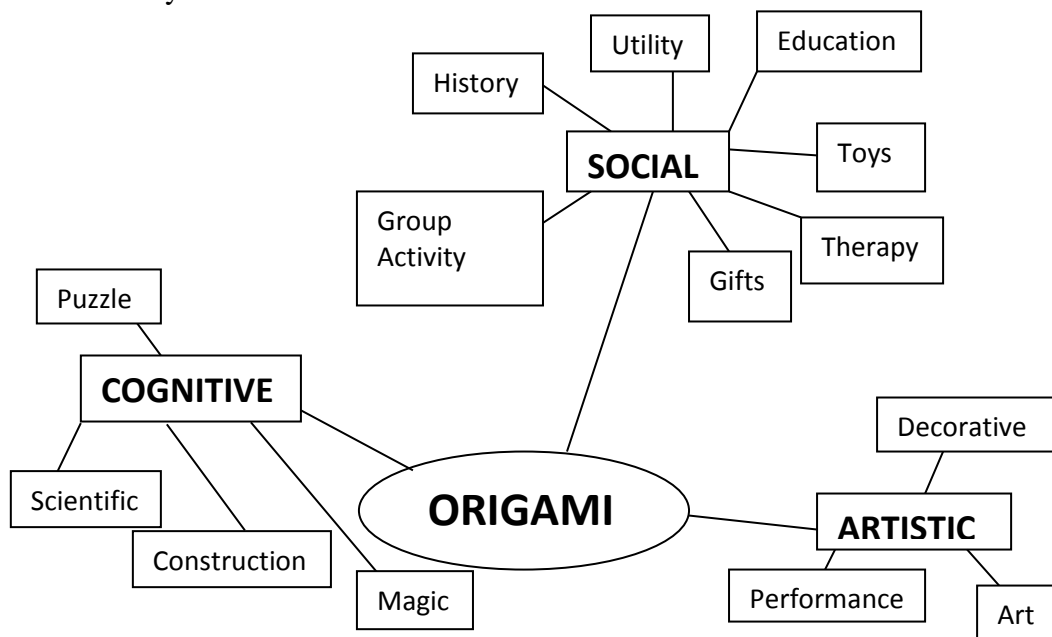


Figure 38. Aspects of Origami
(Smith n.d.)

Figure 40 shows the aspects of origami in three perspectives: cognitive, artistic, social. In social life, origami can be a group activity and accordingly has a therapy impact. It is a good subject for historians and a useful tool for education. Additionally,

origami can be used as gifts and toys. Artistic perspective of origami is probably the best-known aspect of origami. According to this aspect, origami can be folded as an artistic act, performance and for decorative purposes. The third aspect of origami is the cognitive perspective. Folding origami is like a kind of play activity and has similar impacts on intelligence as puzzle. Due to the constructive processes of folding and assembling, origami has a cognitive aspect. Origami is also benefited in different branches of science such as genetics², physics³, architecture⁴, mathematics and geometry⁵ respectively⁶. Origami functions as a kind of magic, since it is possible to create a three dimensional form from a two dimensional sheet without the help of a tool and/or material such as scissors and glue.

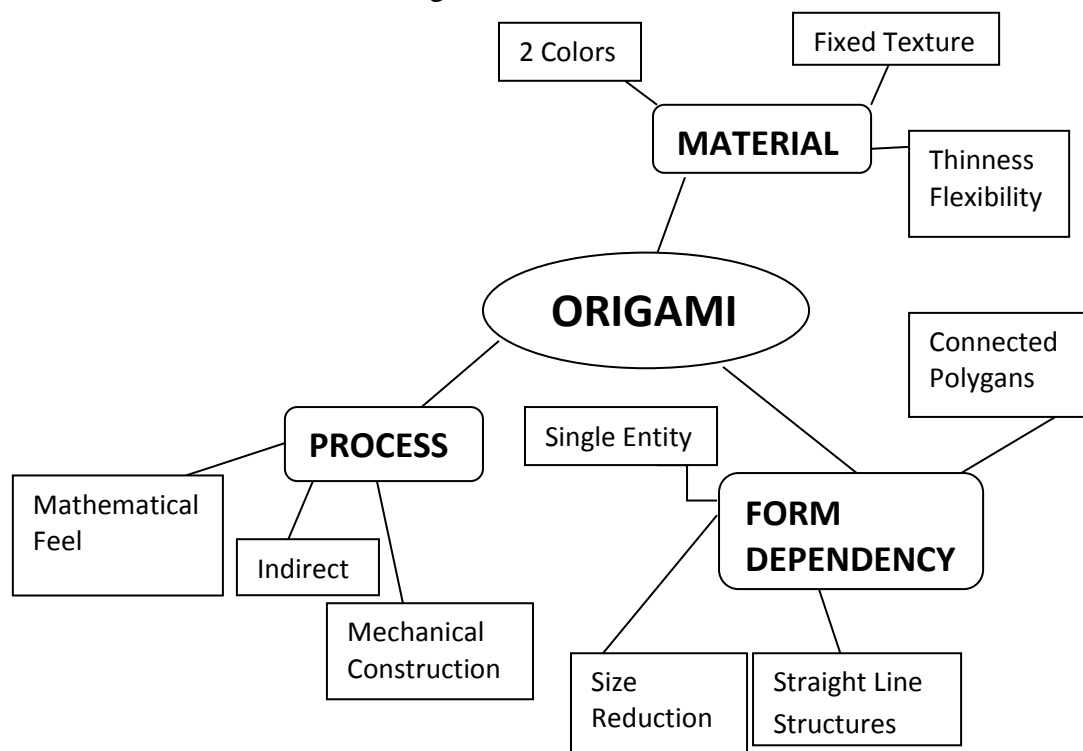


Figure 39. Origami Constraints
(Smith n.d.)

Figure 41 assorts the origami constraints in three branches: material, process, form dependency. The material used for origami can be two sided caused by the sheet

² DNA Origami: The Art of Folding DNA, Barbara Saccã and Christof M. Niemeyer

³ Miura Folding: Applying Origami to Space Exploration, Yutaka Nishiyama

⁴ Architectural Origami, Tomohiro Tachi

⁵ Origami and Learning Mathematics, Sue Pope andTung Ken Lam

⁶ Please see DNA Origami: The Art of Folding DNA (Saccã and Niemeyer year) for the details of appropriating origami in genetics; Miura Folding: Applying Origami to Space Exploration (Nishiyama year) for the details of Architectural Origami, Tomohiro Tachi. Origami and Learning Mathematics, Sue Pope andTung Ken Lam

form, that is to say, it can be in two colors, one color for each side. Texture is also fixed and mostly stable because only those that allow folding can be used for origami.

On the other hand, thickness and flexibility provides more alternatives for origami, and yet, these are limited for the material has to be suitable for folding. As it is indicated in process constraint, folding has limits because of mathematics and the law of physics. Finally, form dependency limits origami, in that origami requires square or rectangle sheet material, and as long as it is folded the size of paper becomes smaller, making it difficult to fold more. Smith explains these three constraints as follows:

Further limitations result from the paper. I have only the two surfaces and textures that I start with. The characteristics of the paper, its thinness and flexibility, are all fixed. The process of folding means that I am limited to straight line construction and to connected polygons. In the purest form of Origami I have only the one entity that gets smaller as my folding progresses. Origami is also an indirect medium with a possibly mechanical and mathematical feel about the process. Compare these constraints with say those of oil on canvas. There is no limit to textures or colors. The medium is direct with as many separate entities as you wish and one step is largely independent of the next (Smith n.d.).

Materials such as paper, which are used for origami are one of the most important elements of origami type. Types of origami papers can be identified as traditional papers and commercial art papers. Paper types can be further categorized as follows: foil paper, origami paper, wrapping paper, washi paper, chiyogami paper and photocopying paper.

The paper should be used relevantly. For instance, for the complex models which are made by a single paper, a flexible and a large paper should be chosen. On the other hand, a model which needs more than one unit and assembling does not necessarily need a flexible paper.

Robinson defines the foil paper as “foil-backed paper, this has one shiny metallic surface, sometimes with an embossed pattern, and one plain white paper surface” (Robinson 2004, 8). Foil paper is used to shape three dimensional models since it stands steady more easily than other paper types and it is suitable for models which need single unit. However, origami artists do not prefer foil paper frequently because it is eroded easily and the corners of the folded part might lack aesthetic beauty.

Different papers can be used for origami and Figure 42 shows the samples of them. Origami paper, generally sized 150 mm X150 mm. can be larger or smaller. This

is a thin paper and sold in sets. It is suitable for basic models and modular models, hence its popularity. It is even suitable for beginners. The high demand on origami paper made it available worldwide.



Figure 40. Different Papers For Origami

Nonetheless, the thickness of the paper does not allow iterative folding, which means artists who work with complex models prefer larger papers rather than this. Origami paper can be in different colors, patterns and sizes.

Wrapping paper is generally plastic-based and used for gift wrapping. Therefore, it is not suitable for origami. Still, it is observed that artists occasionally prefer working with this paper owing to its beauty. Robinson expresses that wrapping paper can be bought in large rolls and so it allows the artist to decide on the size of the paper. He also points out that “some folders like to use such plain paper because they believe it focuses

attention on the model itself. A good origami design, they say, should not rely upon exciting paper to enhance it” (Robinson 2004, 9).

Washi paper has been used from ancient times in Japan, and it is “a high-quality handmade paper” (Robinson 2004, 9). Robinson defines washi paper as “a paper produced with typically Eastern patterns, and seems almost like a length of cloth. The paper has an especially soft finish (you can feel fibres), yet is also very strong” (Robinson 2004, 9). Figure 51 (second line, the left one) is a sample of handmade washi paper.

Chiyogami paper is another sort of washi paper. It has bright colors and woodblock-printed patterns (Robinson 2004, 9). Since chiyogami paper has traditional Japanese patterns, folding this particular type paper gives a sense of authentic experience to the origami artist.

Photocopying paper is one of the most preferred papers for simple origami models because of the price and availability (Robinson 2004, 9). As modular origami requires more than three units, and photocopying paper can be divided into many pieces, using photocopying paper is the easiest and the cheapest way to perform a modular origami model.

Scrap paper is generally used by origamists who cannot live without folding. Obsessed origami lovers fold anything they can fold, and folding paper might be tickets, stamps, brochures, etc. In addition, scrap paper is a good alternative for practicing, so that high quality origami paper will not be wasted while practicing. Using scrap paper for origami appears to be an environmentally-friendly idea as well since is basically waste, and origami transforms it into something useful.

Paper money is used for money-folding and it is “a specialized branch of origami” as Robinson indicates (Robinson 2004, 10). Money-folding is known as ‘orikane’ in Japan, *ori* means folding and *kane* means money in Japanese. Money is rather suitable for origami art, since it is resistant to folding, bending, etc., in the other words, it is not eroded by folding, and can be reused.

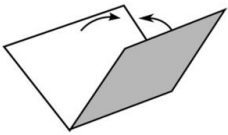
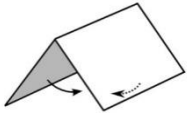
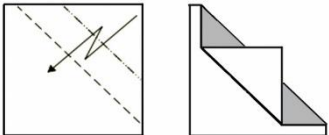
Canson paper is a paper type which is used for fine-arts, and very suitable for folding. Robinson highlights the advantages of canson paper as “it comes in a wide range of subtle colors, has a pleasing texture, and a suitable for making large models”

(Robinson 2004, 10). These advantages allow users to make design mock-ups with canson paper. Furthermore, a folding technique known as ‘wet-folding’ is mostly performed with canson paper, as this kind of paper is more flexible than other alternatives, and can be curled without bending.

Paper type is one of the identifier criteria for origami type, and origami artist should consider which paper type is suitable for the origami model s/he will craft. For instance, some models show both sides of the paper, thus double-sided paper should be used for these models. Similarly, handmade chiyogami paper is not suitable for modular origami, since it is unique and cannot be cut into pieces because of the pattern of the paper.


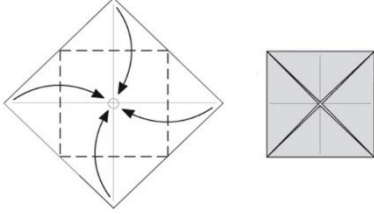
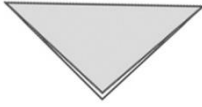
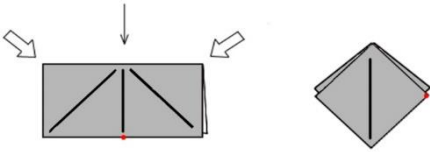
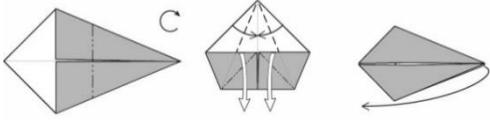
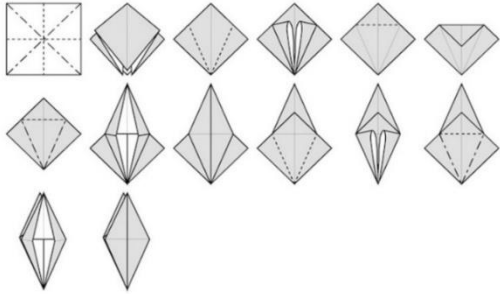
Although there are many origami types and thousands of origami models, there are bases which are acknowledged by origami societies across the world. These bases can be combined for different models and different purposes. Many origami associations evaluate the proficiency of origami instructors by these basic folding methods. These bases are originated from European traditional models (Hatori 2011, 6-7). Folding bases are listed as follow:

Table 16. Folding Bases

Folding Base	Diagram
Valley fold	
Mountain fold	
Pleat fold	

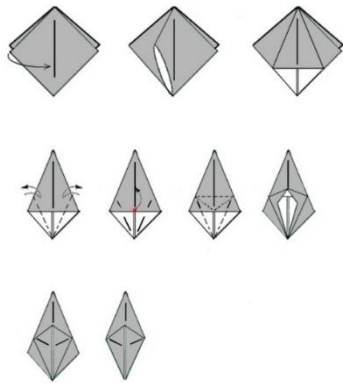
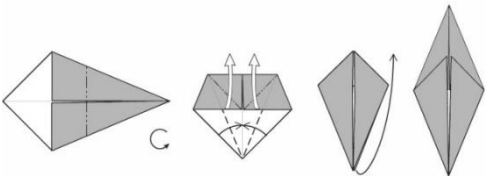
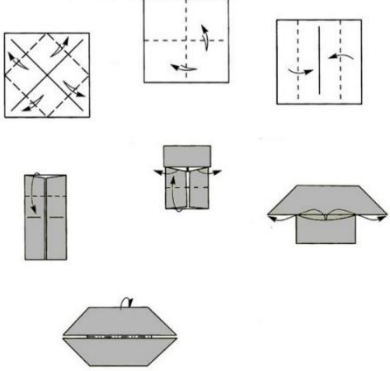
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Table 16. Folding Bases (Cont.)

<p>Water-bomb Base</p>	
<p>Blintz Base</p>	
<p>Stole Base</p>	
<p>Square Base</p>	
<p>Fish Base</p>	
<p>Bird Base</p>	

(cont. on the next page)

Table 16. Folding Bases (Cont.)

<p>Frog Base</p>	
<p>Diamond Base</p>	
<p>W-Boat Base</p>	

(Nippon Origami Association n.d., 1)

The bases above are used for all origami types and models, and all origami designs are combination of these bases. Origami types are categorized according to the number of units required, sizes/dimensions of paper, and folding technique. Each type of origami has different features thanks to these criteria such as number of units required, sizes of paper, material of folding object, folding technique. Origami designers make their decisions about these criteria according to their aim.

Origami Resource Center lists origami types as: action origami, golden venture origami, pure origami, modular origami, strip folding, candy wrapper origami, business card origami, toilet paper origami, crease patterns, origami tessellation, wet folding

origami, dollar bill origami, palm weaving. Different origami types refer to different aims, usage areas and different cultural values. Origami types are reviewed as follows:

- Pure origami: pure origami (Figure 43) is known as ordinary origami by most of the people. Pure origami has rules such as using a square paper, not using scissors and/or glue/tape, and not decorating the folded model.



Figure 41. Pure Origami (Butterfly, Box, Bird)

- Action origami: the most popular sample of action origami is origami planes. However, there are lots of action origami models and many of them are used as toys or relaxing objects thanks to the repetitive action.

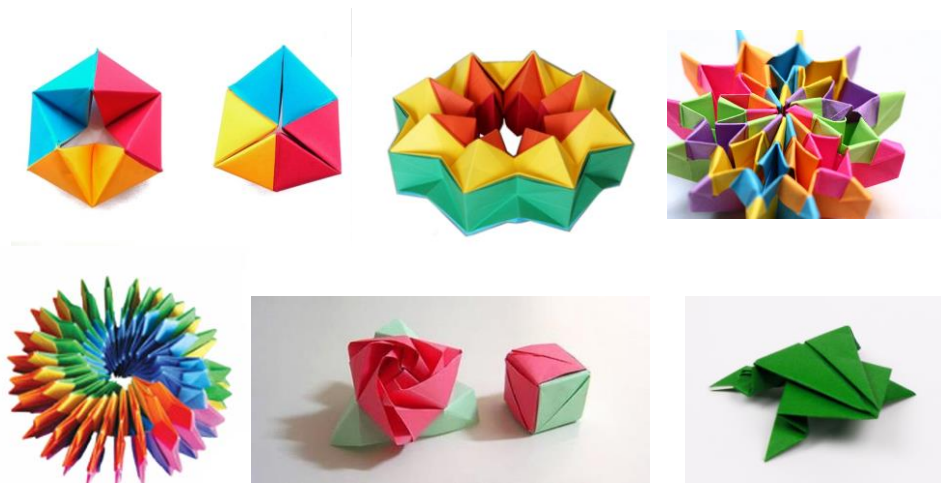


Figure 42. Action Origami

- Golden venture folding: this folding type is also known as 3D origami (Figure 45) It is a kind of modular origami. This type generally needs 250-500 units and most popular models of this folding type is swan, pineapple and dragon. This model can be easily modified and copied. It is easy to transport it and it is suitable for storing. Since, the assemble of this model is like lego type, thus it can be used as constructive toy for children.

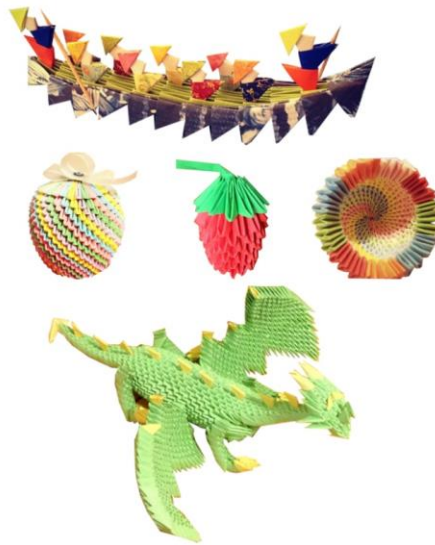


Figure 43. Modular 3D Origami

- Modular origami: for modular origami (Figure 46) 3, 6, 12, 30, 90 units are required. Each unit can be folded in a few steps easily, however, the assembling process can be harder than folding. Most popular samples are *kusudama*, lampshade and coaster.



Figure 44. Modular Origami

- Toilet paper origami: this kind of origami is generally performed in hotels. Origami Resource Center explains this action as “the triangulated toilet paper informs the guests that the cleaning staff has been there, and has finished cleaning the room” (Origami Resource Center 2015). Because of the softness of material, practical models are limited, and because of the function of toilet paper, it is not permanent.



Figure 45. Toilet Paper Origami
(Origami Resource Center 2015)

- Dollar bill origami: it is also known as ‘money origami’ (Figure 48), and the amazing part of this type is resulted by the ratio of dollar sizes. Whereas, the ratio of US dollar size is 7:3, the ratio of Canadian Dollar size is 13:6 (Origami Resource Center 2015). Most folded samples of money origami are shirt, elephant and fish.



Figure 46. Money Origami
(Very Smart Design 2015)

- Origami tessellations: this type of origami requires a single unit. The difficulty of the process progresses stage by stage, thus it provides opportunity for non-professional performers to fold tessellations. First origami tessellations (Figure 58) is believed to be designed by Shuzo Fujimoto, albeit debated. It is also popular in Europe.



Figure 47. Origami Tessellations

- Strip folding: it is approved that this type of origami is the easiest way to construct a three dimensional form from two dimensional sheet material by folding. As it is understood by the name, strip is used for this type and material can be paper or fabric. Popular samples of strip folding (Figure 50) are lucky star, Froebel star and rose.

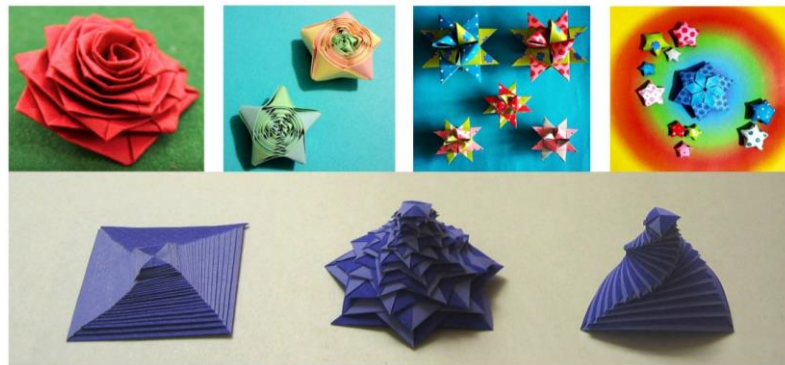


Figure 48. Strip Origami

- Palm weaving & Candy wrapper origami & Business card origami: materials such as palm leaf, candy wrapper and business card are used instead of paper in these origami types. It is similar to toilet paper origami, both of these materials have a significant function except for folding. On the other hand, whereas folded toilet paper has a meaning explained above in the ‘toilet paper origami’ section, palm weaving, candy wrapper origami and business card origami does not have a significant meaning. They are folded for the sake of it.
- Crease patterns: Origami Resource Center defines crease patterns (Figure 60) as “crease patterns are the lines on a piece of paper when you unfold an origami model” (Origami Resource Center 2015).



Figure 49. Crease Patterns

(Takashi 2015, 25)

- Wet folding: this origami type makes origami look like real because of the curls and it was developed by Akira Yoshizawa. Since the corners are flitted, origami models folded with this technique does not seem as robotically as ordinary origami types. Wet folding (Figure 61) requires moisture as the moist of paper provides to curve the lines. The different outcomes of wet folding and ordinary origami on the same origami model is shown on (Figure 52).



Figure 50. Wet Folding

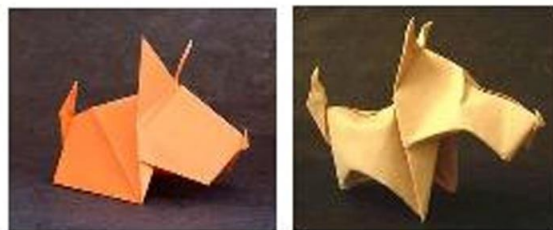


Figure 51. Ordinary Origami Dog vs. Wet Folding Dog
(Origami Resource Center 2015)

Origami types underline the variety of origami, and the review of origami types gives clues about the functions of origami. Origami bases and basic origami types give ideas about what can be done with origami or these folding techniques. Since daily life objects which are designed by using origami are very common, we might be unaware that we are using origamic objects in our daily lives. In the next section, origami in daily life objects and packaging design will be explored in more detail.

4.3. Origami in Daily Life Objects and Packaging Design

Daily life objects with origamic structures and/or foldability feature are considerably high in number. We use them without considering which structures they

contain. For instance, people who use eye glasses never ponder about what they are doing while folding the glasses to put them into a case. Whereas the users are unaware of using foldable glasses, the producers of eye glasses decrease the volume by purposefully making it foldable twice.

Utilizing origamic structures or folding techniques provides advantages such as volume decrease, flexibility, and multi functionality. We all prefer more extensive living spaces. In order to have more free space, we use foldable furniture and fold them when unused. Foldable chairs and tables (Figure 71) are arguably the most popular samples of foldable furniture. Although this kind of furniture makes our lives more convenient, Baudrillard has a striking contradictory opinion on functional furniture. He asserts that this kind of objects constraint our lives by forcing us to use it according to function (Baudrillard 1996, 15-17). For example, if you have a foldable table, you should prop it folded, and according to Baudrillard this foldability function takes away the choice of unfolded table.

In my opinion, owning functional objects such as foldable table does not necessarily provide us with more freedom. On the other hand, if we are not obsessively abode by the function of an object, the object cannot have a power of controlling our life styles and choices. I do not think that folding a foldable table make me less free, however, obsessing over the function of an object might make us feel limited. In addition, regardless we confirm the practicality of foldable objects or not, we all use them.



Figure 52. Foldable Chair and Table
(Google 2015)

The parts of houses such as doors, windows, swatters etc. are one of the most popular samples of foldable objects in our lives. The foldability of these parts resolve the space constraint issues during opening and closing them. Although foldability

reduces the lifetime of the parts because of the erosion, it is still preferred to decrease the idle space caused by un-foldable windows etc.

Apart from ordinary foldable furniture, innovative origamic approaches too are popular nowadays. The foldability feature provides different usage alternatives. For instance, a specific foldable carpet (Figure 53) can be used as a table. Another example is a foldable bed, that can be used as a bed, and when it is folded, it becomes a sofa. In addition, foldable mirrors allow us to adjust the distance of mirror. These innovative folding ideas are pictured below:



Figure 53. Foldable Carpet
(Source: Aliza 2011)



Figure 54. Flux Chair
(Source: Feel Desain 2012)

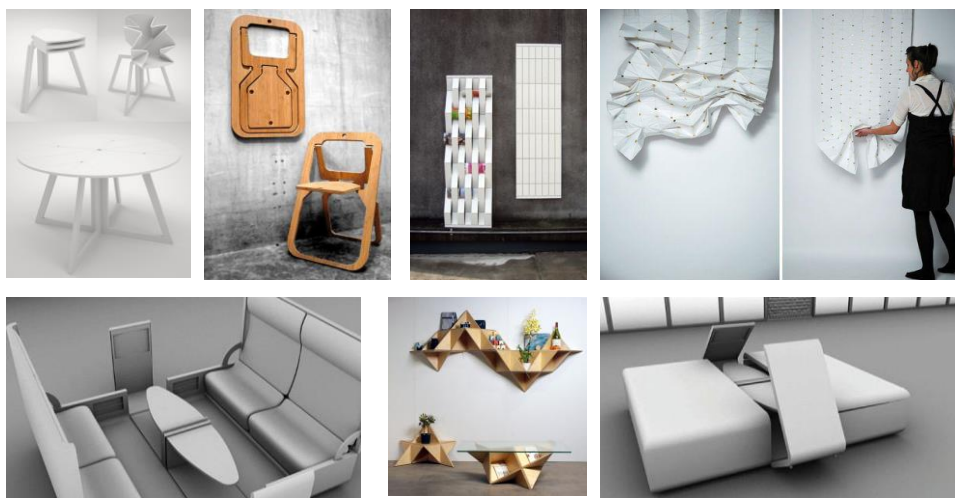


Figure 55. Foldable Furniture, (Source: Living Extraordinary Small 2012)



Figure 56. Foldable Electronic Devices
(Source: designboom 2011)

The foldable samples above mostly are used to increase the capacity of living spaces, since as long as an object is folded, it undoubtedly will occupy less space. On the other hand, providing more space is not the only gain of origamic structures, foldability also brings along multi functionality and portability.



Figure 57. Foldable Cutting-board and Foldable Kettle



Figure 58. Origami Flower Pot Grows With Plant
(Source: Co.DESIGN 2015)

Foldable tools, gadgets and electronic devices have become widely available in our daily lives. Foldability provides volume decrease as exemplified by various furnitures above. Origami does not always ensure a new function, yet, it might help a tool, gadget or device to perform a specific function more easily. For instance, foldable beater has a beating function as an ordinary beater, and foldability does not add any other function, however foldability makes the cleaning of beater easier.



Figure 59. Origami Portable Food Packaging
(Source: Pinterest 2012)



Figure 60. Foldable Wine Bottle Case



Figure 61. Origami Carrier Bag and Origami Biscuit Package



Figure 62. Origami Tea Bag

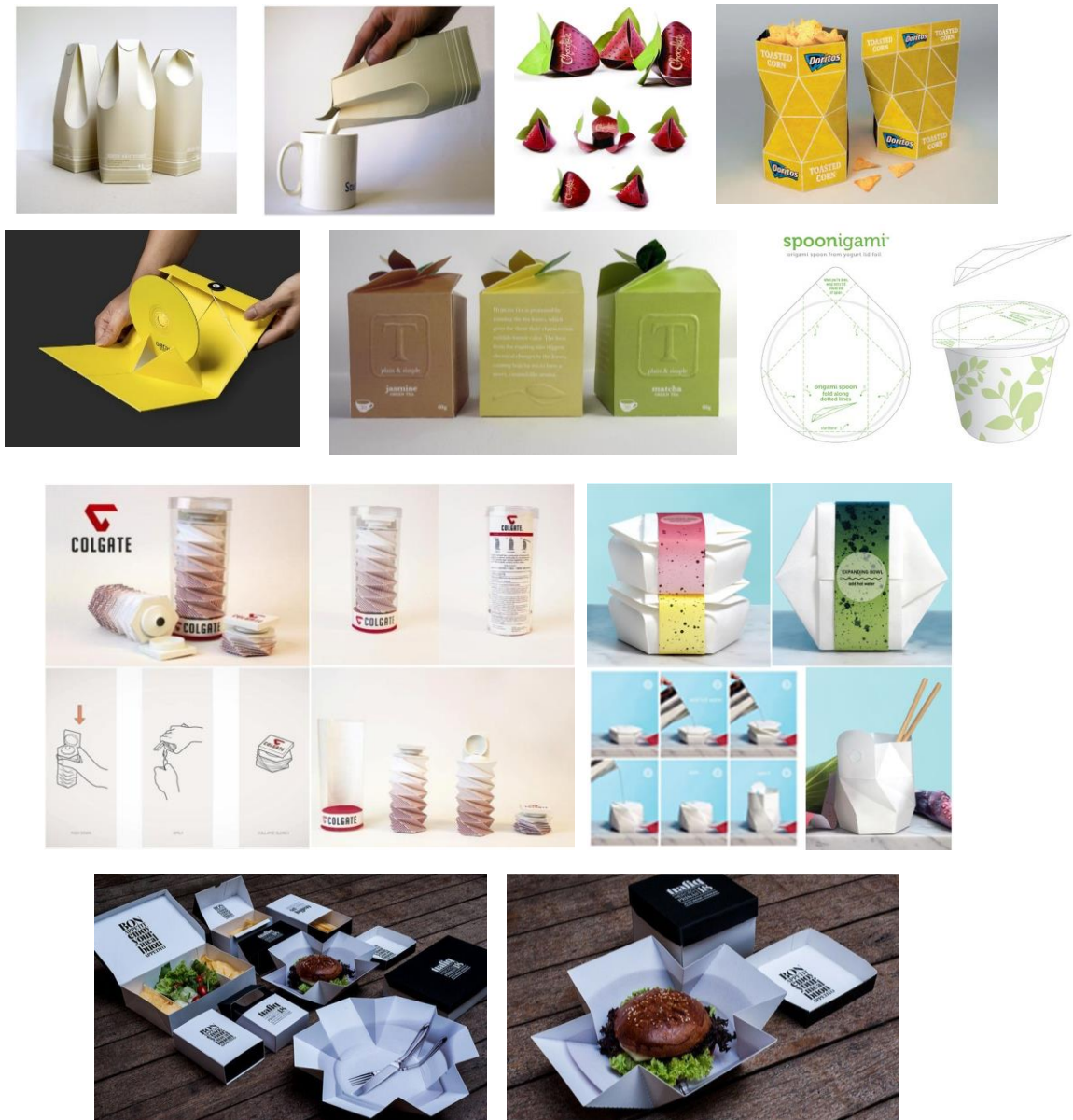


Figure 63. Origamic Packages of Different Products (Source: Pinterest 2012)

The origamic packaging samples above elicit that almost all origami types which are reviewed in the previous section are used for foldable packaging design. If the designer to follow basic origami rules, s/he should not use supporting materials such as

glue or tape. Therefore, chemicals are not used to generate a three dimensional packaging form. In this case, origami reduces the harms of packaging on environment and/or health. Most of the samples above denote that origamic packaging eases the usage of the package and/or product. Additionally, reviewed origamic samples show that origami might provide multi-functionality, for instance Doritos Origami Box was not only designed as a package, but also as an origami toy.



Figure 64. Origamic Packaging Samples in Turkey

The origamic packaging samples above elicit that almost all origami types which are reviewed in the previous section are used for foldable packaging design. If the designer to follow basic origami rules, s/he should not use supporting materials such as glue or tape. Therefore, chemicals are not used to generate a three dimensional packaging form.

In this case, origami reduces the harms of packaging on environment and/or health. Most of the samples above denote that origamic packaging eases the usage of the package and/or product. Additionally, reviewed origamic samples show that origami might provide multi-functionality, for instance Doritos Origami Box was not only designed as a package, but also as an origami toy.

Consequently, origami basically provides a three dimensional form from a two dimensional material without using glue or tape. It can be interpreted that chemical free packaging design might narrow down the possibilities of design alternatives for packaging designer, however according to my experiences, without glue or tape the paper can be used 100% productively. Parts of the paper which glue or tape used are the idle parts of the paper and these idle parts reduce the recyclability degree of the paper.

Glue/tape free packaging can be recycled completely. Because of complete recyclability, and chemical free design of origamic packaging design is environmentally friendly.

CHAPTER 5

A SURVEY FOR ANALYZING USER PREFERENCES

The case study of this thesis has been applied in three stages. Firstly, multifunctional and reusable origamic packages of commercially available products were designed as alternatives to their existing traditional packages. Thanks to origami and play concept, each of these packages can be used as toys after the products are taken, thus they can be reused and thanks to origami rules, packages which were produced without chemicals such as glues, thus these packages can be recycled. Briefly, due to the fact that these packages are reusable and recyclable, they are environmentally friendly packages. Alternative origamic packages are pictured in the next subtitle.

Product cards as well as prototypes of the specifically designed packages are used to visualize the difference between origamic package and the existing package. These materials were used along with a questionnaire, which aims at comprehending users/consumers' preferences. The questionnaires were applied in person in an interview style to be able to gather sufficient and efficient data. In the last stage, statistical results of the questionnaire are analyzed.

The study was conducted at Karşıyaka Universal Child Museum and Education Campus. This museum is chosen for the study because of the museum's education content and the visitor profile. The museum is divided into 7 departments and each of these departments are aimed to teach a universal value: 1) wild life and helpfulness, 2) the band of Bremen and friendship, 3) veterinary and love, 4) traffic and tolerance, 5) environment and respect, 6) airport and responsibility, 7) Pinocchio and truth. In each department a specific education which takes 20 minutes is given to children who are between 4-12 ages in order to raise awareness for universal values. Associated with this thesis, in the environment and respect department how to be respectful to nature is taught. Renewable energy resources, organic farm, recycling, carbon and water footprint are the main subjects of the education. This department is reviewed below:

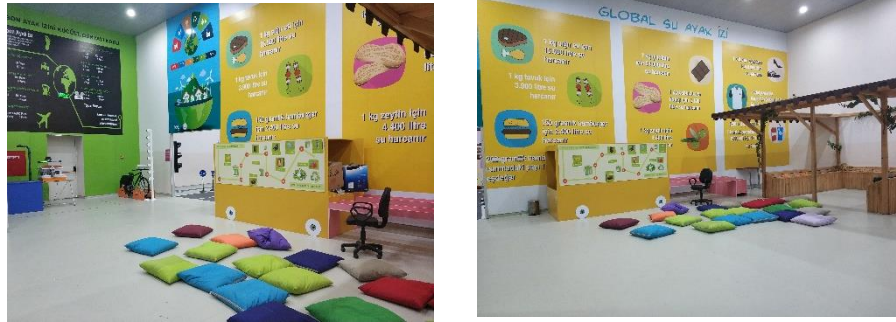


Figure 65. Environment and Respect Scenario Room

Reusability and recyclability and the importance of these terms are explained in the education. The possible results of the consumer behaviors are argued with the visitors. Besides, the visitors are between 4-7 and 7-12 ages. Most of them visit the museum with their parents. A wide range of ages makes the questionnaire more reliable. Thus, this museum is suitable for questionnaire.

5.1. The Aim of the Case Study

The aim of the case study is to understand if the consumers would prefer the environmentally friendly origamic packaging to the existing traditional packaging. It also strives to see to what extent the consumers are conscious about the environmental effects of packaging.

As the study evaluate the awareness of adults, teenagers and children, it also determines if the education provided at the museum would change children's mind or not. It also aims to evaluate if the education of museum makes sense on consumption behaviors of children. Thus, the children who have visited the environment department of museum were analyzed more detailed.

Owing to designed origamic packaging samples and questionnaire, the case study combines all chapters of this thesis. The case study explains why the starting point of this thesis is consumption, what is the relationship between consumption and packaging, how packaging design effects environment and how to reduce harms of packaging, how and why origami is utilized for packaging design, and what is the role of "play" for origamic packaging design.

5.2. Questionnaire

In order to understand consumer decisions about packaging consumption, a questionnaire was designed with the help of Sociologist Görkem Telli Kendir. The questionnaire classifies gender, age, educational state and consumption preferences. The questionnaire was modified for children. The questionnaires consist of yes no questions and open-ended questions. All in all, two different questionnaires were prepared and applied. Teenagers were asked the same questions with adults since they are excluded from the museum's education. The survey was conducted in person like an interview with the participants. It is applied to 572 visitors who are children, teenagers and adults. Pertinent questionnaires can be seen at the APPENDIX A. QUESTIONNAIRE.

Gender, age and education are independent variables of this study. Questions for consumption preferences do not only aim to evaluate consumers' behaviors for products but also their packages. It is targeted to determine if the consumers are eager to reduce consumption or not. If consumption is inevitable for them, it is aimed to measure their sensitivity for reusing and recycling. It is also intended to interpret if their reusing and/or recycling decisions would change thanks to origamic package or not. Additional questions for children aim to determine if education contributes to their sensible package choice.

5.3. Packaging Design With Origami

In order to evaluate if the consumers would prefer the origamic package or the commercially available package, different packages are designed by the researcher as an alternative environmentally friendly choice for consumers. The features of these specifically designed origamic packages are listed below:

- They are glue free. They can be recycled completely.
- They are multifunctional. They can be reused as a toy or an object which serves as play tool.
- Because of their recyclability and reusability, they are environmentally friendly.

What makes these packages reusable and recyclable is origami. Origami is utilized to make the package more environmentally friendly. Once the packages were designed by the researcher, they were prototyped and integrated into product cards to be used in the survey. Provided benefits and negatives of prototyped origamic packaging is tabled below:

Table 17. Origamic Packaging Benefit Evaluation

ORİGAMİC PACKAGING	Reusable	Recyclable	Multi Functional	Low Cost	Storable
Package Alternative for Tuğba Kuruyemiş	✓	✓	✓		✓
Package Alternative for Feliz Baharat	✓		✓		✓
Package Alternative for Tofita	✓	✓	✓		
Package Alternative for Koska	✓	✓	✓	✓	✓
Package Alternative for Kahve Dünyası	✓		✓		
Package Alternative for Milka	✓		✓		

Origamic packages and the existing ordinary packages are viewed below:



Figure 66. Package Alternative for Tuğba Kuruyemiş



Figure 67. Package Alternative for Feliz Baharat



Figure 68. Package Alternative for Tofita



Figure 69. Package Alternative for Koska



Figure 70. Package Alternative for Kahve Dünyası



Figure 71. Package Alternative for Milka

5.4. Results of the Questionnaire

The questionnaire was applied to 572 visitors in total at Karşıyaka Universal Child Museum and Education Campus on the 13th and 14th of April 2019. 173 of the participants are children and 399 of them are adults. 105 of the adults are teenagers. 64 of the teenagers are female and rest of them are male. 92 of the children are female, and 81 of them are male. 236 of the adults are female and 163 of them are male. Totally 244 of the visitors to whom the questionnaires were applied are male, and 328 of them are female.

As it can be understood by graph below, the difference between the male-female rate of adult is more than the difference between the male-female rate of children. Adults and teenagers have applied the same questionnaire, however children's questionnaire has some differences. The graph of those data are viewed below: The analysis of the questionnaires is divided into two parts: 1) Analysis of children's questionnaire; and 2) Analysis of adults' questionnaire.

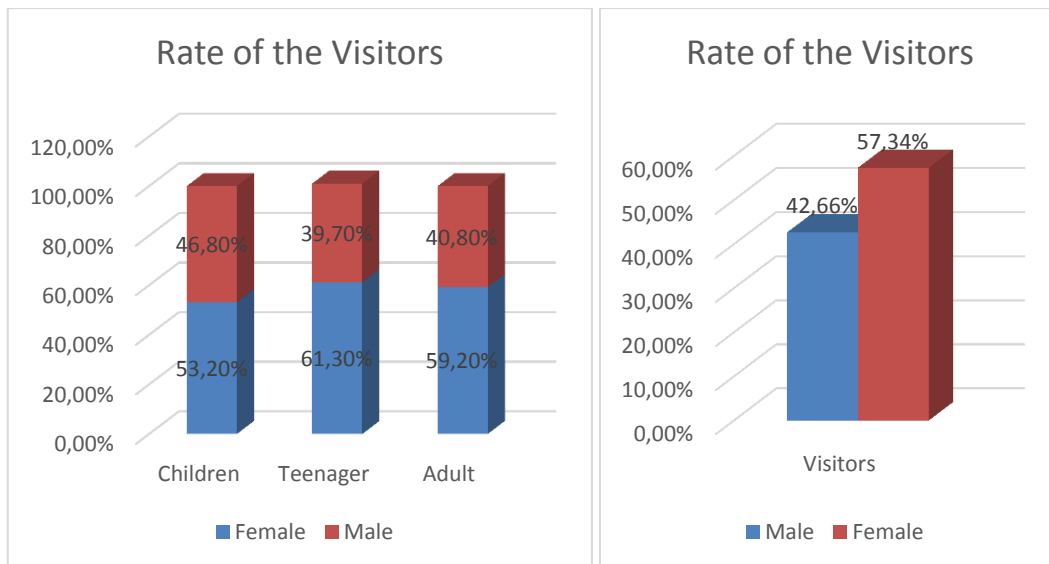


Figure 72. Rate of the Visitors

5.4.1. Analysis of Adult Questionnaire

Adult participants are sectioned as teenagers who are between 12-18 years old and adults who are older than 18 years. The rate of participants according to age is shown and the gender rate of the participants are tabled below:

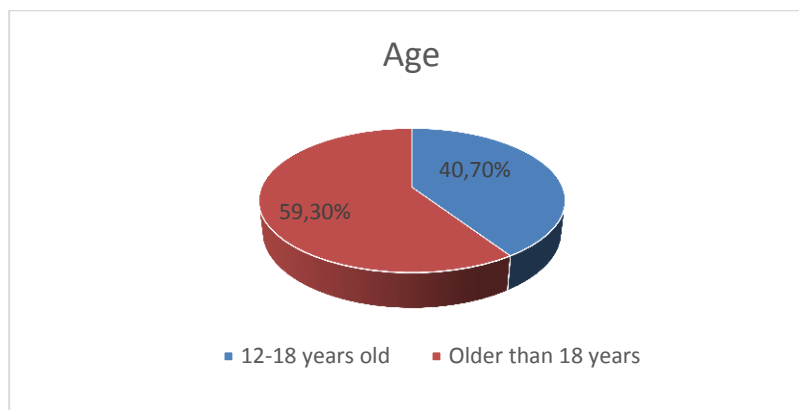


Figure 73. Age Rate of Adult Participants

Table 18. Male-Female Rate for Age Groups (Adults)

	Male	Female
12-18 years	51	87
Older Than 18 years	112	149

The education rate of the adult participants is analyzed as an independent variable for each question about packaging. Furthermore, the distribution of the educational status is viewed below:

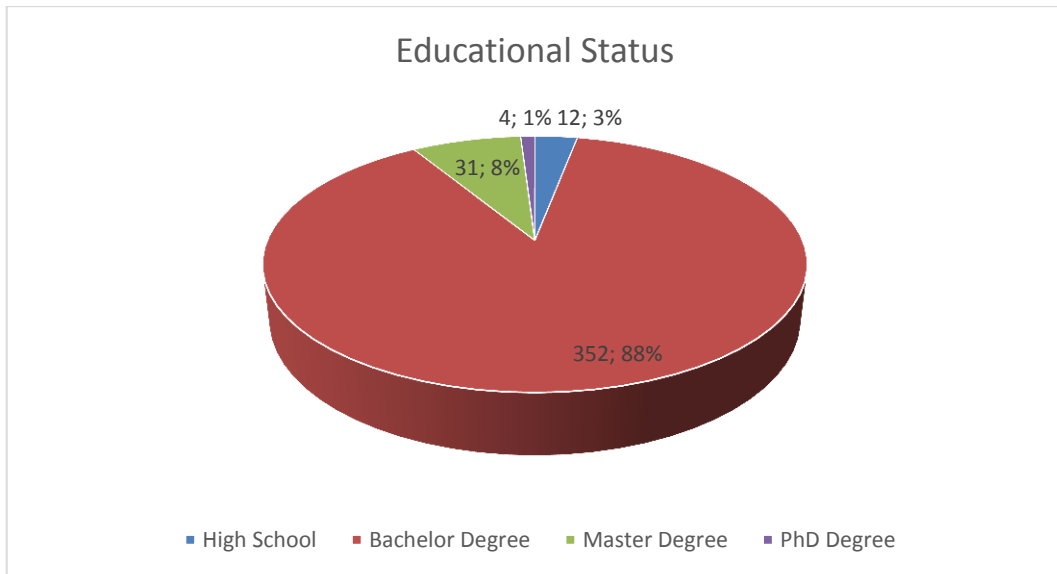


Figure 74. Educational Status

The income rate of the adult participants is analyzed as an independent variable for each question about packaging, and the distribution of the income is viewed below:

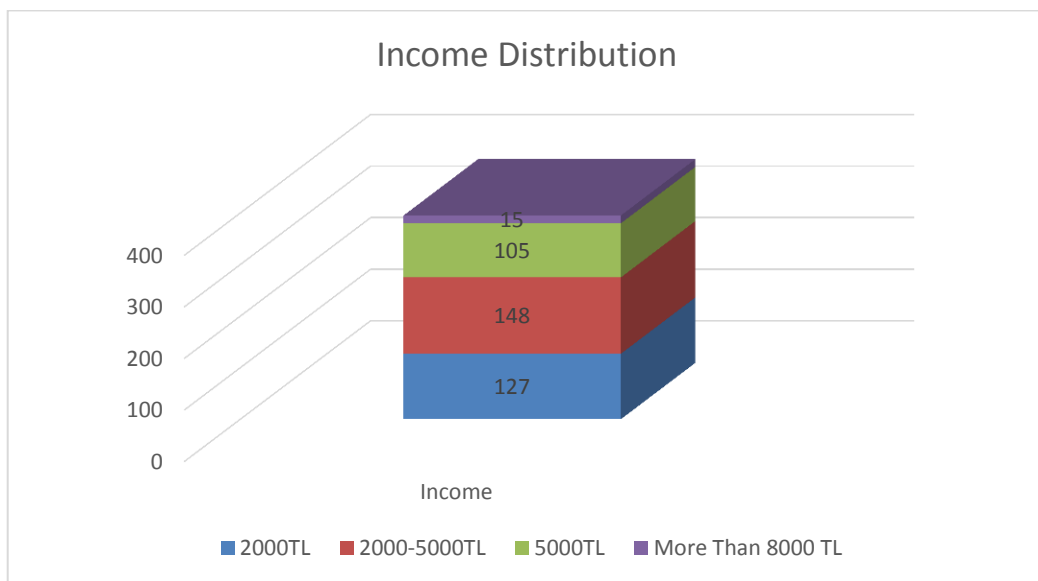


Figure 75. Income

Questions which evaluate the consumption preferences for alternative packaging and the distribution rate of them are listed in APPENDIX C. TABLE OD ADULTS. According to gathered data, 70% of the participants use the products shown in the study.

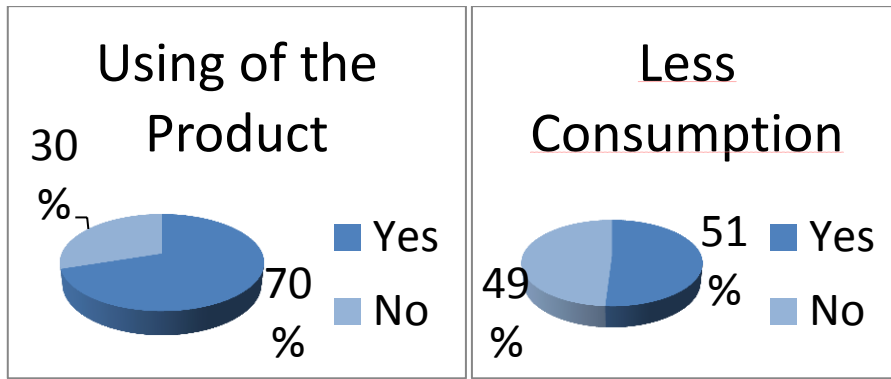


Figure 76. Consumption Preferences of Adults

It can be interpreted as the products are consumed by many of the adult visitors of the museum. 51% of the participants say that they can consume these products less, however 49% of them specifies that these products are indispensable for them. 98% of participants who say that they will not consume these products less are women and 79% of them are between 12-18 years old. Using frequency of products are viewed below:

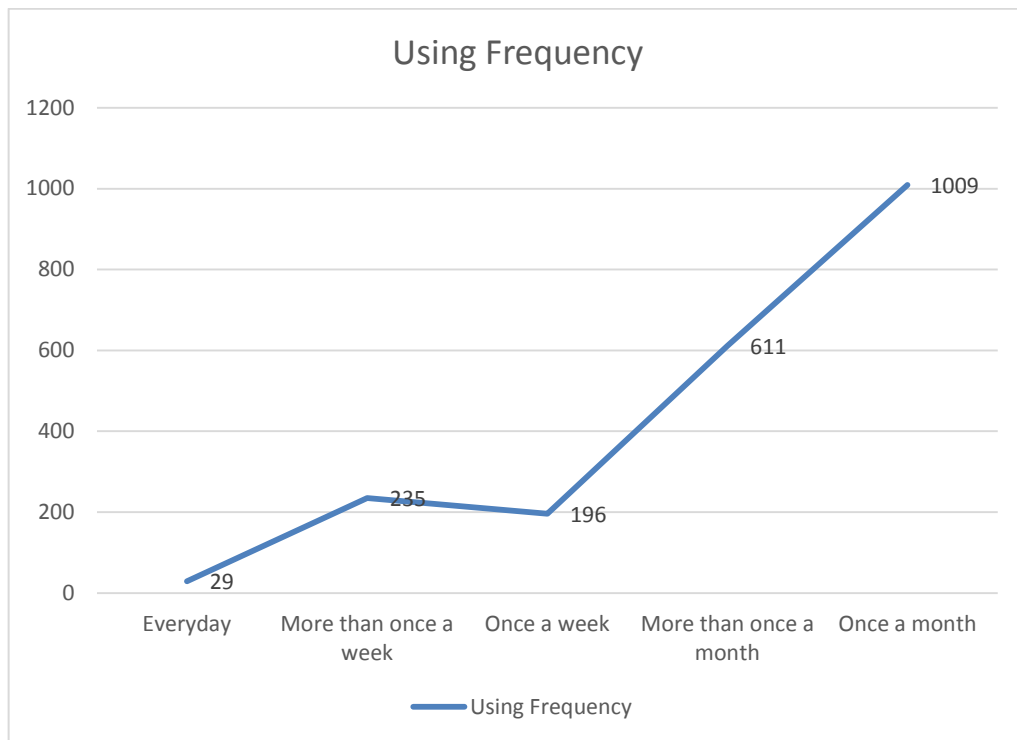


Figure 77. Product Usage Frequency

The percentage of the preferences of the participants for the after-life of packages are shown in Figure 80. These preferences give idea for the reaction of participants to reusable packages. It also gives opportunity to decide if the participants already reuse or not. The figure is shown below:

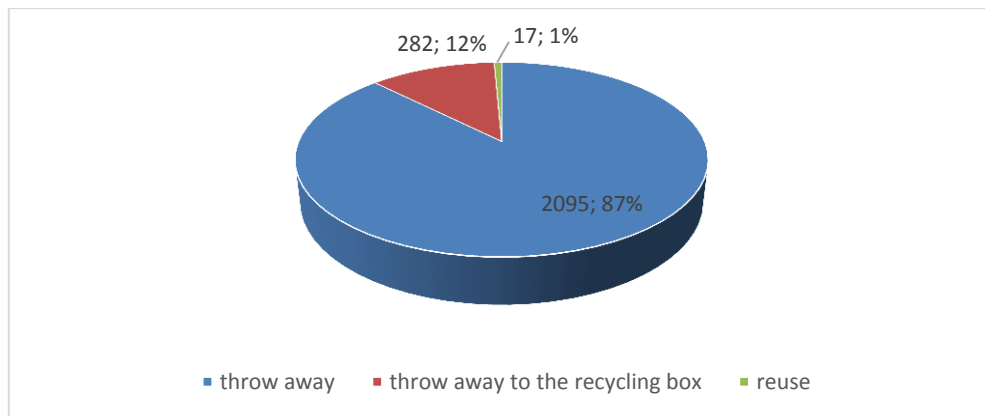


Figure 78. Recycling Preferences of Participants

74% of participants prefer alternative origamic packages instead of the current packages. According to the distribution of gender and age, 61% of participants who prefer origamic packages are female and 72% of them are between 12-18 ages. It can be interpreted as females and younger adults are more sensitive to environment. However, 48% of the participants stated that they would not prefer to reuse the origamic packaging. It means more than half of the participants tend to throw away these origamic packages.

According to the questionnaire results, only 4% of the participants have attended a course/seminar on environment/sustainability during their education. On the other hand, 12% of them agree with the statement that the seminar/course on environment/sustainability has affected their decision about packaging and recycling

The survey has not shown any significant link between the income level and packaging preferences.

5.4.2. Analysis of Children's Questionnaire

Children participants are sectioned as children who are between 4-7 years old and children who are between 7-12 years old. The rate of participants according to age as well as their gender is shown below:

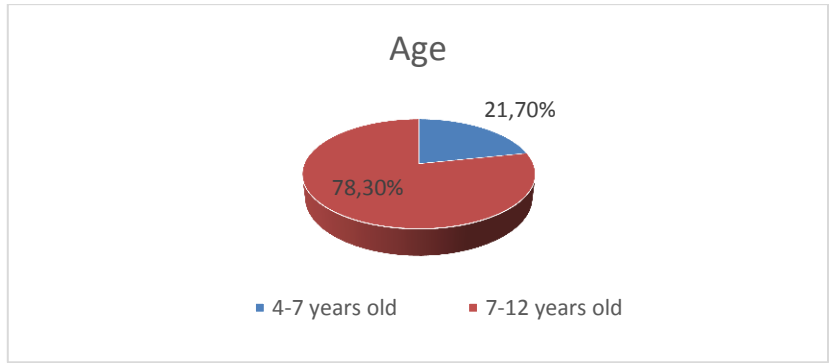


Figure 79. Age Distribution of Children

Table 19. Male-Female Rate of Age Groups (Children)

	Male	Female
4-7 years old	27	38
7-12 years old	54	54

The education rate of the child participants is analyzed as an independent variable for each question about packaging, and the distribution of the educational status is viewed below:

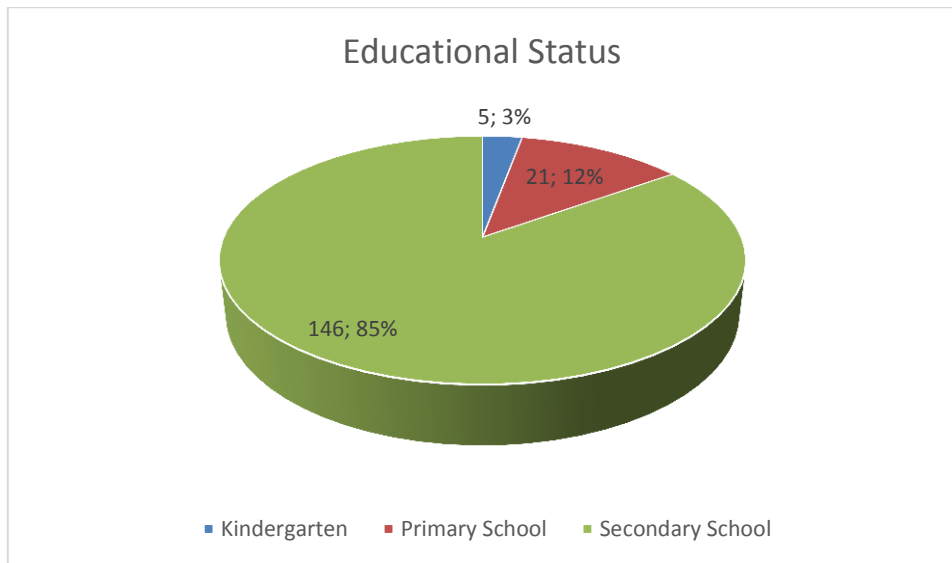


Figure 80. Educational Status

Questions which evaluate the consumption preferences for alternative packaging and the distribution rate of them are listed as a table at APPENDIX B. TABLE OF CHILDREN. There are specific questions for children to evaluate the import of education and to decide if young ages have more environmentally friendly consumption habits or not.

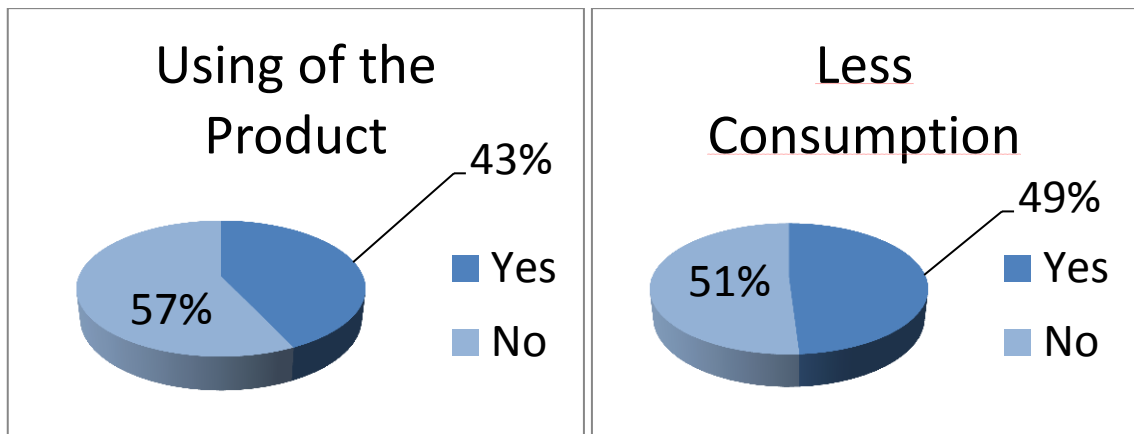


Figure 81. Consumption Preferences

Gathered data demonstrates, 43% of the participants use the products included in the study. That is the included products are not consumed by the majority of the children. This also can be interpreted in a way that adult questionnaire results are more reliable than children questionnaire results.

Almost 50% of the participants states that they can consume these products less, 55% of participants who say that they will not consume these products less are female and 79% of them are between 7-12 years old. It means that gender does not have a crucial role on consumption habits for children. Overall reading of the both questionnaires indicates that consumption addiction increases by age since the adults tend to consume more.

Using frequency of products are viewed below:

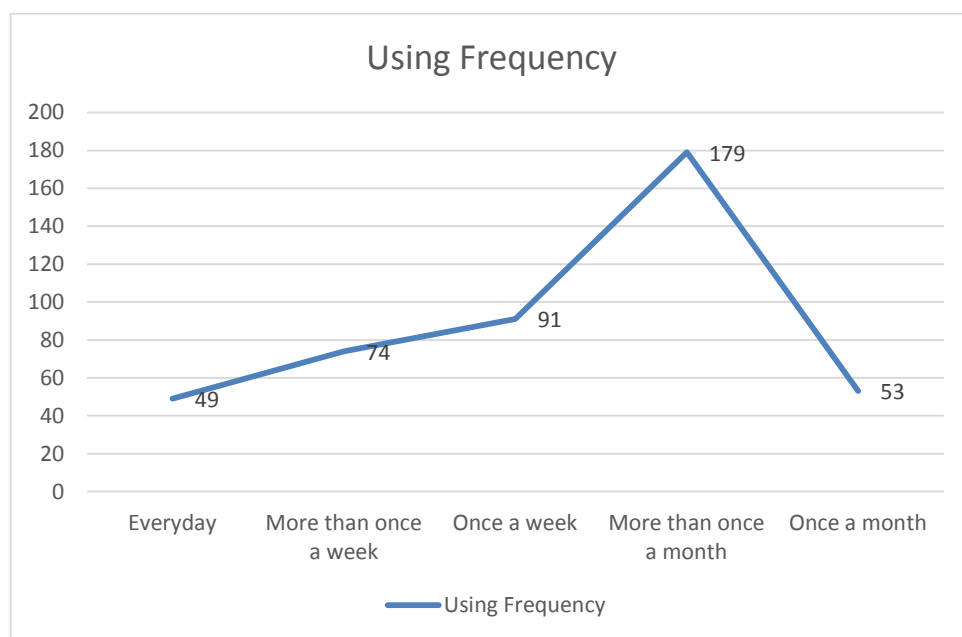


Figure 82. Product Usage Frequency

The percentage of the preferences of the participants for the after-life of the packages are shown in Figure 85:

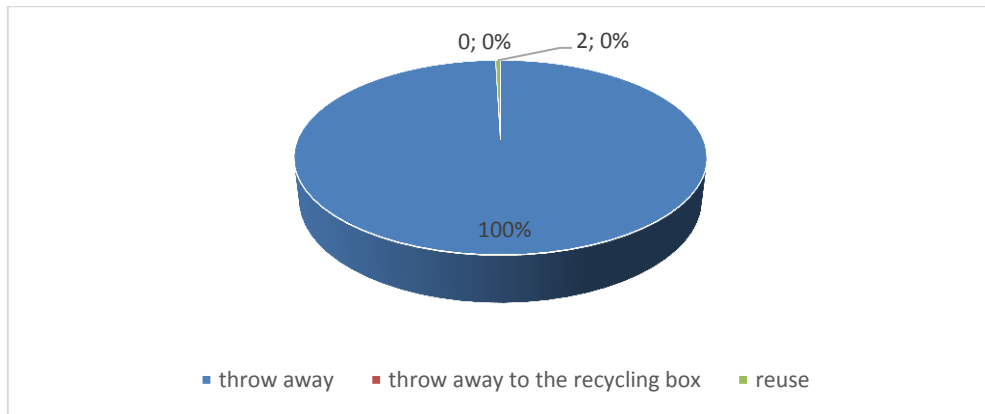


Figure 83. Recycling Preferences of Participants

100% of children participants prefer alternative origamic packages to the existing packages. Additionally, 100% of them prefer to reuse it. It means package has an important role on decision for reusing. According to the questionnaire results, 72% of them have attended a course/seminar on environment/sustainability during their education and 26% of them took an education in the department of Environment and Respect. Besides, 100% of them agree with the the statement that the seminar/course on environment/sustainability has affected their decision about packaging and recycling. According to the distribution of gender and age, 51% of participants who prefer origamic packages are female and 48% of them are between 4-7 ages. It can be interpreted that gender and age do not have a significant role play in their package and recycling preferences. On the other hand, it can be said that education has been substantial for children to become more environmentally sensible.

According to questionnaire, it can be interpreted that consumers who have more environmentally friendly alternatives, tend to be more mindful about reusing/recycling to decrease the harm rate of packaging wastes. In accordance with statistical data gathered from questionnaire it is clear that children have more flexible consumption habits and it is probable that education about environment in younger ages makes a significant difference on their attitudes.

CHAPTER 6

CONCLUSION

Today, the word “consumption” has a deeper meaning which expands beyond satisfying basic needs. We consume in order to satisfy our emotions, for self-expression, for being a member of a society, to belong. It proves inevitable for us to consume. We consume without control and as long as we consume products, packaging wastes are increasing concomitantly. Consumed products and the packages of them have a harmful impact on environment. The first step of environmentally friendly consumption behavior is to reduce consumption; however, the consumerist society and its hedonistic approach encouraging consumption does not allow us to consume less. Then we as designers should find ways to help people consume more sensibly. This has been the starting point of this thesis. Therefore, in the literature review sections I have first examined the consumerism and material culture in order to provide a conceptual basis for my research. Then I have analyzed the impact of packaging on consumers and environment.

In order to make consumers reuse product packages instead of producing waste out of them, some triggers and motivation such as play activity, multi functionality appear to be necessary. Packages which I have designed for the case study of this thesis are constructed with the principles of origami and thanks to origami and play term, these packages can be turned into other products such as lego, toy, candidate, etc. after the real product is taken out. Thus, origami make the packages reusable. In this way, an environmentally friendly solution advice for packaging design to reduce the harmful effects of consumption on environment is generated by origami. In accordance with this, I have investigated origami and its usage in industrial design and packaging in the world and in Turkey.

Finally, in light of the literature review, I have designed a survey to analyze how consumers react to environmentally friendly, multifunctional origamic packages. I have designed origamic packaging alternatives to the existing products. I have created prototypes as well as Product Cards to be used in the study. Two different

questionnaires were applied to adults and children, which allowed a comparison of sensitivity for different ages regarding the matter. Different independent variables such as gender, educational status, income, consumption frequency and consumption habits have enabled me to analyze the questionnaire in different perspectives. The results have shown that contemporary users/consumers are rather educated and are willing to consume more sensibly. Especially children have a remarkable potential for a positive behavioral change in consumption attitude and habits.

The study was conducted only at one venue, namely Karşıyaka Universal Child Museum and Education Campus. However, for a more comprehensive and generalizable data and results, it could be conducted at various locations. Besides, it would be very useful if the prototypes could be actually produced and placed on the shelves. Then it would require a longer research to observe and evaluate the after-life of the designed packages.

The questionnaire was applied to random groups, and these participants were not classified. To this end a specific income group could be chosen as the target group in order to gather more consistent data. A pilot questionnaire could be applied to identify the target group.

The products which I designed alternative origamic packages for were chosen randomly. In order to develop more analytic study, similar brands, similar price range product could be used for the study.

The study was conducted within the perspective of industrial design principles. Marketing, distribution, stocking and cost criteria were disregarded. In a future study, such criteria should be taken into account in order to evaluate the effectiveness of the origamic packages.

In sum, this thesis does not claim that origamic packaging can completely solve the problem of packaging waste and its negative impact on environment, but it analyzes if these packages motivate people to reuse and recycle owing to the potentials of multifunctionality caused by origamic features.

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APPENDIX A

QUESTIONNAIRE

Table A.1. Questionnaire for Adult

QUESTIONNAIRE FOR ADULT			
<p>This questionnaire below is prepared as a part of the research for my master thesis in Izmir Institute of Technology, Industrial Design Department. The aim of the thesis is to analyze the impact of origamic packaging design on environment. Your personal information will be kept anonymous. Thank you for your contribution.</p>			
Date		Hour/Number	
Gender	Male <input type="checkbox"/> Female <input type="checkbox"/>		
Age	Teenager	12-18 <input type="checkbox"/>	
	Adult	Older than 18 <input type="checkbox"/>	
Education	High School <input type="checkbox"/>		
	Bachelor Degree <input type="checkbox"/>		
	Master Degree <input type="checkbox"/>		
	PhD Degree <input type="checkbox"/>		
Income	2000 TL <input type="checkbox"/> 2000-5000 TL <input type="checkbox"/> 5000-8000 TL <input type="checkbox"/> More than 8000 TL <input type="checkbox"/>		
Consumption Preferences:			
Have you ever used this product before?		Yes <input type="checkbox"/> No <input type="checkbox"/>	

(cont. on the next page)

Table A.1. Questionnaire for Adult (Cont.)

How often do you use?	Everyday <input type="checkbox"/> More than once a week <input type="checkbox"/> Once a week <input type="checkbox"/> More than once month <input type="checkbox"/> Once a month <input type="checkbox"/>
Is it possible for you to consume it less?	Yes <input type="checkbox"/> No <input type="checkbox"/>
What do you do with package after you take the product out?	I throw away <input type="checkbox"/> I throw it to the recycling box <input type="checkbox"/> I reuse it <input type="checkbox"/>
Would you use this origamic alternative package instead of this common one? Why?	Yes <input type="checkbox"/> No <input type="checkbox"/>
(if the answer of previous question is yes) Would you reuse it? How?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Additional Questions:	
Have you attended any course/seminar on environment/sustainability during your education/at school?	Yes <input type="checkbox"/> No <input type="checkbox"/>
(if the answer of previous question is yes) Relatively with the education, does your package preference change?	<input type="checkbox"/> Yes <input type="checkbox"/> No

Table A.2. Questionnaire for Children

QUESTIONNAIRE FOR CHILDREN			
This questionnaire below is prepared as a part of the research for my master thesis in Izmir Institute of Technology, Industrial Design Department. The aim of the thesis is to analyze the impact of origamic packaging design on environment. Your personal information will be kept anonymous. Thank you for your contribution.			
Date		Hour/Number	
Gender	Male <input type="checkbox"/>	Female <input type="checkbox"/>	
Age	Children	4-7 <input type="checkbox"/>	7-12 <input type="checkbox"/>

(cont. on the next page)

Table A.2. Questionnaire for Children (Cont.)

Education	Kindergarten <input type="checkbox"/> Primary School <input type="checkbox"/> Secondary School <input type="checkbox"/> High School <input type="checkbox"/>
Consumption Preferences:	
Have you ever used this product before?	Yes <input type="checkbox"/> No <input type="checkbox"/>
How often do you use?	Everyday <input type="checkbox"/> More than once a week <input type="checkbox"/> Once a week <input type="checkbox"/> More than once month <input type="checkbox"/> Once a month <input type="checkbox"/>
Is it possible for you to consume it less?	Yes <input type="checkbox"/> No <input type="checkbox"/>
What do you do with package after you take the product out?	I throw away <input type="checkbox"/> I throw it to the recycling box <input type="checkbox"/> I reuse it <input type="checkbox"/>
Would you use this origamic alternative package instead of this common one? Why?	Yes <input type="checkbox"/> No <input type="checkbox"/>
(if the answer of previous question is yes) Would you reuse it? How?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Additional Questions:	
Have you attended any course/seminar on environment/sustainability during your education/at school?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Did you take an education in the department of Environment and Respect about reusing and recycling?	Yes <input type="checkbox"/> No <input type="checkbox"/>
(if the answer of previous question is yes) Relatively with the education, does your package preference change?	Yes <input type="checkbox"/> No <input type="checkbox"/>

APPENDIX B

TABLE OF CHILDREN

Table B.1. Table of Children

Questionnaire results for children		P1	P2	P3	P4	P5	P6
Have you ever used this product before?	Yes	13	0	173	72	15	173
	No	160	173	0	101	158	0
How often do you use?	Everyday	0	0	5	12	0	32
	More than once a week	0	0	22	15	0	37
	Once a week	0	0	25	8	0	58
	More than once a month	0	0	117	16	0	46
	Once a month	13	0	4	21	15	0
Is it possible for you to consume it less?	Yes	13	0	143	45	15	8
	No	0	0	30	27	0	165
What do you do with the package after you take the product out?	I throw away	11	0	173	72	15	173
	I throw it to the recycling box	0	0	0	0	0	0
	I reuse it	2	0	0	0	0	0
Would you prefer this origami alternative package to the existing one?	Yes	13	0	173	72	15	173
	No	0	0	0	0	0	0
Would you reuse it?	Yes	13	0	173	72	15	173
	No	0	0	0	0	0	0
Have you attended any course/seminar on environment/sustainability during your education	Yes	125	0	125	125	125	125
	No	48	0	48	48	48	48
Did you take an education in the department of Environment and Respect about reusing and recycling?	Yes	32	0	32	32	32	32
	No	141	0	141	141	141	141
Relatively with the education, does your package preference change?	Yes	32	0	32	32	32	32
	No	0	0	0	0	0	0

P1: Package Alternative for Tuğba Kuruyemiş

P2: Package Alternative for Feliz Baharat

P3: Package Alternative for Tofita

P4: Package Alternative for Koska

P5: Package Alternative for Kahve Dünyası

P6: Package Alternative for Milka

APPENDIX C

TABLE OF ADULTS

Table C.1. Table of Adults

Questionnaire results for adult		P1	P2	P3	P4	P5	P6
Have you ever used this product before?	Yes	221	196	387	389	85	399
	No	178	203	12	10	314	0
How often do you use?	Everyday	0	0	8	0	0	21
	More than once a week	36	0	41	7	0	151
	Once a week	29	0	47	18	0	102
	More than once a month	221	61	182	41	8	98
	Once a month	113	338	121	333	77	27
Is it possible for you to consume it less?	Yes	158	98	205	265	47	71
	No	63	98	182	124	38	328
What do you do with the package after you take the product out?	I throw away	335	352	352	352	352	352
	I throw it to the recycling box	47	47	47	47	47	47
	I reuse it	17	0	0	0	0	0
Would you prefer this origamic alternative package to the existing one?	Yes	302	351	358	305	77	151
	No	97	48	41	94	8	248
Would you reuse it?	Yes	91	122	276	126	77	45
	No	211	229	82	179	0	106
Have you attended any course/seminar on environment/sustainability during your education	Yes	17	17	17	17	17	17
	No	382	382	382	382	382	382
Relatively with the education, does your package preference change?	Yes	2	2	2	2	2	2
	No	15	15	15	15	15	15

P1: Package Alternative for Tuğba Kuruyemiş

P2: Package Alternative for Feliz Baharat

P3: Package Alternative for Tofita

P4: Package Alternative for Koska

P5: Package Alternative for Kahve Dünyası

P6: Package Alternative for Milka