

CONTRIBUTION OF INDUSTRIAL DESIGNERS TO THE FOOD  
DEVELOPMENT PROCESS: A REVIEW ON CHOCOLATE DESIGN IN A  
LEADING TURKISH CONFECTIONERY MANUFACTURER

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**CONTRIBUTION OF INDUSTRIAL DESIGNERS TO THE FOOD  
DEVELOPMENT PROCESS: A REVIEW ON CHOCOLATE DESIGN IN A  
LEADING TURKISH CONFECTIONERY MANUFACTURER**

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## ABSTRACT

### **CONTRIBUTION OF INDUSTRIAL DESIGNERS TO THE FOOD DEVELOPMENT PROCESS: A REVIEW ON CHOCOLATE DESIGN IN A LEADING TURKISH CONFECTIONERY MANUFACTURER**

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Although industrial designers are trained to produce new and innovative products, collaboration between industrial designers and food manufacturers is very limited. In today's world, the creation of products, which satisfy the needs of consumers, is realized with the collaboration and contribution of many different disciplines such as food engineering, mechanical engineering, finance, purchasing, marketing etc. However, the wider perspective is needed to survive in the market for food industries.

The specialized project leaders in the product development team integrate the knowledge of different disciplines in the process of creating new food products. In addition to that, when they integrate designers in this process, innovations can be achieved that meet real consumer needs, differentiate from competitors, contribute positively to society and combine long term profitability and growth. A designer can take place in many parts of the food development process such as packaging design, food design, eating design etc.

Industrial designers have great potential to do innovation in the specified properties of the food product since they have a different and creative perspective from food engineers. Therefore, the food industry is better to incorporate designers into product

development processes in order to differentiate from its competitors and to respond to consumer needs accurately.

In this research potential contributions of industrial designers on food development process are investigated and how these different disciplines (food engineers and industrial designers) could work in collaboration is investigated. In order to achieve that interviews are conducted both with food engineers and industrial designers within the frame of research questions.

Keywords: Food Design, Industrial Designer in Food Industry, Collaboration of Food Engineer and Designer, Food Product Development Process, Industrial Designer in Research and Development

## ÖZ

### **ENDÜSTRİYEL TASARIMCILARIN GIDA GELİŞTİRME SÜRECİNE KATKISI: LİDER BİR TÜRK ÇİKOLATA ÜRETİCİSİNDE ÇİKOLATA TASARIMININ DEĞERLENDİRİLMESİ**

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Her ne kadar endüstriyel tasarımcılar yeni ve yenilikçi ürünler üretmek için eğitilmiş olsalar da endüstriyel tasarımcılar ve gıda üreticileri arasındaki iş birliği çok sınırlıdır. Günümüz dünyasında, tüketicilerin ihtiyaçlarını karşılayan ürünlerin oluşturulması, gıda mühendisliği, makine mühendisliği, finans, satın alma, pazarlama vb. gibi birçok farklı disiplinin iş birliği ve katkısı ile gerçekleştirilmektedir. Ancak, gıda endüstrisinin pazarda ayakta kalabilmesi için daha geniş bir perspektife ihtiyaç duyulmaktadır.

Gıda sektöründe ürün geliştirme ekibinde yer alan uzman proje liderleri, yeni ürün yaratma sürecinde farklı disiplinlerin bilgilerini bir araya getirirler. Bununla birlikte tasarımcıları da bu sürece dahil ettiklerinde, gerçek tüketici ihtiyaçlarını karşılayan, rakiplerden farklılaşan, topluma olumlu katkıda bulunan ve uzun vadeli kârlılığı ve büyümeyi birleştiren yenilikler elde edebileceklerdir. Bir tasarımcı, ambalaj tasarımı, gıdanın fiziksel tasarımı, yeme tasarımı gibi gıda geliştirme sürecinin birçok bölümünde yer alabilir.

Endüstriyel tasarımcılar, ürünü geliştiren mühendislerden farklı ve yaratıcı bir bakış açısına sahip oldukları için ürünün belirtilen özelliklerinde yenilik yapma potansiyeline sahiptir. Bu nedenle; gıda firmaları, rakiplerinden farklılaşmak ve

tüketici ihtiyaçlarına doğru bir şekilde cevap vermek için tasarımcıları ürün geliştirme süreçlerine dahil etmelidir.

Bu arařtırmada, endüstriyel tasarımcıların gıda geliştirme sürecine potansiyel katkıları arařtırılmıř ve bu farklı disiplinlerin, gıda mühendisleri ve endüstriyel tasarımcıların, iř birlięi içinde nasıl çalışabileceęi arařtırılmıřtır. Bunu başarmak adına, arařtırma sorularının çerçevesinde hem gıda mühendisleri hem de endüstriyel tasarımcılar ile görüşmeler yapılmıřtır.

Anahtar Kelimeler: Gıda Tasarımı, Gıda Endüstrisinde Endüstriyel Tasarımcı, Gıda Mühendisi ve Endüstriyel Tasarımcı İř Birlięi, Gıda Ürün Geliştirme Süreci, Endüstriyel Tasarımcı ve Arařtırma Geliştirme



To my lovely daughter Defne

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# CHAPTER 1

## INTRODUCTION

### 1.1. Problem Definition

Food is an essential substance that gives needed nutritional support to consumers. In order to survive and live healthy, humankind have to feed themselves with different types of food products which have different types of nutritional sources such as proteins, carbohydrates, fats and son on. Therefore, there is a wide range of food industry to provide consumers' need for nourishment.

The food industry is a hybrid area of different businesses and farmers that together provide food consumed by humankind. All areas of food manufacturing and sale are considered under the definition of food industry which covers different fields such as food engineering, packaging, marketing, designing, distribution, storage, processing, research and development (Allen and Albala, 2007). These different disciplines complement and support each other. Although food is an industrial product, cooperation between food engineering and industrial design disciplines are not very common in today's food industry. For example, the book titled as *Food Product Design: An Integrated Approach*, defines food design as a technological activity based on engineering, technology and social sciences (Boekel and Linnemann 2011: 19). There is not any role dedicated to the discipline of industrial design (Schifferstein, 2016).

Food industry is a sector that grows and develops in order to meet consumer needs. Particularly in line with the needs of fast consumption, industrialized packed foods have a significant place in human life. In that, it becomes more important to produce consumer-focused products in order to be selected from other similar products in the market. Most companies decide to launch their products through the cost, price,

efficiency, and sale strategy of the new product. However, in order to develop a product that meets the expectation of consumers; they need to be analyzed in detail. It may be the first step of a product development process, because without consumer a product is meaningless. At that point, a designer can make a great contribution to food product development. However, most food companies do not have awareness on how the product can change with the touch of an industrial designer and sniff into a form that explains why it exists. Industrial designers have great potential to do innovation in the specified properties of the product. The food industry is better to incorporate designers into product development processes with this knowledge in order to differentiate from its competitors and to respond to consumer needs accurately in order to survive in the market. By the cooperation of food engineer and industrial designer the process of food product design can bring creative solutions and new ideas from a different perspective.

## **1.2. Aim and Scope of the study**

In this thesis, both food engineering and industrial design disciplines are referred. As a food engineer who works as a product development engineer in a well-known food company in Turkey, the author of this thesis put the knowledge of the process of food product development and as a master student in industrial design, she reveals the correlation between these two disciplines. Someone from the discipline of food engineering can handle this thesis with features such as food content, processing conditions, packaging type or quality only. On the other hand, an industrial designer who has no knowledge about food engineering would work on this topic by focusing more on appearance, form and packaging design of the food product. Although the food would be considered as an artisanal product, in this thesis food products, which have capability to be produced in industrial scale, are handled.

A multidisciplinary study is needed to examine the product design for the consumer. This research also provides a source of information about the importance of the design of food products in eating experience. In the light of this information food producers

would take into consideration to cooperate with industrial designers to create a consumer-focused design, which is proper for their brand. On the other hand, it is aimed to encourage industrial designers to design new food products in collaboration with food engineers during the food product development stage by showing that food is also an industrially designable product. In order to achieve this, the general structure of the study is based on the following questions:

1. What can industrial design bring to the food industry?
2. How does a designer contribute to the process of industrial food product development?
  - a. What creative solutions does an industrial designer bring to an industrial food product?
  - b. How do the creative solutions that an industrial designer brings about change the product?
3. How do these two different disciplines; industrial design and food engineering contribute each other?
4. How do food engineers and industrial designers work in collaboration? What are the factors and limitations in this collaboration?
5. How should the industrial food sector involve designers in the food design process and what kind of tasks and positions can they deliver and hold?

### **1.3. Definition of terms**

In order to understand terms that are mentioned in this thesis some important ones are explained. As a main object *food* is defined as an industrial product, which is sold in stores, where meet the consumers. *Food design projects* means designing physical properties of a food product, determination of all decision points to finalize a product; ingredients, production method, consumption ritual, marketing etc. It can be mentioned with/without packaging. *Perception of consumers* is an impression of a consumer when s/he contacts with the food product. *The food product development process* is all the decision points taken from the introduction of the idea of new product

development until the product meets the consumer. *Visuality* means the physical view of the food product. *Model* is used to define structural design of a food product or molding of a food product.

#### **1.4. Structure of the thesis**

This thesis consists of five chapters. Chapter 1 presents a brief introduction pointing out the significance of the study, and the goal and scope along with the research questions.

Chapter 2 presents the literature review. It starts with a brief overview of development of food industry. Then, it continues with contribution of industrial design discipline to food industry. Following, opportunities and challenges in collaboration of food engineers and industrial designers are mentioned.

Chapter 3 focuses on the current status of industrial design in the food industry. It was introduced how food design affects consumer perception and how important design is in the product development process.

Chapter 4 is about the contributions of industrial designers to the food development process are reviewed on chocolate. It summarizes the research method for this study, focusing on qualitative research methods and technique used for the analysis of data along with findings and discussions.

Chapter 5 summarizes the overall conclusions considering the findings from the field study and literature review by revisiting the research questions. Then, it discusses the implications of the study for design, which includes a table presented as the output of the thesis. At the end limitations and recommendations for further research are presented.



## **CHAPTER 2**

### **THE REVIEW OF THE RELATED LITERATURE**

The food industry has been tremendously altered and improved over the 20<sup>th</sup> century with the purpose of satisfying customer needs and acting with the contemporary trends of consumer needs. It can be stated that, food industry is developed through a complicated system of activities related with supply chains, consumption trends, appropriate storage and logistics of food products across the entire earth. However, another vital factor affecting the food industry, food design, must be investigated in detail with the intention of explaining the cooperation between food industry and industrial design.

In this chapter, the current status of food design and designers' efforts in the food industry will be discussed under subsections such as progress of food sector, consumer decisions and requirements for food selection, food design for industrial design, innovation in food design. Then potential contribution of industrial design discipline to the food industry will be reviewed with the contemporary design examples and studies in the literature. Later on, opportunities and challenges in this inter disciplinary collaboration is going to be examined with current models, academic and industrial studies, and conceivable co-work possibilities. Finally, improvement of designers from working with food industries will be given with literature review.

#### **2.1. Development of Food Industry**

The progress of food sector has been accelerated after the industrial revolution in 19<sup>th</sup> century. Since the transportation opportunities boosted through national and international railroad systems, the delivery time of food which is an easily putrefying material, is lessened at a significant ratio. The developed steam engines allowed the

improvement of logistics in supply chain of food sector in various ways such as railroads, sea routes and land-based systems (Scott, 2013).

Food was carried in long distances to acquire from farms and production sites to markets and distribution centers while keeping its freshness to guarantee the adequate taste and safety. Since all foods endure changing grades of deterioration during storage and transportation, appropriate packaging and logistics methods were needed to be developed (Potter and Hotchkiss, 1998).

Refrigeration is a crucial food storing method that contains a thermally shielded box and a chemical, mechanical or electronic heat pump for removal of heat from the interior of the box to its exterior. The fridges for home use are invented in 1913 and got an extensive usage after 1920s' (Heldman, 2003).

These two technological developments on logistics and storage of food lead to a novel area of study called food packaging design in this sector. In the second half of 20<sup>th</sup> century, technological advances in computer-based drawing tools allowed industrial designers to be a vital part of food industry as well as other sectors such as automotive, machinery, furniture etc. (Scott, 2013).

Most distinguished innovations of food sector came into reality in the field of packaging. Modified atmosphere packaging (MAP) augmented shelf life such as milk which was begun selling in plastic containers, and cooked food in meal bags popped up (Kevin, 2004). In 1970s products with MAP reached the markets (Blakistone, 1998). Later on, commercial utilization of aluminum cans for food and beverages begun with improved mobility and transportability.

Industrial designers have frequently been employed in the packaging design sections of food sector. Packaging not only shields food from exterior impacts such as dust, insects, micro-organisms, moisture, air and light throughout the logistics and storage phases (Robertson 2013; Dekker 2011) but also carries info regarding the ingredients

of product, fabrication date, user instructions, final consumption date and the like. Moreover, probably the most trade centric and subliminal mission of packaging is amalgamating brand name with an attractive image and invite potential customers (Rundh, 2009; Klimchuk and Krasovec, 2012). Consequently, food packaging employs a critical portion of food creation in a trade system.

In addition to packaging and even more than that, industrialization and globalization have both extensive impacts not only limited with the food sector but also in every production and manufacturing cycle. There have been two major issues related with the extensive trading of the food products, first industrial revolution and then liberalization after the World War II. The improvement of advertisement opportunities with the invention of television and internet also boosted the overall food trade capabilities and consequently food production phases have comprehensively improved. The storage and logistics technologies encouraged the food trading to overseas countries. This yielded in the local food producers being more involved in the global market, and food industry has been emerging over the last half century (Ospina, 2018).

### **2.1.1. Current State of the Food Industry**

The food industry is a complex sector with enormous diversity and challenges in its involvement into the global food supply chain. Some products can be sold directly to the costumers or used as ingredients in other food cycles. On the other hand, other food products that are directly processed, can be used, or undergo further processing, for instance, cooking either by the consumer or retailer. Also, the range of commodity type, that is, matrix composition, spans from the simple to complex, and to the food industry, regulatory agencies, and the consumer. This complicated structure forces food sector to work in harmonization with chefs, scientists, engineers, designers, etc. (Lampel and Wilson, 2016).

The snacking sector in food industry has already reached at \$89 billion and growing at a 3% rate each year. (Mintel, 2018) In this statistic, every item someone eats and drinks outside of what considered being full meals is defined as snacks and it has been observed that 94% has a snack food everyday with average number of 4-5 snack foods eaten. In addition to this, 91% had a snack beverage everyday with average number of 4-5 snack beverages drunk (Datassential, 2017). This yields creation of an enormous market which industrial designers play a vital role in every phase of the food creation.

### **2.1.2. New Product Development Process in Food Industry**

The greater part of food products undergoes various types of processing and then they can reach costumers. Some of the processing has broad impacts thus almost the consumers do not have any preparation for eating the food. Processed food sector stands for one of the biggest industries all over the world.

Food manufacturing industry can be defined as the sector that transforms agricultural harvest into products of food for eating and consumption. Even though the processing simply comprises negligible modifications, for instance meat slicing or peeling of fresh products; in the food sector processing is strongly related with more multifaceted goods, for example baked foods, soups stored and sold in cans and frozen meals such as pizza, meat, fish etc. These products are mostly sold in supermarkets and almost ready to consume after simple activities like heating in microwave and so on.

The processed food manufacturing industry can be considered as having several types of actors with varied magnitudes. The food industry includes large multinational companies, which basically sell brand name and company specific labeled products in a variety of food categories to small processing plants and firms with few workers to establish an individual local brand or product with improved customer loyalty.

Food retailers are becoming gradually more significant in the food industry, not only due to the key role as distributors and promoters of processed food products. On the other hand, data related technologies have been emerging and yield retailers the

capability to control the food products made by food manufacturers. Over the past decades, the food retail industry has been spectacularly altered driven by the expansion of novel food retailers for instance big box supercenters (Martinez, 2007) and improvements in technology have transformed sales tracking (Leader and Cuthill, 2008).

Supermarkets and warehouse sellers have augmented their shares of food at home products significantly at the expense of traditional food retailers. Other small retailers have even partial product assistance than supermarkets, but they have extended their food service in recent years (Martinez, 2007).

Retailers in Turkey have huge purchasing power, thus well-known retailers (such as Migros, Şok, A101 nation wise) have the capability to manipulate the types of products created by food producers by shaping which food items can be placed on the limited space of retail shelves (Martinez, 2007). The development of automated inventory analysis and control software also has provided retailers with powerful tools for finding which foods can be sold better and quickly and, allowing retailers to decide on which items they are keen on putting on their shelves and selling to consumers. Food products have to be compatible with limited space on retail centers, and food producers have to develop and design their products that can create high incomes for retailers with the intention of keeping on in the market share positions (Leader and Cuthill, 2008).

As the retailer forces manufacturers to invent and design novel food products, processed food manufacturers shape their organizational schemes and create big groups of staff with a range of skills such as industrial designers, food engineers, market researchers, food scientists, nutritionists, chemists, microbiologists, controllers and other workers. In Figure 2.1, the detailed organization of these professional groups with operations, customer, technical, and administrative expertise are depicted.

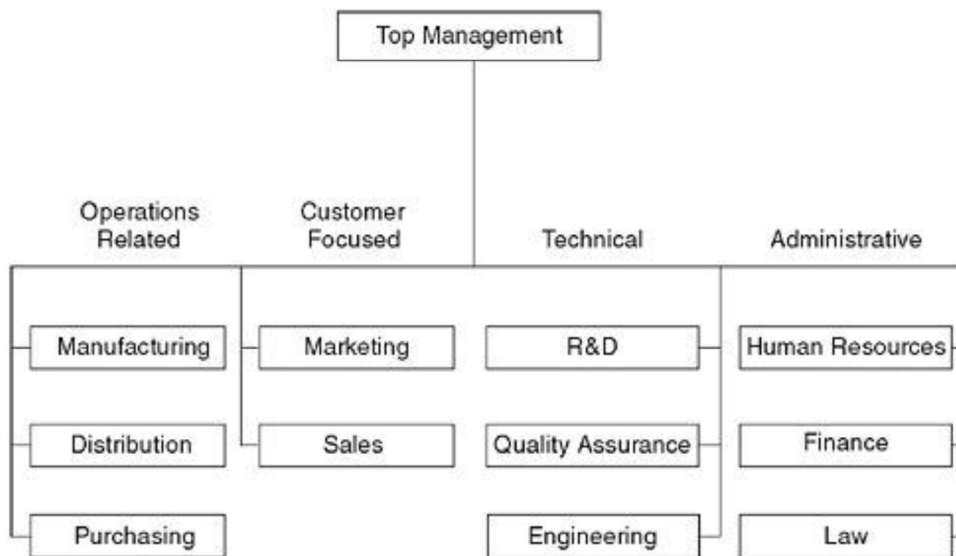


Figure 2.1: Business groups involved with product development (Beck, 2008)

Research and development groups inside food manufacturers are concerned with not only developing novel products but also reformulating current ones. International food producers can perform several of their research and development studies at global research institutes (Nestle, 2007). However, in other local producers' R & D employees can be inadequate, and a limited number of engineers and scientists can be in charge for numerous activities (Beck, 2008).

One of the most important topics are related with connection between food producers and ingredient suppliers, external contract developers, and consultants. Since as external partners they are also involved in food progress phases. These actors are very beneficial in employing know-how that is significant for producers and lessening overall in-house research cost (Beckley et al., 2007). Consultants can be experts from other private companies or academics from universities that have numerous experiences on research and generating revenues (Fuller, 2005).

The food producers get into the expensive and long time required procedures of novel product design phases related with the subsequent reasons (Fuller, 2005):

- Novel or reformulated foods are required to sustain and develop manufacturers' business portfolio since some products come to the end of their life cycle and sale ratios decrease dramatically;
- Market demands occur precisely for healthful products;
- Innovative methods and technologies allow to create novel foods and improve feasibility of food manufacturing;
- Alternations in governmental rules and policies force producers to reformulate current products or generate inducements for novel food design and reformulation such as achieving limitations for health regulations;
- Novel or reformulated foods are mandatory to react against competitive market rules.
- As the consumer generation changes, novel ideas and needs come from consumers.

Food development process commonly contains a series of important phases, which are illustrated in Figure 2.2.

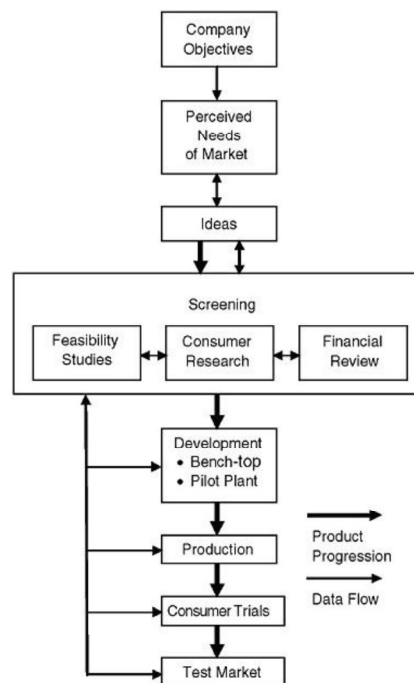


Figure 2.2: Phase of new product development (Fuller, 2005)

Valdovinos (2009) more basically classified this process into four phases,

- Idea generation;
- Concept development;
- Plan and design;
- Launch and produce.

Multinational food manufacturers have professional marketing departments in order to search and determine customer behavior and collect data on the present food industry. This helps manufacturers to generate plans and decisions on how to meet customer desires and create successful foods through the production processes (Straus, 2009). Ideas for novel production can pop up through several interior and exterior factors that is given below, then professionals gathered from various departments conduct brainstorming to evaluate and find the valuable production plan (Straus, 2009; Topp, 2007).

#### Interior Resources from Food Manufacturers

- Business and marketing departments
- Research and development groups
- Sales and packaging experts
- Regulatory affairs departments

#### Exterior Sources from Food Manufacturers

- Other food manufacturers
- Suppliers
- Customers
- Distributors and retailers

The motivation of distributors and retailers are very significant for food manufacturers since they are the first-hand buyers of the product. Thus, manufacturers have to induce retailers to stock new products. The business department of manufacturers can



approximate the manufacturing cost and the prospective earnings so that the company can make a decision on which product ideas are mainly expected to be doing well in the market (van Boekel, 2009; Topp, 2007). When the food product notion is selected for production, benchtop development phases start working. Benchtop phases entail generating prototype products and creating former plans for processing factors (Kramer, 2002). High level understanding of many process disciplines such as food science, engineering, chemistry, microbiology, and packaging is employed to generate trial food products to find out the product aspects within the requirements and rules of the modern food processing techniques without exceeding the proposed product cost limitations. As initial products are produced and tested, the most capable formulations undergo the test procedures, then they can be sent to mass production.

Field experts and marketing staff are responsible to verify how the initial products are received by customers. The appearance and taste of the product is tested as well with the customers' attitudes to the new product aspect (Cox and Delaney, 2009; Moskowitz, 2009). Initial products tested in the field with real consumers can be modified to satisfy customer needs according to focus group and sensory scientists' feedback, (Kramer, 2002). Shelf life of the products must be measured carefully to meet financial plans and also guarantee food quality and safety (Saguy and Peleg, 2009).

As initial products are finalized after the successful test procedures, further planning has to be done for mass production. Production engineers and business departments decide on the facilities and infrastructures needed and whether the manufactured foods can be created in-house places or partners' co-packers (Weinstein, 2002).

Purchasing department struggles to procure the required contents and necessary packaging materials (Fuller, 2005). Business and sales experts plan for launching of the product, including advertisements in the target markets (de la Huerga and Topp, 2007). Additionally, and synchronously, sales experts meet with distributors to advertise and pitch novel products. Regulatory department makes sure that the food

product and its packaging are appropriate to the governmental standards and rules (Fuller, 2005). After all these steps are accomplished and necessary regulative actions are done, the final stage of food process can begin.

Although the concluding launch and production phase can be stated as the final step; most of the food manufacturers pursue to test their food after the preliminary launch and add supplementary ingredients or do necessary modifications in the previous steps. Test markets also can be employed in order to lessen the threat of large product failures. Initial product launch can be done into a small market compared to real one. The amount of accomplishment in the test market can guide to a larger movement to real one or the company can recognize some problems in the food that has to be solved and further research and development procedures must be applied (Fuller, 2005).

Food manufacturers continuously apply R&D procedures for reformulating products with the intention of (Fuller, 2005):

- improving sensory or dietary features such as elimination of contents realized by customers as unwanted,
- defeating troubles with ingredient accessibility;
- lessening ingredient or manufacturing costs;
- employing novel methods and technologies;
- generating novel market positions for the product;
- sustaining the legislation of food products once the regulations are altered;

accomplishing dietary health statements or other regulations to permit for front-of-package labeling (Webster, 2009).

## **2.2. Contribution of industrial design discipline to food industry**

The contribution of industrial designers has huge impact on almost every sector. Since industrial design requires innovative solutions beyond traditional behavior, industrial designers can contribute to the design and production procedures more than realized.

On the other hand, industrial designers can entail almost all phases of the processes. For instance, in food design, not only in packaging but also the model of the food itself can be designed. Also shelves to present products or supermarkets can be organized through design tools and activities. In view of the fact that designers manage process phases in computer-based systems and avoid retries and tests consuming time and money, designers mainly lessen overall operational cost and time wasted.

In this perspective, potential contribution of industrial design discipline to food industry for new product development process must be discussed in order to clearly define industrial designer's capabilities. Then, continuous innovation and product development can be examined and food project development in coordination with various disciplines has to be described.

Food product development processes must be planned methodically, and commercially oriented research has to be applied in order to develop food products and processes fulfilling the customers' requirements. In addition to this, food product development is a technique of industrial research by its own. Thus, industrial design professionals must be positioned as a vital part of the team. Food design is an amalgamation and common functioning of natural and social sciences.

As the populations and family incomes rise with altering lifestyles, novel food products must be offered. Most products preferred as processed, since people have limited time thus processed food can save their time and money. These consumer's concerns bring pressure for transformation in food industry. Thus, industrial designers' innovative thinking methodologies with their capabilities of creating innovative solutions to challenging problems can be employed in food sector as well.

It can be significantly noted that multinational companies and local firms are in search of achieving value-added food products to encourage import. As the storage and transportation capabilities increase, growth in trade of processed food products will be augmented. Thus, trade flows can be as well shaped according to the increasing degree by the altering scope of the global food industry.

Industrial designers have to propose solutions for food production processes in order to;

- Lessen overall prototyping costs and time
- Improve packaging features
- Enhance storage and freezing capabilities
- Augment logistics
- Effectively manage food demonstration in supermarkets (Schifferstein, 2016)

There are certain fields that require expertise in the food design process. These fields cover different works of disciplines (Moskowitz, Saguy and Straus, 2009). The success in food design can be achieved with the combination of following procedures as given in

Figure 2.3.

1. Defining and meeting target consumer needs and expectations,
2. The right food combination,
3. Proper packaging and preparation,
4. Appropriate marketing and market shelf placement,
5. Meeting corporate logistics and financial imperatives.

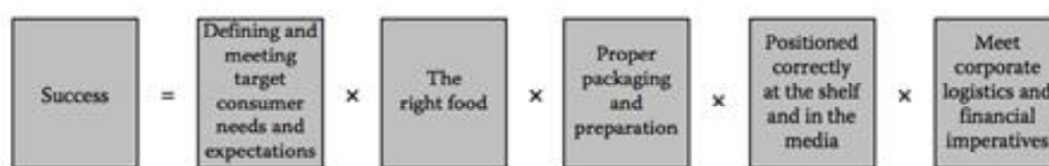


Figure 2.3: Definition of novel product success equation (Moskowitz, Saguy and Straus, 2009)

### 2.2.1. Continuous Innovation and Product Development for the Future

Food innovation is a crucial aspect for food producer companies in order to achieve the planned goals by providing the correct foods to the market with quickness and creating major distinction in terms of economics and quality. Innovation phases of

food products employ the traditional consecutive procedures illustrated in Figure 2.4. Decision for innovation is made and the idea of product is generated. Then, the idea is screened. That is a design review step. After that, the concept and prototype are developed. The concept is tested and validated. Later, the product and process are developed and validated by tests. At the end, the product is introduced to the market. The market performance of the product is tested. This scheme is recognized as New Product Development (NPD) process and operated by two key contributors of R&D and marketing (Huang, 2007).

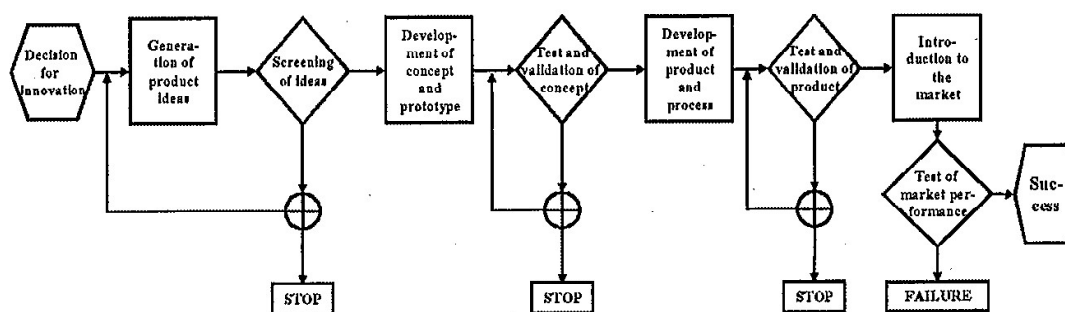


Figure 2.4: Classic model of innovation process (Weindlmaier, 2001)

Effective food innovation is critical for producers to accomplish supportable development and profitability in terms of financial assets. Over 60% of food companies believe that merchandise innovation or product range modifications for healthier food can lead them to revenue growth. In food industry, accomplishment of strategic goals is mostly reliant on novel product innovation. Due to this situation, food producers plan on successfully providing novelty products to meet their strategic goals. In food industry the failure rates of novel food products are higher than any other manufacturing industry and these rates can climb as high as 90% (Barska and Wojciech, 2014; Bigliardi and Galati, 2013).

Food producers frequently aim to devote less than 2% on R&D and innovation for novel products from their annual financial earnings. Unfortunately, this strategy is an obstacle to innovation and R & D achievements in the food industry. The improvement

of R&D activity and innovation have been realized after the importance of global health and wellness market has been seen by food producers (Raymond et.al, 2015).

### 2.2.2. Project Development Coordination with Different Departments and Disciplines

The food sector mostly preferred to use design concept associated with packaging and advertising activities. The other accomplishments are named as product development, formulation of the product and sensory events. However, in current applications adaptation of food product development connecting with design areas is a widely appropriate approach (Earle et. al, 2001).

The expected food product is a combination of consumer needs, quality of its content, with appealing appearance in terms of its packaging and the food itself, eco-friendly structure and functionality and satisfaction in sensual and taste aspects. At this point, food product design turns into the combination and coordination of the various technical and social disciplines such as customer and market research, technology development and engineering study with design preparation as shown in Figure 2.5.

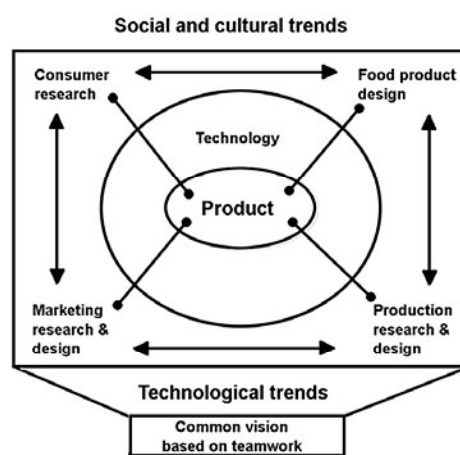


Figure 2.5: Integrating the main disciplines in product creation (Blaich and Blaich, 1993)

Food product design is a critical step for food development since it requires collaboration among engineers, scientists, market researchers and customer analysts (Blaich and Blaich, 1993). In this collaboration process,

- Customer analysts shape the affiliation between customers and the food product.
- Market researchers investigate current food market conditions and arrange the marketing and delivery approaches related with the market scheme.
- The food engineers, scientists and technologist study on the product and the development process simultaneously to arrange the production of food and its physical appearance.
- The food product designer explores the public and traditional circumstances related with the product.

It is vital to indicate that; the collaboration of design phases requires synchronous studies in an iterative closed loop concept. Thus, every research finding of a specific discipline has to be used to improve process and has the power to influence the development procedures.

### **2.2.3. The Integration of Expertise**

In novel food production development phases and improvement of the existing foods, industrial designers have a critical importance since they can collect data effectively to be implemented in the development phases and they have diverse perceptions and viewpoints on the project at hand. This powerful capability of industrial designers can be located at the center of design phases in order to integrate their valuable expertise.

In several cases, such as leading the origination procedures and simplifying teamwork between the numerous development disciplines with creating necessary design tools can be done by industrial designers. Design tools for providing data collection, increasing development inspiration and teamwork, communication and management aspects play a crucial role in development of food product.

Bruns Alonso et al. (2013) propose that the designer can play the fundamental role of old-style chefs in mixing the various categories of firm know-how in food companies. Since in old fashion firms, the success of the product is depended on few people who

are familiar with the procedures, once they quit the company most of the know-how disappears. However, as industrial designers get involved in the design phases, the automatization of development and dissemination of food development know-how through the company can be achieved. Actually, industrial designers have a tendency to define themselves as accumulators and integrators of information (Bohemia, 2002).

Industrial designers constantly evolve and modernize the development phases as a result of feedbacks from internal meetings, returned data from customers and analysts. The demands of several project partners can be processed and balanced by industrial designers in order to find the optimum approach (Valencia et al. 2013; Calabretta et al. 2014).

#### **2.2.4. Moving Forward with Right Decisions**

Kristbergsson (2011) defines that novelty in food development is a decision-making process, and each innovative creation is a summation of choices regarding formulation, advertising, manufacturing, and innovation administration. A project executive has to be assigned in the project as the decision maker. In addition to this, managing the harmony and time concerns of the project has to be done by this leader. Collected data from the development phases have to be analyzed in regular meetings, and major decisions have to be taken by the board of directors and executive committee.

In design and development procedures, there has to be applied various trade-offs to move forward with the right decision. A trade-off can be defined as a situational choice that encompasses lessening or dropping one feature, extent or asset of design in the profit of improving further facets. In the modest expression, a tradeoff symbolizes a concept where one design factor escalates and the other one must decline.

Thus, tradeoffs are critical in food design and development in all its aspects to get into the right direction. In most cases, the factors such as producing cost, food appearance, packaging considerations, logistics and replacement of food in markets must be



considered and analyzed simultaneously. This mandatory situation yields industrial designer to influence the overall food development phases.

For instance, the most significant packaging characteristics for all food are the opening features, which appeared to effect customer buying choices for food products. Great number of customers is ready for a minor rise on charge for extra handiness or tamper-evident characteristics of the package. Thus, designers have to process the situation and do necessary trade-offs to take the right decision (Jinkarn and Suwannaporn, 2015).

### **2.3. Opportunities and challenges in collaboration**

Although industrial designers contribute to food development phases with their wide scope of data analysis capability and creativity, some major challenges occur due to collaboration obstacles. As these challenges and obstacles are removed, the development procedures can be improved and better products in terms of cost, quality, customer satisfaction etc., can be achieved.

#### **2.3.1. Factors that may obstacle the employment of industrial designers in food industry**

The capability of industrial designers to boost food novelty and production processes is enormous. However, the most of producers in food sector are unaware of industrial designers and their capabilities. This perception is based on the restricted imagination of industrial designers by company executives (Schifferstein, 2016).

Industrial designers cannot be seen as limited in creating beautiful things in terms of color and shape, more than that they can involve in almost significant choice the food company makes. The modern food design considerations are forcing design through the whole phases such as product formulation, packaging and labeling, shelf placement, customer interactions etc. (Ignatius 2015).

An additional obstacle causing low involvement of industrial designers in the food sector can be stated as the extensiveness of the problematic assessment phases lead

food producers' administrations behave uncomfortable. Industrial designers have to be free to be imaginative and pioneering to be more efficient and productive. As a result, food manufacturers are likely to be outcome-focused, with partial budgets and performance goals. Thus, this yields obstacle and limitations on industrial designers' implementation and creativity.

Also lack of support from company collaborators is a critical complication for industrial designers who must feel themselves protected and comfortable in terms of financial and job guarantee issues (Nussbaum 2013).

In addition, food sector is an extremely multifaceted sector with comprehensive expertise and close to be progressive and interested in working with diverse sectors, fields and circumstances. Lundahl (2012) states that the food sector can be defined as historically slow to embrace change. Since food producers are mostly grown from family companies in farming groups, they concentrate on finding a market for products from local farmers, and not on innovation.

Another obstacle to change in food industry is the huge penalties of minor fails in the making routine of a food. Since production capacities are so high and income margins are small, any change can cause big impacts on the company itself (Schifferstein, 2016).

Additionally, food production phases are secured harshly by administrative rules and regulations guaranteeing food safety, thus every minor modification can cause entailing enormous investments in novel devices and labs (Schifferstein, 2016).

A different object for lack of designers in food sector is that the food product itself is perishable. Therefore, slight alternations in the food content, packaging or market placement can disturb the aim of customers consuming the food (Schifferstein, 2016)

### **2.3.2. Progress of industrial designers working with food industries**

Industrial designers have the huge capability of modifying and improving the related issues in food sector such as food appearance, content, packages and tableware etc.

This high modification capacity enables them to adapt alterations in the food merchandises, logistic and storage arrangements. As a result of this effort, long-term improvements can be achieved.

For instance, Lundahl (2012) claims that there is a methodology in which multidisciplinary teams work together, including measurable and qualitative procedures for developing researchers' predictions of customer engagement.



## CHAPTER 3

### THE CURRENT STATUS OF INDUSTRIAL DESIGN IN FOOD INDUSTRY

#### 3.1. Current status of food design in the world

Food design is the activity of processing food more efficiently with the intention to promote the action of purchasing edible materials in a particular situation, location or consumption place in pleasing way. Food design studies on the motivation behind the consumers' food experience with the purpose of adequately meeting the needs of the customer with design modifications. Food design handles edible products, communication with consumer, packaging of product, service methods and locations associated with the marketing and consumption of food (ADI Food Commission, 2014).

The current status of the food design can be well understood through the examination of food industry from the perspective of consumer decisions and the need for innovations in the sector. Thus, contribution of industrial design to food sector is a consequence of customer requirements and presentation of food in an attractive approach since customers' needs shape the food process. Food companies have to analyze customer requirements in order to manage their process flow, packaging design, food ingredients, storage capability, market distribution etc. Success in this analysis can yield improvement of the overall sells and profit (Van Donk, 2001).

In some food design definitions especially by chefs, the food itself with its ingredients and recipe was brought to the fore, however after the integration of food sector with industrial design disciplines the accurate definition was matured. The contribution of industrial design to food market can be stated as (Boujut and Lincas, 2009);

1. Improving product quality, safety and traceability
2. Boost competence in national and international markets

3. Propose products satisfying customer needs
4. Propose inventive and novel products for reaching new markets.

Stummerer and Hablesreiter (2010) introduced a definition focusing on the food by itself. “Food design can be stated as the design of edible objects, which includes all processes from the cultivation/breeding to the preparation of food and all decisions made to decide food as an item; more accurately the design of taste, consistency, touching, surface, the sound of chewing, smell and all other related features addressing the sense organs.” In this context, the preparation procedures of food are emphasized compared to how it is served. Nevertheless, much more inclusionary perspective has to be indicated, in order to satisfy the customer requirements. The consumers have the first interaction with the representation and packaging of the food rather than its composition. Packaging plays a vital role to give consumers the initial movement of buying items.

On the other hand, Vogelzang (2008) proposes a general statement for food design.

“Food design is part of a larger discipline can be named as eating design and is the actual and literal design of food where food, as subject and thus material, is being designed. This could augment the eating involvement, but it could help to widen an ideology or to fight food waste. Food design is a significant part of eating design, which is the practice of designers employed on the matter of food. The resulting product is not certainly lone the material of food itself but more than that it can as well include a system or a service. Eating design interacts a large area related with engineering, science, psychology, nature, culture and society.” (Vogelzang, 2008)

This definition is very convenient for the purpose of examining the interdisciplinary status of food design since it is not only related with cooking but also has tight connections with social and industrial science disciplines. Schifferstein (2016) stated an explicit distinction between food and eating design with their sub disciplines and areas of interest.

“Food design includes the overall activities to perceive in the awareness and to permit the formation of a novel food product, identifying its materials, recipe, preparation, packaging, appearance, instructions for storing and serving. On the other hand, eating design comprises accomplishments to consider and to support the design of a novel way of preparing and consuming a variety of foods. The foods’ features and environment can be specified by the techniques of consuming, storing, preparing, cooking, eating, logistics of the foods, and finally the method of waste disposal.” (Schifferstein, 2016)

Planning the food design phases is another vital point in the food industry. The planning must include whole activities starting from the cultivation of ingredients and food material to the end point of service to the table and even disposal of the food. Since waste of food is an imperative instrument and input for bio-energy and energy conversion, the future work in food design shall comprise this research field as well.

A notion for a food table preparation and service or a menu proposal is correspondingly food design. However, this requires a wider range of awareness such as educational knowledge or cultural norms related to food. These activities have their particular influences upon customers, traditions, behaviors, and practices of food culture.

Below are the definitions of 'Food Design' by experts from different disciplines;

‘Food Design’ is a new concept, which correlates food and its appearance, eating experience, its touch and the sound while it is breaking. ‘Food Design’ means the design of all edible objects. From planting to food preparation, it includes all the decisions taken for the design of taste, consistency, texture, surface, chewing, odor and all other object characteristics. (Stummerer and Hablesreiter, 2009)

According to Vogelzang (2008) food design is part of ‘Eating Design’. Food design is the actual design of food where food material is being designed. This could be to improve the eating experience, as well as to fight food waste or to communicate an ideology. Food design is a significant part of eating design. Eating design is the subject

of designers working on food products. The outcome does not have to be a food material. It can also be a service or system. Eating Design covers a wide range of science; psychology, nature, culture and society (Vogelzang, 2008).

Anna Cerrocchi, who organized the first Food Design competition and exhibition in 2001, sees food design as a part of design, calling it ‘design process’. Food Design is a design process that is based on the needs of users, modifying one or more properties of food, tools, ways and objects associated with consumption, to develop the mental and physical fulfillment of the food itself (Cerrocchi, 2010).

The following two definitions from designers and chefs in the food and beverage industry bring food design to cooking, the visual aspects of the food and the content of food: Food Design is where the art of cooking begins. Each meal begins as an idea such as an image, a feeling or a smell and at the end it is turned into an unforgettable souvenir (Briscone and Parkhurst, 2018).

Food Design is the art of presenting food in a way that improves its integrity with visually attractive, mouth-watering view (Girard and Spiegel, 2014).

Food Design is the activities that create a new food product; determine the ingredients, preparation, recipe, presentation, packaging, preservation and storage instructions (Schifferstein, 2016).

These are a variety of definitions, which are different from each other, since researchers have different backgrounds. Some of them consider food design as the visual design of a physical food product; some of them consider food design as a whole with packaging, eating experience and consumer-product relationship.

### **3.1.1. Innovation in Food Design**

The food industry deprived of industrial designers’ contribution will face the lack of innovation to create novel products. Since industrial designers have the experience and perspective to create innovative products to satisfy customer needs (Costa and Jongen, 2006). Industrial designers are liable to overcome design challenges and



manage the scope of the food projects in a broadening manner by merging their experiences with design tools and customer needs (Costa et. al, 2003). Accordingly, industrial designers can deliver further pioneering solutions, which can lead project phases of production, packaging, marketing concurrently. Industrial designers are additionally capable of creating tools and methods dedicated to food design such as TRIZ and C-K, which propose general framework for understanding innovative design (Van Donk, 2001). This yields further improvement on the food sector. In general viewpoints, industrial designers can accomplish food product development procedures by enabling collaboration among various disciplines and perform a vital role in integrating their knowledge. The innovation in food industry can be achieved by consolidation of industrial designers' performance, which provides consumer needs' satisfaction, positive influence on public and amalgamating lasting profitability and financial development.

Innovation studies in food sector begin with identifying a customer need and struggling to propose a solution to this requirement through a technological perspective. Food companies frequently manage to perform customer surveys through numerous phases of the food production. This leads companies to take critical decisions for innovation projects (Moskowitz and Saguy 2012).

In contrast, Moskowitz and Saguy (2012) state that product advancement in the food sector is properly a deliberate routine since the sector has a conservative structure in a general form due the stable and unchanging habits of the customer. Consumers mostly addict the products they like for couple of years and it is better for companies to keep and improve that product (Rama, 2008). This also keeps customer satisfaction high and market shares improving. The food habits of public do not alter rapidly. Also, food neophobia, which is an overwhelming fear of new or unfamiliar foods, can affect the publics' acceptance of new food products (Pliner and Hobden 1992). For instance, technological developments such as microwave technology boosted industrial designers' contribution both in terms of ingredients and packaging. Microwave

utilization requires further improvement on the food packages to be compatible with radio frequency.

Novel product development in food industry requires strict customer, business and technology interaction. Industrial designers can be placed at the center of this loop in order to communicate with each partner and develop the required needs as shown in Figure 3.1.

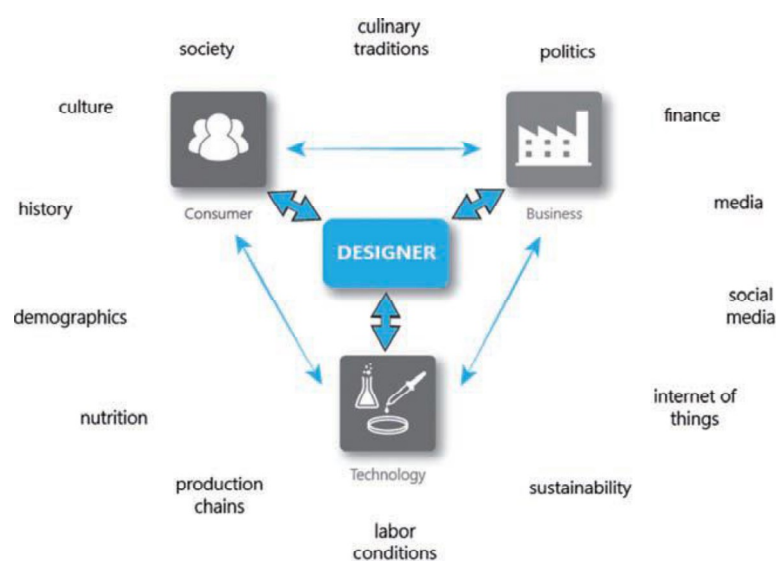


Figure 3.1: Role of the designer in food innovation (Schifferstein, 2016)

Industrial designers can impact the visual design of food product besides the food package and its market. The innovation in food sector can be accomplished by the full integration of industrial design processes to the food production phases.

### 3.2. Design points affecting consumer decisions and requirements for food selection

The consumer food choice is affected in a major manner by food products' prices and quality and also related with consumers' income. The understanding of quality definition through consumers has undergone significant modification during the past decades. Current consumers' food quality discernment can be classified into groups of

quality attributes for food products: sensory attributes, health attributes, process attributes, and convenience attributes (Brunso, Fjord & Grunert, 2002; Grunert, Baadsgaard, Larsen & Madsen, 1996).

The major aspects influencing consumer decision on food products can be investigated under the packaging design, first impact of visual arousal of the food itself, sensorial experiences that consumer gets during eating and the communication of product and consumers during the purchase decision time.

### **3.2.1. Packaging of the food product**

In order to improve the selection of packaged food products such as chocolate confectionery, it is significant to ensure that the product packaging is designed in an attractive and informing manner (Talbot, 2009).

Wang (2013) investigated the customer attitudes concerning visualization of packaging and its impact on supposed product quality and food preference. The outcome of the study proved that assertiveness of food product's package has a straight encouragement on consumers' decisions, perceived product quality and brand selection. As a result of this demand, excluding quality and ingredients of food, which affects overall cost, the food product value can be improved through packaging indirectly.

Visual representation of the food product package also implies the efficient communication and brand management strategies for manufacturers and marketers. The easiest and the direct methodology to communicate with customers for sending product messages is related with the packaging design. Thus, growing number of manufacturers aim to re-organize their supply chains and re-designs visual qualities of their packaging to generate a healthy and an aesthetic form' of their product.

Horska et al (2011) investigated the consumers' food choice and quality perception. A comparative analysis of customer behavior in selected Central European countries (Poland, Czech Republic and Slovakia) is conducted. Food hygiene, product safety,

taste, brand name, product packaging, quality mark on the package of product and system of quality safety during production are considered as the selection metrics of the study. The survey results have shown that;

- Packaging with the quality symbol influences very positively the Polish consumers,
- Design of the product package plays a very significant role in the Czech consumer behavior,

Packaging design has a very low perception by the Slovak consumers.

### **3.2.2. First impact of visual arousal of the food product**

One of the brain's significant roles is to assist foraging and feeding. It is most probably not a coincidence that the mouth is located near to the brain in most animal species. Thus, right after the food package is opened or the food itself is observed through a transparent package, the food stimulates an impact on the consumer's brain (Spence et al., 2016).

This stimulus has a vital impact on decision of eating the food or not. The personal experiences coming from previous cases and the basic instinct related with foods can manage consumers to buy or not and even to eat or not to eat.

In addition to mouth, brain and visual impact of the food are closely associated with purchasing that food product. In the brain, dramatic physiological impacts can be seen in reaction to food images. The notion of visual starvation can be stated as the strong wish to view attractive images of food, and resulting changes in organism, is introduced (Spence et al., 2016).

### **3.2.3. Sensorial Experience**

Sensory attributes can be defined as the generic food quality aspects such as taste, appearance, and smell in which taste can be selected as the dominant aspect. Taste has a practice superiority that can be assessed only after buying, and customers utilize a

host of market signals, such as brand, price, and quality labels, in order to predict the taste experience (Grunert, Poulsen & Juhl, 2001). Each of these criteria entails the contribution of industrial designers to improve overall product quality.

The most vital decision parameter leading consumer acceptance and satisfaction is obviously sensual quality, pertaining to how the food product tastes, smells, feels, looks and even crunch heard during eating.

### 3.2.3.1. Taste

The key aspects behind customers' food and beverage buying selection can be summarized as sensory satisfaction, price, healthiness, convenience and sustainability. Moreover, the taste as a leading sense for food controls highest selection criteria with 81% of people say, it has at any rate several effects on purchase choice, followed by familiarity 65%, price 64%, healthiness 61%, convenience 54% and sustainability 39% as shown in Figure 3.2.

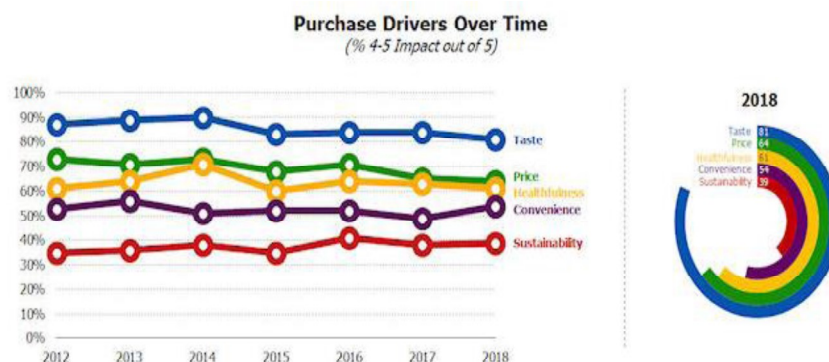


Figure 3.2: Food purchase drivers over time (Food Insight, 2019)

### 3.2.3.2. Smell

Food product selection and purchase are managed by both sensory and metabolic procedures. The sense of smell has a critical role in the sensory impacts on selection and eating.

The sense of smell mainly plays a primary role in eating behavior. The odor exposure encourages appetite particularly for the cued food. However, the control of odors on food selection and eating is less comprehensible and can as well rely on the alertness or strength of the odors, or character qualities of the consumers. The role of smell is not that clear as the taste is (Boesveldt and de Graaf, 2017).

### **3.2.3.3. Touch**

The sense of touch permits consumers to be aware of feelings reasoned from the outside textures of objects. Food surface can be felt with tongue, teeth and mouth feel (palate), palm of hand and fingertips. Texture can manage jelly to be felt as greasy and slippery or a cookie crispy and stringy.

As the food product is chewed it has been continually processed. The teeth and tongue employ a force to the mouthful, to measure how effortlessly it breaks down and flows into the mouth.

As customers set superior requests about the food product that they consume, food texturization will be taken as improving opportunity for the food sector professionals, and expansion of novel, pioneering textures can be created while considering innovative food production processes.

### **3.2.3.4. Sight**

The human eye has a significant impact on the awareness of color, and this affects the idea of food product. The consumers relate precise color awareness of food with well-known aromas except tastes such as bitter and sweet. The stronger the taste and associated color relation, the larger the interaction of food color becomes. As color levels amplify the sensitivity of flavor and strength of taste boost as well.

The foods cannot be identified either discolored or uncolored, and consumers who are colorblind can be incapable of informing the distinction between some food products.

This can influence consumers' capability to choose food based on its dietary features, and the pleasure taken from certain foods.

#### **3.2.3.5. Hearing**

The pleasure taken from eating food or drinking beverages can be affected by hearing the sound of food or beverage during eating and drinking process. The sizzle and spit of the cooking process and in addition the crackle and crunch as consumers eat as well make customers feel the food and decide if food is edible or not.

Hearing the sound of food also supplies the understanding of taking crisp and crunchy foods like potato chips and biscuits. There is confirmation that it is implicated with consumers' discernment of taste and smell as well.

#### **3.2.4. Communication with consumers**

All representation of food products on shelves including text and image on them, sound or visual appearance must precisely symbolize the product and brand, together with the taste, size and content (Nestle, 2011).

In this context the shelves have to be well organized and the products must have direct visualization. As the level of shelves and products are the same with consumer height, the probability of its purchase increases. Thus, the products, which are wanted to be sold immediately, have to be located in the middle height position.

As seen in the Figure 3.3, the products are properly located, and visual organization is attractive for consumers.



Figure 3.3: Shelf impact on food communication with consumers (retrieved from: <https://99designs.com/blog/packaging-label/6-rules-of-great-packaging-design/>)

### 3.2.4.1. Marketing strategies

The significant aspects that lead to novel food product development can be denoted as marketing and managerial synergy, strength of marketing communications and launch effort, and market need, growth and size (Ilori et al., 2000). All of these factors highlight the function of marketing in the product development process.

The marketing strategies start with the research of potential consumers for food products and valuable qualitative and quantitative data have to be collected by field research, interviews, surveys, focus groups, experiments and trials, industry blogs and online data.

Subsequent to the data collection, demographic and psychographic profiling of the potential costumers has to be done. In demographic research, consumers can be divided into age groups, genders, education level, occupation, income range, marital status, family size and cultural background. Then in the psychographic segmentation personality, values, interests, behavior, opinions and lifestyle can be investigated. After all customers can be analyzed in (Monitaba, 2019),

- What types of food products they like?
- Where do they like to buy?
- How much are they are willing to spend?



After classifying the relationships along with the consumers in the target market, then the customer requirements can be better understood, and food products can be designed in the most effective way. Also, the brands have to focus on advertising. The industrial designers have great capabilities of improving ads for food products as well. Interaction of food advertisement with food design process can also affect the food purchase and overall company incomes in a positive manner. In Figure 3.4 creative food advertisements are depicted.

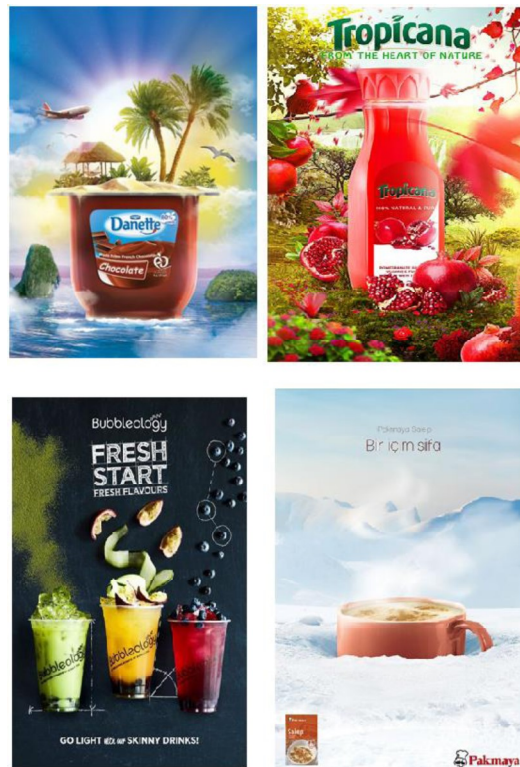


Figure 3.4: Shelf impact on food communication with consumers (retrieved from: <https://tr.pinterest.com/pin/431923420484979634/?lp=true><https://99designs.com/blog/packaging-label/6-rules-of-great-packaging-design/>)

### 3.2.4.2. Advertisements

The strategies employed by food companies in order to sell their products in large mass of people groups have significantly been altered over time from the beginning of marketing and consumer-oriented sales in the food industry. The notion of advertising started by aiming to create consciousness of products and introduce the

name of brand and product in a simple way. However, current adverts are designed considering various aspects such as communication language, gender of consumer, popular events and occasions etc. (Keller, 2012).

The impact of adverts is essential when a product is primarily located on the market shelves or on the menu. Food companies must struggle to propose the maximum attraction plan for their items and excellently spread consciousness amongst the targeted customers in the market. Adverts play a critical role to convince consumers that they really require and desire to buy advertised food item. Advertising, labels, in-store communication (shelves, displays, posters etc.), being well known in the media, and sponsoring are the types of marketing strategies which can be controlled by food manufacturers (Grunert, 2006).

Adverts also discriminate the customers according to their gender in general. Products that are most noticeably aimed for women by illustrating women who use products are happy, thin, and attractive. The vision of being sexy, fit and beautiful is imposed and matched with the use of product (Keller, 2012).

The relation between the characteristics of food product and the adverts must be established carefully. For instance, the Magnum products are associated with strong woman feature and a female lion. In addition to this Magnum offers promotions each summer and delivers ultra-lux sport cars. These cars are also so elegant and express the impact and idea that Magnum wants to deliver to the consumers as shown in Figure 3.5.



Figure 3.5: The Magnum advert associating woman with female lion (retrieved from: <http://ogrencikariyeri.com/haber/reklamlarda-kullanilan-kadin-ve-erkek-imgesi>)

In addition to stressing women's strength, also the sexy side of women is associated with the Magnum products as shown in Figure 3.6. It can be clearly seen that the pleasure of eating Magnum ice-cream is linked with sex and also the summer time is associated with summer loves and ice-cream.

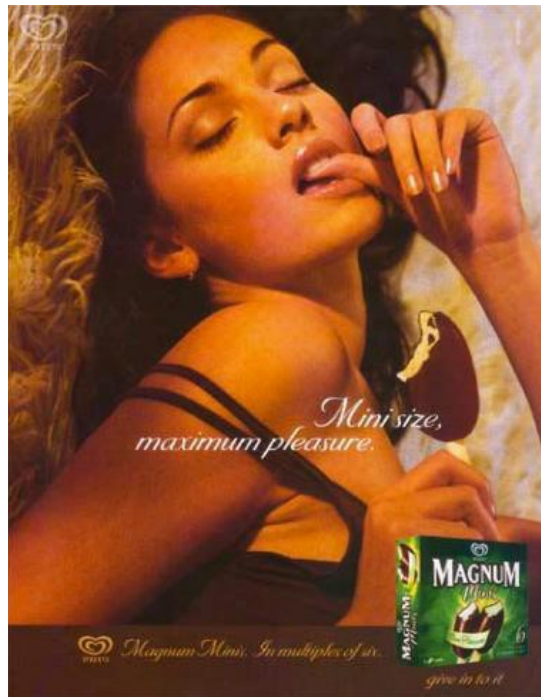


Figure 3.6: The Magnum advert associating woman with sex (retrieved from: <https://advertisingandsociety.wordpress.com/2012/10/08/hedonism-give-in-to-it-magnum/>)

On the other side, another ice-cream brand called as Golf, turned their adverts as reply to Magnum. In its following advert, Golf indicated that they have no luxury cars but the quality of the product. This process is some sort of communication of both brands over the adverts. This also clearly depicts the image of product created by the company is linked with the adverts and influencing the customer behaviors.



*Figure 3.7:* The Golf advert as reply to Magnum: “What is it with you?” (retrieved from: <https://www.eniyireklamlar.com/video/pandanin-magnumla-dalga-gectigi-reklam>)

As shown in Figure 3.7 and Figure 3.8, Golf’s ice-creams stress that women are a part of daily life without being sexy as well. Thus, their adverts include irony and ridicule for Magnum.



*Figure 3.8:* The Golf advert indicating woman as an individual (retrieved from: <https://pazarlamasyon.com/pandadan-ince-gondermeler/>)

### 3.2.4.3. Sale strategies

Siegrist et al. (2019) examined the consumers' food selection behavior in three-dimensional (3D) virtual reality environment. The research is conducted with the purpose of determining the behavior of customers standing in front of a supermarket shelf. The decision-making factors for the customers are observed by a virtual environment. The results of the study illustrate that with regard to evaluating and selecting foods, the ingredients of the food package are vital for most customers.

Figure 3.9 depicts the shelves and cereals used to model customers' food selection behaviors. As clearly shown in the shelves most of the packages have similar designs and it is hard to differentiate products. This also forced manufacturers to be innovative in their design, and work in a close relation with industrial designers.



*Figure 3.9: Shelves and cereals used to model customers' food selection behaviors (Horska et al, 2011)*

### 3.2.4.4. Graphic design on package

Meyers and Lubliner (1998) noted that the graphic design located on the food package helps brand to communicate with consumers visually. The design on food and beverage packs intends to promote for buying items. Thus, graphic design can be stated as a strategy of giving reasons for purchasing actions.

The packaging design on food covers are able to talk with consumers to send information regarding the product and meaning of it in an apparent and direct way.

Images utilized in graphic design can be associated with the story of product and the message of brand that is written on the package.

The images used on the packs are appreciative to take the attention of customers. Thus, images placed on food packs can guide consumers paying attention to the packaging and also the food product.

The following approaches of the representing the images on the packs can be applied by showing (Pensasitorn, 2015):

- Product alone by the image
- The benefits of the product by the image
- Product while used by user images
- Emotional appeal by images
- The end result of the products' utilization
- The brand personality
- Product names, trademarks, or brand name
- Mascot as presenter
- Images of famous people as presenter
- Decorative pattern on the packaging
- Drilling package to show product inside.

In Figure 3.10 the front and the backsides of package's graphic design is given for a Thaifood pack. On the front side of the package; benefits statement, corporate endorsement, product description, flavor, brand name, product features, product images, promotional statement, net weight, GDA label and special advantage mark are showed. On the back side of the package; nutritional facts, ingredients, trademark registration, how to use, manufacturer and expiration date are specified. By this way before the consumer faces with the food product itself, s/he has been informed by the help of illustrations on the food package. The consumer can communicate with the product with this information and be encouraged to purchase.



Figure 3.10: The front and the backsides of package graphic design

### 3.2.4.5. To attract the attention of consumers through global trends

The global trends in the food sector are very important since the consumer desires can be accurately determined over precise analyses. The food producers have to respond the global trend alternations and novel food design processes or reformulation procedures have to be applied.

Incorporated supply chains that regionally tailor food products to meet up local customers' selections can promote business of less-processed agricultural merchandises over trade in processed food products. Consequently, as the food industry turns out to be more international with the identical worldwide vendors and manufacturers, food demand can be progressively provided at the regional level where food suppliers are enhanced to offer precise needs of local customers

Consumer awareness in convenience of food product has been increasing quite significantly over the last few decades. Convenience can here be stated as concept of the product, which saves time or energy during the personal household's food making chain, such as throughout the shopping, keeping in a safe environment, cooking, eating, and disposal. In a wider sense, convenience relates to home-meal replacement

alternatives like eating out (Darian & Cohen, 1995). This demand forces the contribution of various disciplines into the food design phases.

Health concerns of food products essentially are related with food process and ingredients. This is a major communication concern between the product and consumers. The healthiness of various types of food is conflicting for consumers they believe industrial production is less healthy than craftsmanship, and additives are unhealthy (Brunsø, Fjord & Grunert, 2002). The food products have to become convincing to manage this perception. Industrial designers can also contribute to hygienic concerns through the food design procedures, which affect the overall case in a positive manner.

### **3.3. Examples of food design by industrial designers from around the world**

#### **3.3.1. Visual Design of Food Product Examples**

The visualization of food products plays a critical role on customer selection and satisfaction. Since the first impression of the consumer generally affect the sense of taste and guides the product decision.

Chocolate bars can be produced in architecturally inspired forms to bring a completely novel communication language to the brand's design. As shown in Figure 3.11, chocolate bars carrying the sculptural pattern and ingredients can create smoother, edgier and simultaneously enjoyable senses.





Figure 3.11: The sculptural pattern and ingredients on chocolate bars (La Folie, 2017)

The design impacts on food production can also be applied to pasta design as illustrated in Figure 3.12. The geometrical shapes and surfaces of tortellini are calculated by mathematical formulae, drawings and illustrations using design tools.

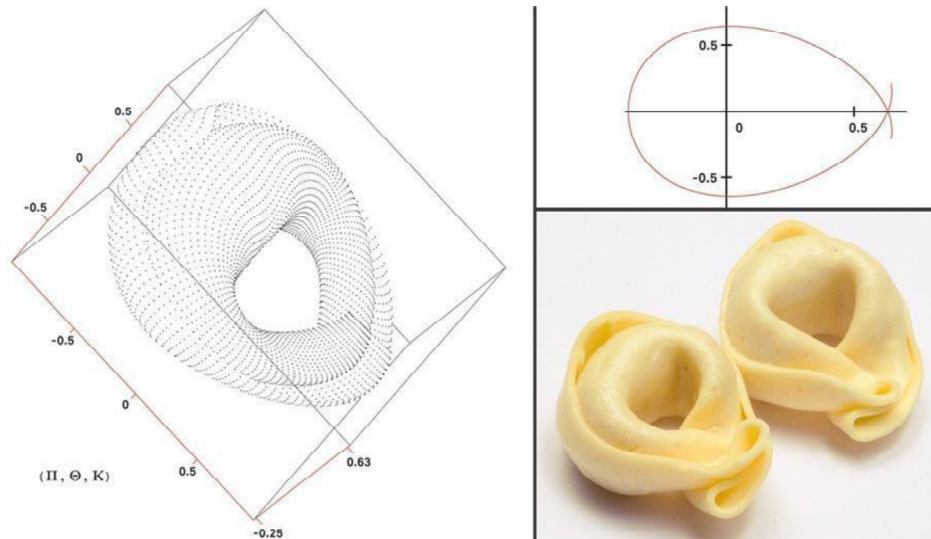


Figure 3.12: The computer-based design procedure of tortellini (Pasta by Design, 2012)

In Figure 3.13, a Panzani brand pasta which is designed by Giorgetto Giugiaro is illustrated. He is originally a automobile designer. However, similar to the cars, the pasta is an exercise in structure and each pasta is designed to be escorted by a specific sauce, with the purpose of having the seamless mixture of flavor and texture.

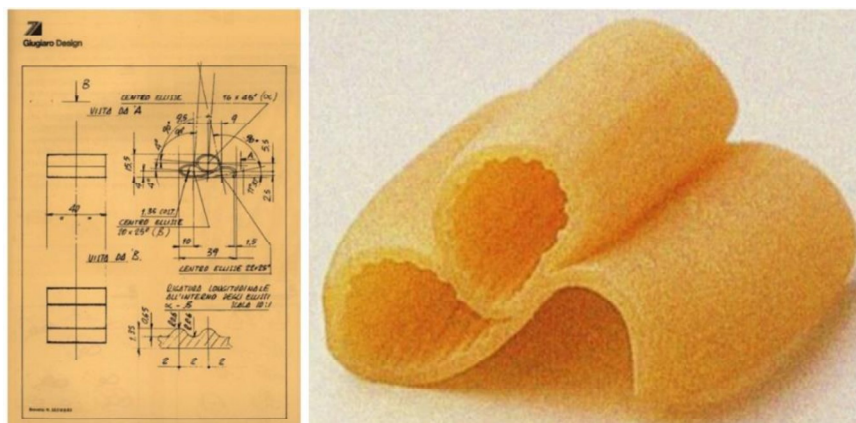


Figure 3.13: Marille pasta design by Giorgetto Giugiaro (retrieved from: <https://medium.com/hellodesigner/from-automotive-design-to-pasta-design-59b57f7255fa>)

Another pasta design is made by Phillippe Starck, the legendary contemporary industrial designer. This time, 4 years after Giugiaro, the Panzani brand hired Starck to design its novel pioneering pasta as shown in Figure 3.14.



Figure 3.14: Mandala pasta design by Philippe Starck (retrieved from: <https://medium.com/hellodesigner/from-automotive-design-to-pasta-design-59b57f7255fa>)

ETİ has developed two novel products which combine their original ETİ Crax with barbecue sauce and ketchup as shown in Figure 3.15. These instances are specific cases for food innovation and show that how products can be enhanced with the help of industrial designers. Not only the ingredients of the product but also the package design is charming and representing the product content precisely. The product is designed by Turkish industrial designer Gamze Güven.



Figure 3.15: Novel Eti Crax products (retrieved from: <https://www.carrefoursa.com/tr/eti-crax-kivrimli-ketcapli-cubuk-kraker-115-g-p-30146416>)

Industrial designers can impact the visual design of food product besides the food package. The innovation in food sector can be accomplished by the full integration of industrial design processes to the food production phases.

In Figure 3.16 the attractive package design of Vena Cava is illustrated, which represents the mythical union of science and the excellence. The actual meaning of the Latin word is the large vein that carries the blood, which has disseminated through the whole body, into the heart.



Figure 3.16: An example of Vena Cava packaging design (retrieved from: <https://www.venacavaistanbul.com/our-story/>)

In 2019, Algida Magnum presented its novel product named as Algida Yakut which has a special package design as shown in Figure 3.17. As seen from the design, the package itself gives the feeling of freshness which is appropriate to eating ice cream in summer. Also, this design is much more different than the previous Algida designs. Former packs were more like simple and identical to each other. However, Yakut has a unique design which attracts the consumers.



Figure 3.17: An example of Algida Magnum Yakut package design

ETI Tutku and ETI Karam have been awarded for the Label of the Observateur Du Design in 2012. The designs of chocolate tablets have been shown in Figure 3.18 and Figure 3.19 respectively. ETI's innovative approach has led the Turkish industrial designer Gamze Güven into the edible product design sector. This also

shows the success of an industrial designer in a totally novel area and how effectively industrial designers participate in the food sector.



Figure 3.18: ETI Tutku Label of the Observateur Du Design (tasarimussu, 2019) (retrieved from: [http://www.tasarimussu.com.tr/en/portfolyo\\_urun\\_09.php](http://www.tasarimussu.com.tr/en/portfolyo_urun_09.php))



Figure 3.19: ETI Karam Label of the Observateur Du Design (tasarimussu, 2019) (retrieved from: [http://www.tasarimussu.com.tr/en/portfolyo\\_urun\\_09.php](http://www.tasarimussu.com.tr/en/portfolyo_urun_09.php))

Gamze Güven began to specialize more on the packaging industry with the Yeni Rakı bottle design in 2005. Then most of her work has turned into three-dimensional packaging and food products for various international and local brands. As an industrial designer, Güven (2012) has stated that the corporate identity of the firm, its history and its target audience are key factors for the design itself. The market researches of the given industry, the product evaluations, focus group results and films have to be examined before design phase.

Industrial designers make sure that the products are innovative and push the limits but also maintain a firm stand, which is wanted to be producible and acceptable in costs. As a consequence, design of packaging and food is related with products' features

such as sales increase, consumer satisfaction, cost, manufacturability into consideration and food market trends. However, a good designer is the person who configures consumer demands and needs in the best way possible. The consumer perceptions of rapid consumption products and brand value have to be addressed in an innovative way and a positive impact on sales has to be achieved with the food designs.

The Amador Assorted Chocolate project, which is one of the first chocolate packaging design and serial production work in Turkey, is conducted by Turkish industrial designer Nadire Şule Atılğan. The project was launched in 2001 by Balaban and Ülker companies. This can be stated as a unique example of an industrial designer involving into a graphic design work for chocolate mass production.

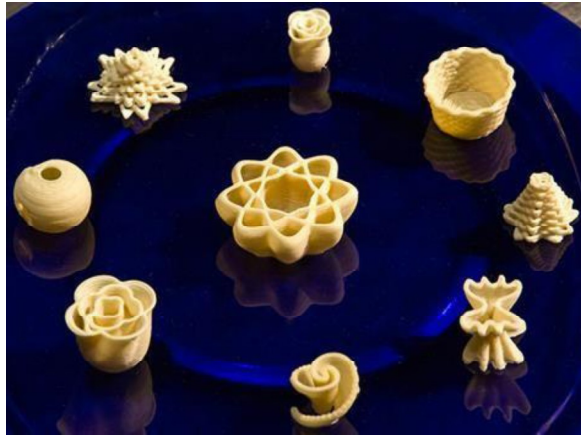
In Figure 3.20, the innovative and novel chocolate design made by Atılğan is shown below. The proposed design is a valuable impact of an industrial designer on food industry in which designed chocolates are also exported to Europe.



*Figure 3.20: Sule Atılğan's Amador Assortment Chocolate Design (ODTU Biltir, 2019) (retrieved from: <http://www.biltir.metu.edu.tr/digeralanprojeleri.html>)*

As the technology is improved, design and manufacturing capabilities in the food sector also augment. One of the leading technological developments in the manufacturing field is the utilization of 3D printing methods. 3D printing allows food producers to design and produce their products in a convertible and coherent way.

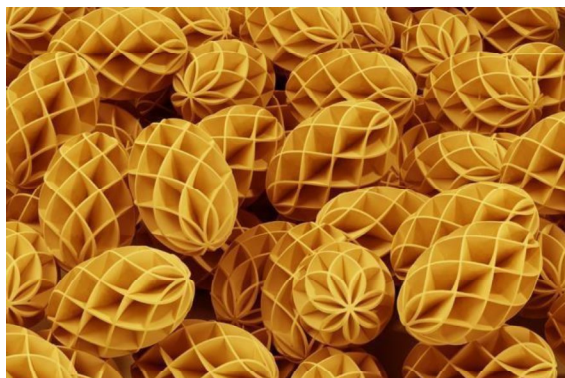
Simply you can use your design output as the input of production line and using 3D printers produce a prototype in a very quick and low-cost process. In Figure 3.21, 3D printed pastas can be seen. The designers' innovation can be fully mirrored to reality.



*Figure 3.21: 3D Printing Pasta Samples (spadellatissima, 2019) (retrieved from: <https://www.spadellatissima.com/>)*

Industrial designers mostly have high integration ability to the discipline they work with. Since they can use their imagination and engineering capabilities, they can boost the design processes in various sectors.

In Figure 3.22 a pasta design sample is given in which the designer team works on various fields such as food, electrical devices, shoes, etc.



*Figure 3.22: Industrial Designers' Pasta Samples (desall, 2019) (retrieved from: <https://desall.com/>)*

As one of the leading companies with their chocolate product and package design, Compartes has unique and elite chocolate designs as illustrated in Figure 3.23. The

company has the designs custom made for each truffle and chocolate bar box to reflect the theme or ingredients in the specific recipe, creating unique, Instagram ready packaging stories that are as drool-worthy as the chocolates they have.

As seen, the aesthetics is concerned with the food ingredients, and products are designed by considering social media impact. Since most people share their food in Instagram then this gives the designers a very significant consumer input. The food design is becoming all and all satisfying not just for the taste but also visually.



Figure 3.23: Compartes chocolate designs (compartes, 2019) (retrieved from: <https://compartes.com/>)

### 3.3.2. Food packaging design examples

Packaging can be classified as the key advancement of customer-based capitalist trade strategy, the development of food systems and noteworthy progress in the worldwide foundation of main food brands and mass consumerism (Maffei and Schifferstein, 2017). Although the primary function of food packaging is to shelter, stabilize and reserve the contents during handling, trading, logistics and storage (Dekker 2011), packaging design can propose ease of product usage such as offering methods to open or close the package simply or sustain the eating and drinking instantly from the package. Alternatively, packaging can be utilized as a critical tool for product desirability on the market shelf. Since the well-designed package is also a valuable instrument for real time advertisement. Figure 3.24 depicts various charming package designs with the aim of presenting same content.





Figure 3.24: Design variations on chocolate bars (La Folie, 2017)

In Figure 3.25 each brown paper package is designed to be an imaginative and enjoyable presentation of pasta offering visualization of food inside the chef's belly.



Figure 3.25: Pasta package design with transparent visualization of box content (Fresh Chicken, 2012)

Nadire Şule Atılğan's Amador Assortment Chocolate design includes not only chocolate bars or pieces but also the package. As seen from Figure 3.26, Figure 3.27 and Figure 3.28 various package designs for Amador Chocolate is produced.



Figure 3.26: Şule Atılğan's 24 Pieces Amador Assorted Chocolate Package Design (ODTU Biltir, 2019) (retrieved from: <http://www.biltir.metu.edu.tr/digeralanprojeleri.html>)



Figure 3.27: Şule Atılğan's 48 Pieces Amador Assorted Chocolate Package Design (ODTU Biltir, 2019)



Figure 3.28: Şule Atılğan's Oriental Amador Assorted Chocolate Package Design (ODTU Biltir, 2019)

Compertes also has innovative and charming chocolate packages as seen in Figure 3.29.



Figure 3.29: Compartes chocolate package designs (compertes, 2019) (retrieved from: <https://compertes.com/>)

In Figure 3.30, a great example of simple, clear yet highly distinctive packaging design is illustrated. In this design clarity and simplicity is privileged.



Figure 3.30: An example of simple, clear and distinctive packaging design (retrieved from: <https://99designs.com/blog/packaging-label/6-rules-of-great-packaging-design/>)

Also, the package design can be an example of authentic and memorable packaging design as shown in Figure 3.31.



Figure 3.31: An example of authentic and memorable packaging design (retrieved from: <https://99designs.com/blog/packaging-label/6-rules-of-great-packaging-design/>)

A well-planned stand design can be beneficial for both customers and retailers. Since consumers' total shopping pleasure escalates, once the in-store shelf design is organized properly. Consequently, superior customer satisfaction manages an increment on retailers' sales volume (Fancher, 1991). However, the market layout organization is not limited with stands or shelves, aisle and pathway design, product promotions and product placement on shelves directly affect customers' shopping behaviors.

The orientation of product placement plays an important role on customer decisions. Valenzuela et al. (2013) investigated and showed that, in general, products that are

located at the horizontal axis of the shelf are considered to be discounted. Simultaneously, products that are positioned in a central location are observed to be more popular.

However, vertical item locating has much stronger impacts on sales compared to horizontal positioning (Raghubir and Valenzuela, 2008; Hansen et al., 2010). Since eye-level product placement is most efficiently achieved on vertical product allocation in terms of product sales. Moreover, vertical product positioning has more influence on the customers' observations and ideas concerning the food product. Products placed on the higher shelf sections are concerned to be expensive and attractive, whereas items on the lower portions are connected with cheapness (Raghubir and Valenzuela, 2008; Meier and Robinson, 2004).

In Figure 3.32, an ordinary café shop is designed. A minimalist and contemporary design approach intends to manipulate the space giving illusion of the interior and exterior part of the café is blended together. This concept supports the sales of food product through a unique concept of exhibition. (Coroflot, 2019)



*Figure 3.32: A café house design concept (Coroflot, 2019)*

### **3.4. Indispensable contributions of the industrial designer that cannot be managed by the food engineer**

Various aspects that affect consumer perception in product development process are discussed. Modifications in food product and innovation in product span made by

industrial designers are given, additionally none of these accomplishments can be realized only within the framework of food engineering discipline.

The visual design of product, imagining, rendering the three-dimensional lines, determining the color combinations of the product, determining the lines of the physical food product can be given as beneficial examples of the contribution of industrial design discipline (Saravacos and Kostaropoulos, 2002).

The parameters related to how the product's package will be opened and closed, how it can be retained without breaking the product, how much space it will occupy on the shelf, and how it can be effective during transportation are the elements that an industrial designer can analyze in the right way. Since industrial designers are already studying to improve these merits.

Numerous shelf layouts, alternative sales techniques etc., in the product stand can be arranged by industrial designers. All of these aspects that require a diverse perspective of view, with a creative work make the food product recognizable and appreciated (Rama, 2008).



## **CHAPTER 4**

### **CASE STUDY**

In the previous chapters, the product development processes, the factors affecting the consumer perception of the product and the contributions of industrial designers to these factors are examined. In this chapter, a case study is conducted on chocolate design as to how industrial designers could be involved in the product development process, at what points they could work together with food engineers, and how they should be involved in the product development process are discussed. Due to the fact that there are two interviewed industrial designers who worked in collaboration with the food industry in Turkey, this study is focused on the chocolate product.

In the first step of the chapter, in order to better understand the chocolate product mentioned during the study, the definition of the chocolate product, the introduction of the chocolate product about how it is produced takes place. Afterwards, the purpose and methodology of the case study by describing the design process, then how the case study is conducted are given. Finally, the analysis of the data is explained and discussions on findings are presented.

#### **4.1. Chocolate Confectionary in Food Industry**

Chocolate is a luxury food product, which is composed of a complex emulsion and stimulates active pleasure center of the brain (Afoakwa, Paterson, & Fowler, 2007). It is a well-known fact that the chocolate sensory profile is affected from its particle size distribution, raw materials and process. Some studies are done on sensory evaluation to understand the effect of ingredients on the perception of chocolate, and some studies are done to investigate the impact of the manufacturing process (Lenfant, Hartmann, Watzke, Breton, Loret & Martin, 2013). Results of these studies focused on sensory methodologies rather than sensory properties of the product

(Lenfant et al., 2013). Sensory testing may determine the worth of a good or even its satisfactoriness by virtue of conforming approved standards (Meilgaard, Civille, & Carr, 1991).

Chocolate is basically made of cocoa oil, sugar, cocoa mass and/or cocoa powder, milk and/or milk powder and seasoning. These ingredients are mixed and molded properly according to regulations.

Chocolate has a certain shape, and its melting time, spreadability in palate, perceived tastes are affected from its shape. However, it is hard to simulate and investigate this physical factor of chocolate. According to the shape of chocolate, different sensory profiles are stated on the characteristics of melting, smoothness, and smaller but worthy differences on caramel, cocoa and aftertaste (Lenfant et al., 2013).

Chocolate confectionery items are popular gifting products and extensively consumed especially during holiday seasons, special days and festivals such as birthdays, anniversaries, religious feast days etc. In addition to this, chocolate confectionary has a positive impact on human's mood and as a sweet snack it gives pleasure to consumers. It is beneficial to consume chocolate regularly, avoiding overdose. It contains phenyl ethyl amine (PEA), which is the identical substance as brain creates when individual feels like falling in love. PEA promotes brain to stimulate endorphins with the purpose of feeling happy and relaxed in a natural way.

The chocolate confectionery retail market in Turkey increased in volume by 4.8% in 2017. Market volume in 2017 occurred as 0.144 million tons. This was the strongest growth in recent years for chocolate confectionery retail. The annual growth in chocolate confectionery retail for the period 2013-2017 was determined as 0.2%. In 2022 it is forecasted to reach 0.172 million tons with representing a volume calculate compound annual growth (CAGR) of 3.5% starting from 2018. In Figure 4.1, the absolute size of retail market in Turkey is given with the projection to 2022.



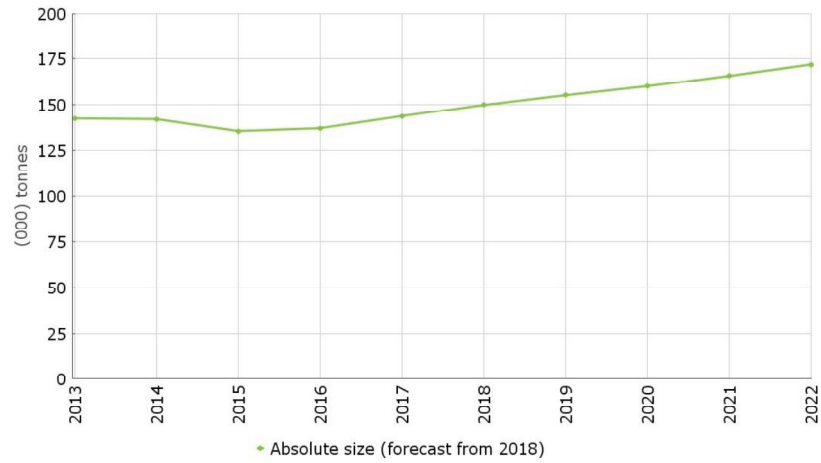


Figure 4. 1: The absolute size of chocolate confectionery retail market in Turkey (Mintel, 2018)

In the case of chocolate consumption in Turkey, chocolate countlines are almost dominating the market. The overall chocolate confectionery market volume in 2017 is around 143.6 kilo tons and countlines cover almost 93.8 kilo tons of this consumption. Since these chocolate products are cheaper, easy and quick to eat and have charming packages, they lead the total market quantities. On the other hand, tablets and non-individually wrapped packages are seated on the second and third place with the 34 kilo tons and 7.5 kilo tones respectively. Although tablet chocolates are suitable for daily use, non-individually wrapped packages are mostly preferred for festivals and special days. Figure 4.2 depicts the retail market segmentation of chocolate confectionery in Turkey.

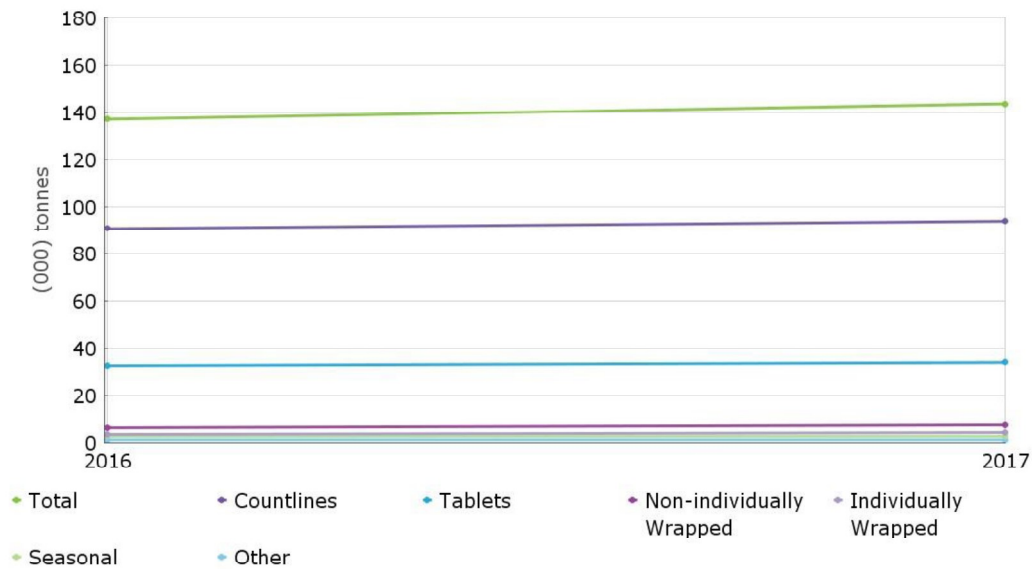


Figure 4. 2: The retail market segmentation of chocolate confectionery in Turkey as of 2017 (Mintel,2018)

As the population of Turkey is increasing along with consumer price index and gross domestic product year by year (excluding the financial crisis years of 2008 and 2018) the interest of the foreign investors in the chocolate confectionery market is boosted. Mars Inc., Ferrero Group, Mondelez International, Meiji Co Ltd, Hershey Co and Nestlé SA can be classified as the main manufacturers of chocolate in the world (ICCO, 2019).

Three of the biggest six companies in the world are also chocolate sectors' players in Turkey. Although almost half of the market is dominated by two local groups of Ülker and Eti, foreign companies have the share of over 10% as shown in Figure 4.3. The essential impact of these foreign investments can be seen in the field of product design and advertisement. Since the food sector has entered into a professional and an uphill struggle, even local manufacturers in the sector realized the importance of industrial design for their products. The dominance of designed food products in the market with changing customer behaviors towards attractively designed and advertised products lead manufacturers to focus on design phases. However, the integration of

industrial designers in food industry is still very limited and has to be improved significantly.

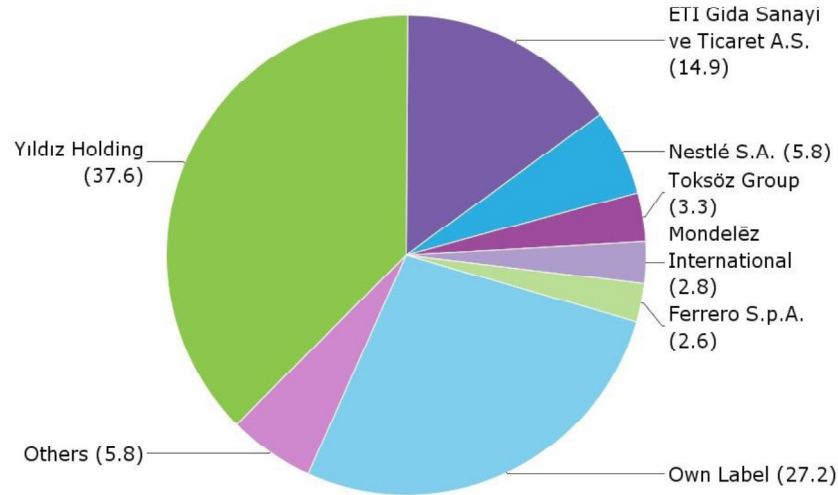


Figure 4. 3: The Company retail market share by volume in Turkey as of 2017 (Mintel, 2018)

#### 4.1.1. History of chocolate

In history, Aztecks of Mexico long before of the arrival of Europeans planted cacao trees. The beans were valued for not only the use of currency but also the production of ‘chocolatl’, which is a spiced drink.

The chocolate beans were roasted in earthenware pottery before grinded between stones. The chocolate was prepared by blending the mixture with cold water and other ingredients such as honey or spice. After that the mixture was whipped in order to obtain a frothy texture (Whymper, 1912).

First, Columbus brought the cocoa beans to Europe as driven by his curiosity. Later, Don Cortez exploited the cocoa beans commercially as a new drink (Minifie, 1980). Spaniards gave preference to sweetened form of chocolate, which provided popularity of chocolate to spread in Central and Northern Europe. It was still restricted to the wealthy as of 1664. In 1727, Nicholas Sanders mixed milk into the chocolate drink in the UK (Cook, 1984). It is still uncertain why he did this.

Today's chocolate is not composed of only cocoa beans and sugar. Without fat, it's texture becomes very hard that is not pleasurable to consume by consumers because of its mouthfeel effect. In order to obtain fat, cocoa beans are pressed and fat inside of the bean is exposed. This process is developed by Van Houten of the Netherlands. By this way, solid chocolate production is developed and remaining cocoa powder, which has low fat content, is used in the drink. This drinking chocolate was preferred more than the original mixture.

The history of the cocoa and chocolate production and distribution all over the globe is given in Figure 4.4.

1519	Cortez discovered that cocoa had been cultivated by the Aztecs for more than 3000 years
1528	Cortez introduced a chocolate drink to Spain
1606	Chocolate drinking spread to Italy
1615	Chocolate drinking reaches France
1657	First chocolate house established in London
1727	Nicholas Sanders invents a milk chocolate drink
1746	First cocoa planting in Bahia
1765	First chocolate company established in North America
1828	Van Houten patents the cocoa press
1847	Fry's factory established in Bristol to produce eating chocolate
1876	Daniel Peter manufactures milk chocolate
1988	World cocoa grindings exceed 2 million tonnes

Figure 4. 4: Some important dates in the history of cocoa and chocolate (Beckett, 2003)

#### 4.1.2. Production of chocolate

Cocoa beans, the main raw material of chocolate, are the seeds of the fruits of the trees of the genus *Theobroma Cacao*. Trees grow in the tropics; for example, in Ghana and Ivory in Africa, Brazil in South America, Venezuela and Malaysia in Asia. The fruits on the tree are similar to melon and each contains 20-22 seeds. Fruits are cut, and seeds are taken from it. These seeds are subjected to fermentation. By this way, aroma and color are developed. After fermentation for 3-5 days, the seeds are dried, packed to a maximum of 7-8% moisture and sent to all parts of the world.

Chocolate production starts from cocoa beans. The seed is cleaned first (trash, stone, etc.) and is rescued from physical pollution. Then the roasted aromas are developed.

Then, they are separated from their shells and ground to obtain cocoa mass. The cocoa mass is pressed to produce cocoa butter.

For the production of chocolate, cocoa mass, sugar, cocoa butter and milk powder if necessary are mixed and thinned in five cylinders (20-25 micrometers) and conveyed to the conching machines. In these machines, the latest aroma enhancement and emulsifier addition are done.

In Figure 4.5. the schematic diagram of the traditional chocolate-making process is depicted. As shown in the figure, the process starts with the fermentation of cacao and drying of cacao beans and followed by the cleaning and roasting of the beans. After all intermedia processes, the cacao is refined, and fat is added to the substrate.

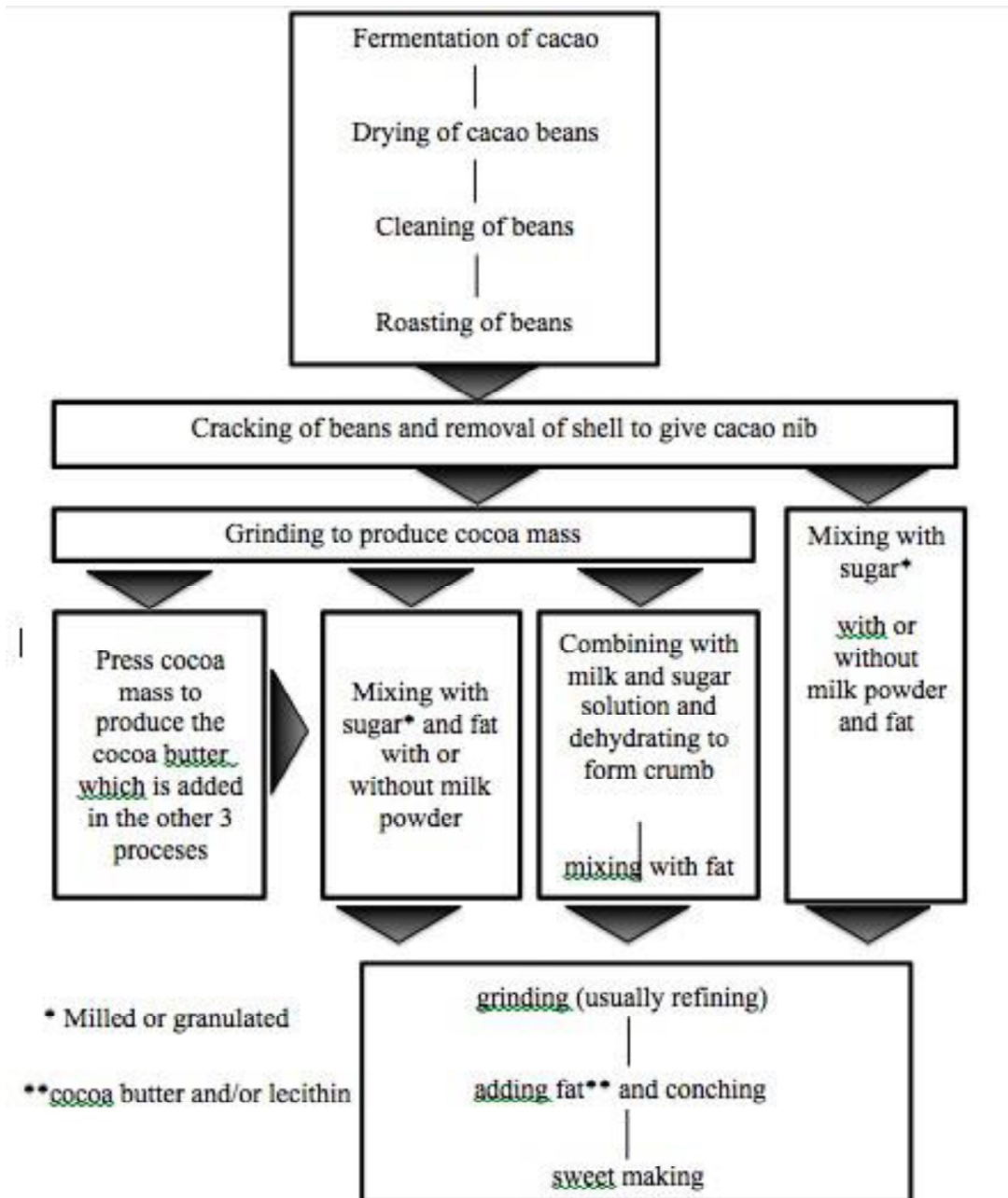


Figure 4. 5: Schematic diagram of the traditional chocolate-making process (Beckett,1999)

### 4.1.3. Chocolate types

Chocolate appears in three types:

1. Bitter Chocolate
2. Milky Chocolate

### 3. White Chocolate

Chocolates are categorized as;

1. Plain
2. Seasoned
3. With Filling

Bitter chocolate is made of sugar, cocoa oil and cocoa mass, milky chocolate is made by addition of milk powder but has less cocoa mass. White chocolate is made of sugar, cocoa oil and milk powder.

When at least 25% of total product weight is a composition of bitter chocolate, milky chocolate, white chocolate or a mixture or any of them or filled, the bite chocolate is called as “Pralin”. When the filling and coating are different, the sphere shaped chocolate is called as “fruffe”.

The production of bar chocolate made according to the chocolate standards starts with crushing the cocoa beans after being separated from the shell. Cocoa oil is added to the obtained cocoa liquor. According to desired kind, milk powder or nuts and sugar are added, then shaped and packed.

According to shape and content of chocolate, chocolate market is investigated as tablet, bar, chocolate covered wafer, chocolate gift, surprise chocolate, dragee and so on. As seen in *Table 4.1*; tablet chocolate has 33%, bar chocolate has 22% turnover ratios in chocolate market. The biggest share in segment breakdown in chocolate market belongs to tablet chocolate.

Table 4.1: *The turnover split of chocolate types in Turkey (Mintel, 2017)*

	Turnover split (YTD17)*
<b>CHOCOLATE</b>	<b>100%</b>
Tablet	33%
Bar	22%
Covered wafer	25%
Chocolate gift	5%
Surprise chocolate	7%
Dragee	6%
Other	2%

#### 4.2. Aim and Methodology of the Case Study

As it is mentioned in previous chapters, industrial designers have great potential to do innovation that food industries need. The aim of this research to understand how industrial designers contribute to the process of new product development, what food industries need to do innovation, how industrial designers work with experts who are responsible for new product development in food industries. Since food industry covers a wide range of area, chocolate is taken as a subject in this study.

For the case study, it is aimed to adapt a qualitative approach in order to investigate the place of industrial designers in food industry and to understand approaches of both industrial designers and food engineers. There is not any alternative way to collect in-depth data from first hand except interview method (Gillham, 2000). Therefore, it was decided to conduct interviews for this study.

As Gilham mentioned, interviews are categorized in three types: structured, semi-structured and unstructured (Gillham, 2000). In this study semi-structured interview is preferred and extensive and detailed set of open-ended questions are prepared.



In the words of Gilham (2000), this research can be defined as a select interview, since it focuses on special interviewees who are professionals in their fields and answer questions with their professional insight.

### **4.3. Selection of the Interviewees**

The interview questions were prepared to understand the perspective of food industry and industrial designers on the participation of them in the process of food product development. For this reason, interviews were conducted with not only industrial designers but also experts in the food industry. Since the food sector is a very wide area ranging from ice cream to freezing, salty snacking to sugaring, it was decided to select a specific food product. Thus, more specific information would be obtained and discussed on the subject. For this reason, because there are two industrial designers who worked with the chocolate producers, the study was handled over the chocolate product. Otherwise, the thesis would be limited with the perspective of the food industry. Another motivation behind working on chocolate is, as it is mentioned in Chapter 2.1.1, chocolate products have an important place in the eyes of consumers. Interviewees were selected from food engineers who have worked for at least one of chocolate producer company, and from industrial designers who have worked with at least one of these companies. In order to understand the perspective of industrial designers, the interviewees were selected among them who have worked with food industries on product development before. In order to understand the perspective of the food industry, interviews were held with food engineers working in the product development departments of food companies.

Accessibility was an important factor in determining the industrial designers to be interviewed. Although there were designers who collaborated with the food industry abroad, it was not preferred due to practical considerations. Therefore, only industrial designers who live in Turkey were investigated. Unfortunately, there were very few of them who have worked with food industries. Only two Turkish industrial designers; Gamze Güven and Nadire Şule Atılğan were interviewed.

Gamze Güven has designed visuality of ETI Karam chocolate, ETI Tutku chocolate, ETI milky chocolate, ETI Petite chocolate family, ETI sticks chocolate, ETI Keyfince chocolate, Eti Crax Curled stick cracker with ketchup flavor, ETI Zaga chocolate with corn and salt, ETI Karamela chocolate with caramel filling and ETI Ahenk chocolate. Moreover, she has designed package of Sölen Istanbul Collection Chocolate, Humm Organic products. In fact, her portfolio is very wide. In order to remain within the frame of the study area, these samples were selected. Nadire Şule Atılğan is the other industrial designer who has contributed to the research. She has designed the visuality of Amadore Assortment Chocolate, which is designed for a Turkish company but sold abroad.

In order to understand the perception of people who has a huge role on developing new food products, four food engineers were interviewed. Since the researcher works for ETI Food Company; she did not prefer to contact product development engineers who work for a competitor food companies in Turkey due to confidentiality issues. For this reason, three food engineers work for ETI Food Company and one who works for Mondelēz International, Inc. in Polland were interviewed.

#### **4.4. Interview Schedule**

The researcher prepared open-ended questions within the framework of the research topic. The interview consists of eight parts that focus on collaboration of food industry with industrial designers, which can be seen in Appendix A. In general, the questions were the same, but some questions were asked to food engineers and industrial designers from different angles.

The first part is where the participants talk about themselves and their disciplines. In this section, industrial designers describe how they meet with food design, while food engineers describe how they are involved in product development.

The second part focuses on the idea of merging ‘food and design’, ‘chocolate and design’. Additionally, it is dwelled on the effect of design of a product or chocolate on consumer perspective.

The third stage focuses on the key elements and decision-making points of the food product development and/or design process in current food industries.

The fourth stage focuses on the collaboration between industrial designer and food engineer. The points where the two disciplines complement each other and feed on each other are investigated.

The fifth stage focuses on the potential contribution of industrial designers to the food industry and potential value of them for food industries over the chocolate product sample.

The sixth stage focuses on the areas where industrial designers need support in order to achieve their goals and challenges in working with food companies.

In the seventh stage, place of industrial designers in the food industry were emphasized. The reasons why industrial designers are far from the food development process were asked. It is focused on how food engineers and industrial designers evaluate this situation.

In the final stage, additional information from food engineers and/or industrial designers is included.

#### **4.5. Conduct of the Interviews**

After determining the designers and food engineers to be interviewed, some of them were first contacted via their social media accounts; some of them were first contacted by e-mail or telephone. The researcher first explained which topic she studies on for her master's degree. Afterwards, she stated that she would like to discuss this matter with them. According to the eligibility status of the interviewees, an appointment from them was requested. Details were discussed via e-mail or phone, such as when to meet and what questions the interview would cover. However, some interviews were postponed more than once.

It was difficult to make an appointment because the researcher was working in a company at the same time, the interviewed experts were very busy, and the dates of

the interviews coincided with the summer vacation period. Although the researcher worked with food engineers in the same place, she had problems getting together with them due to the intensity of work schedule. Since one of the industrial designers lives in Istanbul and the other in Ankara, the researcher was able to do interviews with inter-city trips. Most of the interviewees chose to meet in their offices. The interviews with the food engineers Serdar Maraşlı, Sinan Çaysever and Emir Altınok were conducted at R&D building in management campus of ETI. The interview with Gamze Güven was conducted at her office Tasarımmüssü in Kanlıca, Istanbul. Nadire Sule Atılğan was interviewed in her office in the campus of Hacettepe University, Ankara where she is a professor. Banu Dal Eşgin was interviewed via Skype application since she was in Poland.

Before starting, each interviewer was given a handout (Appendix B), which gives information about the researcher and the aim of the study. This handout also included the purpose of obtaining permission from the participants to use their names and confirming that the information provided in this study will only be used for academic research.

All interviews were voice recorded by the researcher's mobile phone. The total interview length was expected to last approximately 90 minutes; however, recording lengths lasted from 36 minutes to 2 and a half hours.

Since the interviews were done during working hours, some interviewees were interrupted by a phone call or a colleague. During these interruptions, sometimes the interview flux was impaired. Although the interview questions were prepared in advance, additional questions were asked during the flow of conversation to clarify the answers given. Interviews were conducted in the Turkish language, the mother tongue of the participants.

#### **4.6. Data Analysis**

According to Bogdan and Bikken (1982) analyzing the qualitative research is studying the obtained information, organizing it by dividing into manageable pieces,

synthesizing it, discovering what to be learned and what is important and deciding what to say to others about it.

Since interviews were voice recorded, they were transcribed verbatim. In doing so, a few words spoken in the interview were listened, the speech paused, the part spoken was written, and this process was repeated throughout the interview. On the behalf of the absence of a missing part, speeches in the interviews and the part transcribed was checked again.

The texts were printed and read many times. The main subjects were determined from the underlines. These subjects shaped the subtitles of findings and discussions part.

During the interview, the industrial designer or food engineer answered the questions irrespective of the researcher's direction, addressed irrelevant issues. Sometimes they gave answers ahead of questions and have already answered the questions to be asked in the following parts of the interview. This was expected because the questions were of open-ended type. In such cases, the researcher did not interrupt the speaker not to break the flow of conversation. She continued taking the necessary notes during the interview. The participants were contacted again for missing points or additional information.

#### **4.7. Findings and Discussions**

In this section findings and information obtained from the interviews will be included and discussed within the framework of research questions in two parts: the point of view of industrial designers and that of food engineers. Discussions will be presented at the end of each subtitle generated on the keywords, which were identified during the review of the interviews.

The industrial designers and the food engineers generally addressed themselves as "we". However, they actually refer to themselves and their team members. In addition, during the interview, sections that may contain confidential information have been omitted.

#### **4.7.1. Background of the Industrial Designers**

In the first part of the interview, the participants are asked to provide some information about their professional backgrounds.

Banu Esgin has been working in the R & D department in the food industry since 2010 and currently continues her work in the department of product development. She has more experience in bakery and continues to work on developing new products such as biscuits, crackers. She started her career as an R&D engineer in Eti in 2014 and worked in this department for 3 years. Subsequently, she worked as the product development manager in cracker category for new product development department. Currently, she has been working for Mondelez as the Middle and East Europe R&D Senior Product Development Specialist for the brand Oreo and BelVita.

Emir Altınok graduated from Ege University Food Engineering Department. He obtained his master's degree from the University of Salerno on Food Engineering on encapsulation of heat liable components via cold gelation. Then he obtained his PhD degree from Namık Kemal University on chocolate and toffe products. Currently, Altınok has been working as product development engineer over a year at Eti Gıda. His specialty at ETİ Gıda is over chocolate, bars and wafers. Previously he had worked 3 years for Yıldız Holding as R&D engineer on jellies, dragees, laces, hard candies and toffees.

Gamze Güven graduated with a first degree from the Middle East Technical University, Industrial Design Department in 1987. She has been working with Eti since 2009. Since industrial design was not a well-known area, and she lived in Ankara where the industry was relatively limited, she designed for different industries. She worked as a freelancer in furniture and office furniture industry. After graduation, she carried out activities in order for the recognition of industrial design profession along the professional organization of industrial designers. As most of her customers are in İstanbul, she has been working in İstanbul since 1998. After working in the industries

such as glassware, exercise equipment, kitchenware, she made stand designs in the early 2000s. In the design competition opened by Tekel in 2004, her design was chosen as the lead. Currently, seventy percent of her work consists of such packaging designs. After 2009, she started to work with Eti. During this period, she made efforts to highlight the chocolate of the Eti product, Tutku. Later on, she worked on the design of many other brands of ETİ such as Crax, Sütlü, Zaga, Ahenk, Karamela, Karam, Petito, Sticks, Keyfince.

Serdar Maraşlı graduated from Gaziantep University Food Engineering Department and worked as an R & D Engineer at Yıldız Holding between 2004-2013. After working as the Business Development / R&D Manager at Yıldız Holding, he transferred to Konya Şeker as the Snack Business Unit R & D Director. After Konya Şeker, where he worked between 2013 and 2015, Maraşlı worked as the R&D and Quality Director at Modern Çikolata. Since 2016, he has been serving as R&D Director at Şölen Gıda.

Sinan Çaysever who graduated from Hacettepe University Food Engineering Department in 1991, worked as a research assistant at Hacettepe University between 1991 and 1994. He has been working as R&D manager in Eti since 1994.

Nadire Şule Atılgan started her higher education at Gazi University Faculty of Medicine but later she received her bachelor's degree from the Middle East Technical University, Industrial Design Department, and her master's degree from Hacettepe University, Graphic Design Department and she completed her doctoral studies at the same university. Atılgan, who won the Eczacıbaşı Design Competition First Prize in 2001, realized industrial design products and projects in different fields. Many of her works have been exhibited in Turkey and abroad.

#### **4.7.2. Perspective of food engineers and industrial designers on ‘food design’**

In this section, an overview of the food design is presented from the food engineers’ and industrial designers’ point of view.

Nadire Şule Atılgan emphasizes the importance of industrial product design in determining the shape of food by stating “design changes everything”. She highlights the importance of design with the fruit pulp and jelly bean examples. She says: “The difference between fruit pulp and jelly bean is addressed by the design. One of them is a designed object, the other is an undesigned object.” Likewise, Gamze Güven points out to the importance of design. According Güven, the design of the product allows consumers to decide within 3 seconds. She states that:

Although the inside of the product is not visible, the product image on the packaging communicates with the consumer. The design of products such as furniture and glassware does not surprise the consumer as much as a food product which is covered by a package. Therefore, the design addressing to five senses becomes more important for food products. For example, in terms of chocolate there is a different ritual. Each consumer has a different way of eating chocolate, which is directly related to the design.

Serdar Maraşlı points out the importance of aesthetics in industrial design. According to Maraşlı, product design is related to the correct positioning of the product. Similar to Güven, Maraşlı states the importance of five senses and argues that consumers perceive food products with five senses. According to Maraşlı, the senses of sight, smell, touch and sound give information about the quality of the product. Sinan Çaysever tells that: “Visuality is important in the product.” According to him, the visuality of the product is related to both the product in the package and the packaging itself. Apart from visuality, he says that: “The taste of the product should be taken into consideration in food design.” Banu Esgin declares that: “Food design is solid outcome of the consumer comments and wishes.” Emir Altınok considers food design in two main parts;

- parts of it consistency (fillings, coatings, condiments etc.)
- shape (size, thickness, height, weight etc.) and appearance (writings, shapes etc.)



He also adds that: “Design is linked to brand for consumers. When consumers see some colors, shapes or etc., they can easily correlate with specific brand.”

In summary, the participants emphasized the importance of the design of the products with different points of view and expressed the importance of the products to address the five senses which is related with the product design. While food engineers evaluate ‘food design’ by considering the product's visuality and aesthetics, designers evaluate ‘food design’ by considering the product's image and eating rituals and eating experience rather than. On the other hand, both food engineers and industrial designers agree on the fact that design of the food affects the eating quality, eating experience, consumer perception, and flavor profile of the product.

#### **4.7.3. Difference and similarities between food engineer and industrial design**

In this section, an overview of the differences and similarities between food engineers and industrial designers are presented from the point of view of both parties. The participants focus more on the differences between food engineer and industrial designer.

As an industrial designer, Nadire Şule Atılğan points out the difference between a food engineer and an industrial designer in terms of “concept development”. Atılğan declares that:

The food designer is a concept developer, the food engineer is more technical. Developing concepts cannot be realized by food engineers because engineering does not include social perspective, thus, they are not capable of developing product concepts.

Gamze Güven, on the other hand, looks at the difference between industrial designer and food engineer in terms of eliminating constraints. According to Güven, food engineers have limitations. While industrial designer can eliminate the constraints by brainstorming, food engineers may be insufficient to eliminate the constraints.

As a food engineer, Serdar Maraşlı looks at the difference between an industrial designer and a food engineer in terms of creativity. He declares that:

Focus areas of industrial designers and food engineers are different. While industrial designers look at events from different perspectives and think about things that no one else can see and think about; food engineers want to read and see the processes.

Maraşlı relates the reason behind this difference to the difference in trainings and education. On the other hand, Sinan Çaysever emphasizes the creativity of food designers similar to Serdar Maraşlı and the experience of food designers similar to Gamze Güven as explaining the differences between food engineers and industrial designers. Çaysever says that:

Food designer is the one who can reveal what s/he saved in his/her memory where necessary. For example, while industrial designer can think and develop pumpkin crackers, food engineer can knowingly use it in different fields after the production of this product.

Atilgan also states that: “Cooperation between food engineering and industrial design is a new trend in the world.” She also adds that: “Industrial design requires experience. Therefore, skills are more important than theory. Therefore, food engineer can only design according to his personal skills.”

In summary, the participants emphasize that the most important difference between industrial designer and food engineer is creativity and experience. While industrial designers design products with his/her training, food engineers can produce new combinations based on an existing products. In addition, food engineers develop food products with technical problems in mind, but industrial designers design food products with a concept design in mind which may not have any precedence.

#### **4.7.4. The current point of view of industrial design in the food industry**

In this section, an overview of the current situation of industrial design in the food industry is analyzed by industrial designers and food engineers.

Both Nadire Şule Atılğan and Gamze Güven who are the industrial designers think that engineers can make design, but their design would be basic when the last improvements of industrial design are considered. Atılğan criticizes the position of Turkey in terms of industrial design due to making copies from other designers. On the other hand, Güven says that:

Everyone who criticizes the idea of industrial design in food industry agreed and accepted the inevitability of food design. They even accepted it so much that they opened a food design competition 4 years ago. Food design and packaging design started to be given as projects in design departments in schools. Projects on food packaging and food design started to be accepted.

Aspects of food engineers are a bit different than industrial designers. For example, Serdar Maraşlı analyzes the process as a whole. He indicates that conditions have characteristic role upon the improvement of food design. He emphasizes how the world globalize, getting information become quickly, and how machines are developed, competitors and technologies are followed easily. He declares that: “As a result of this contemporary world, food design enters the agenda of this sector.” Another point of view is from Sinan Ceysever who questions; how many people finish their school as a real merit designer in Turkey and how many of them make difference in business. Ceysever indicates that:

Food design is not only about industrial designers but also about food engineers, it is a team work and a food engineer who studied industrial design or participated in studies related to industrial design helps considerably in food design.

Banu Esgin and Emir Altınok also believe in the improvements about food design and its importance. They are aware of the fact that developments in the sector are ongoing.

In summary, with the latest developments on technology and sector, there is no doubt that food design becomes more and more important for the companies. Only product itself is not enough for consumer any longer. Food design is perceived as an internal part of a product. In order to differentiate from competitors and survive in the market in this fast-growing sector where competition increases, food manufacturers need to incorporate with the discipline of industrial design.

#### **4.7.5. Food designing/development process and its key elements**

In this section, main elements of the food development process are questioned.

Nadire Şule Atılğan talk about three elements, changing even one of them differentiates the design. For her, these elements are ergonomics, flavor combination and reproducibility that is determined according to the brief of company. Parallel to that, Gamze Güven states that:

Of course, we take the production conditions into account. But as I said throughout the design, we are working on how to reflect the brand's identity, advertising communication, and that concept of chocolate. While designing the food, we consider the rituals and experience of the product and its effect on the five senses. That's why we're different.

Food engineers also have similar ideas about what are the main elements of food designing process. Serdar Maraşlı explains this process with two things; one is the prescription, the other one is the method: one is what is used, the other is how it is used. For him, these two need to be understood very well and in addition to these two things, quality parameters which can be varied from product to product are crucial. Sinan Ceysever indicates the three elements as Atılğan mentions; quality, time and cost. On the other hand, Banu Esgin does not talk about these three certain elements, yet she explains main elements as a process. She states that:

The starting point of the project is rooted from these concepts... The concept of the product, which is validated in prototype form, must maintain the same

properties in process conditions as well as in industrial production conditions. This is critical.

Not only Atılgan and Çaysever emphasize three main elements but also Emir Altınok highlights processability, profitability and consumer satisfaction of a product as three main elements.

In summary, although terms change from person to person, there is a common ground shared by both industrial designers and food engineers. Key elements of food designing process are related to both these elements and achieving the balance between these elements which are quality, time, cost, processability, profitability, consumer satisfaction, prescription and method.

#### **4.7.6. Communication between designer and food company**

In this section, conversation between designer and food company is analyzed through industrial designer's perspective.

Nadire Şule Atılgan explains her communication process with the food company that they exchanged information about the flavor of the product and made evaluations on benchmark products together. She says that:

It was talked with the food company about how the consumer would have an experience while eating the product, how the 'tick' sound would be heard while the bark on it was biting, along with cream and dried fruit pieces in the product.

Likewise, Gamze Güven gives product-based communication examples which she experienced with ETI Karam, Keyfince, Milky, Sticks, Petito and Ahenk between company and her. She emphasizes that:

Conversations are mostly focused on what is aimed with that product. Improvement of process takes shape according to the target audience of product and communication between designer and food company is also shaped according to this. This can be illustrated briefly by the example of

Karam product (shown in Figure 5.1). For Karam product, the company stated that “We want to be the market leader in bitter, we want to do something ambitious. How do we get the Turkish consumers to eat the bitter chocolate? How can we make it more attractive?”. In addition to these, products go to consumer test, positive or negative feedbacks can be revised accordingly. This test also affects the state of play.



Figure 5. 1: ETİ Karam Bitter product (retrieved from: <https://www.hepsiburada.com/eti-c-80-gr-karam-70-kakaolu-bitter-cik-19804-pm-zyhpeticecik005>)

As food Engineers, Serdar Maraşlı and Sinan Çaysever add brief interpretation of their experience of communication between industrial designer and food company. Maraşlı focuses on the idea that food company must remember why they need an industrial designer. He emphasizes that: “Food company should not lose its initial aim and scope why it decided to work with industrial designer.” Çaysever gives a suggestion to the food company to create the right communication experience with the industrial designer that the food company needs to tell the industrial designer exactly what they want. He states that: “A clear brief should be given to industrial designer to evaluate his/her work and then to share it with the company.”

In summary, communication between industrial designer and food company is crucial to manage a successful process. Both sides should be open to mutual interaction. All industrial designers and food engineers interviewed are in agreement on this point. Industrial designers should be provided with sufficient and effective brief about the project so that both food engineers and industrial designers can be on the same page. The mutual exchange of information must be productive and effective from the very beginning of the product development process.

#### **4.7.7. The cooperation between food engineer and industrial designer**

In this section, how food engineer and industrial designer work together is analyzed by both food engineers and industrial designers.

Emir Altınok explains his perspective as a food engineer:

The food engineer can give the designer an insight into what s/he has developed. How the process is conducted, how it can be conducted alternatively. The engineer can show that when s/he knows the product better, s/he can perhaps highlight a feature which the designer is not aware of. The engineer can add a subtle nuance that only s/he can add by his/her technical knowledge, and the designer can bring it to the fore and reflect it on the product ranging from its quality, user experience and even its advertisements. Perhaps, the designer can bring about something that is not in the mind of the consumer. The designer shapes the vision of the food engineer and give him/her another framework. The food engineer shows the designer what is happening in the sector and what is happening in the background. This will also strengthen inter-sectoral communication. The designer is the one who will change the perspective of the food engineer and that a food engineer can join the design process through what s/he sees in other products. A food engineer's perspective can change with feedback and insights from the designer.

In parallel with Altınok's perspective, Serdar Maraşlı also emphasizes the importance of mutual communication and talked about the roles of food engineers and industrial designers that the food engineer will determine the beginning and the end of the process, the difficulties, the constraints, the raw materials to be used and the methods to be selected. He explains that the designer would bring about their contribution to the design of the product and, check and encourage the perspective of the engineer.

On the other hand, Sinan Çaysever has a different point of view which indicates the balance between food engineer and industrial designer. He says that:

Food engineer shows borders and limitations to designer. However, designer sometimes wants to push the limits for creating something new. Ultimately, the constraints given by the food engineer come from production experience. Industrial designer might try to keep it in mind, but if product has serious constraints, it would be a waste of time.

Nadire Şule Atılğan who has not work with a food engineer during the product design process before, justifies that the designer and the food engineer should work together without interdisciplinary conflicts. Food engineer and industrial designer should work together at every step of product development. Moreover, Gamze Güven who has meetings and teleconferences with food engineers for each project she conducted, thinks similarly to Atılğan. Güven states that:

Engineers and industrial designers have to work together. The food engineer will talk about some issues, we will say let's evaluate them together. Sometimes it may not fit exactly where to evaluate the marketing of the product, but if you approach to the process as a designer, then we can make a suggestion that if we make the product at a certain way, then marketing department can approve. There should be a triple synergy between the parties.

In summary, the common concern that food engineers and industrial designers share is working together through the whole process. They all believe that working together creates inter-sectoral communication that will only strengthen the process. Besides, an experienced food engineer who worked in the same position for long years in the same company says industrial designers can sometimes waste time insisting on changing the commonly known facts. Others, however, agree that changing these known realities, a perspective away from the operational blindness may bring the products to an innovative point.

#### **4.7.8. Contribution of industrial designers to product development process and decision points that have an impact on consumer perspective**



In this section, how the decision of industrial designers affects consumers and what contributions are made to the product development process by them are examined.

As to the contributions of industrial designers from their own perspective, Nadire Şule Atılğan states that:

When designers are involved in product development process, product becomes considerably improved. Industrial designer contributes to the process as an idea-concept developer. A designer may be needed for modeling, developing a new model and thinking it through in three dimensions. The sales side and the marketing side can be fed from designer with a different perspective.

As an experienced designer Gamze Güven, who has been working with food companies, says that:

In the food industry they should not see the designer only as a form creator because designers are looking at the process holistically. The needs of the consumer, whether the money spent for the perception of the product, whether this money is worth the product; we look at everything holistically. From the ergonomics of the product, to the user-value relationship, the suitability of the product category to the brand' range, ...we look at everything. Industrial designers contribute not only to the product itself but also to its advertisement. For instance, ETİ Canga is a well-known and widely consumed product. The target consumer group is young people mostly around middle and high school ages. Thus, the adverts emphasize that the product is messy with peanuts on it. In the advert a Gorilla is acting like messing around its room and the mother is just watching and accepting the situation as it happens in real world. The adverts (shown in Figure 5.2 and Figure 5.3) utilize actors and objects representing the product's characteristics determined by the designer from the initial production step. As the designer involves in all the steps much further

than the product itself, the product can be shaped more suitable to satisfy consumer needs and wants.



Figure 5. 2: ETİ Canga advert's scenes(retrieved from: <https://m.haberler.com/daginik-sevenleri-yeni-bir-macera-bekliyor-5166771-haberi/>)

Figure 5.2.



Figure 5. 3: Motto of ETİ Canga (retrieved from: <https://www.kizlarsoruyor.com/toplum-sosyal-iliskiler/q4852126-en-sevdiginiz-cikolata-hangisi>)

As to the contributions of industrial designer, Serdar Maraşlı as a food engineer thinks that designers will contribute to product design, consumer understanding, line-product commissioning, sales side and market positioning. Sinan Çaysever states that:

When you need to do something different from standard patterns, you should be able to look at it from different points. Industrial designer can look at things from outside the common business blindness. Industrial designer contributes to the form and structure of products in ways that you do not think of. Designer

somehow shares the forms in his mind and imagination with you; make interesting designs, make interesting comments.

Banu Esgin says that: “The product is a design yes, but the product is actually a target on the line. I'm including the consumer side of the product design yes, but the designer is involved in the production and needs to get to know the production stages.” Lastly, Emir Altınok says that: “While one is limiting (engineering), the designer can further expose the subject. And s/he can force the engineer to go beyond these limits. The designer can pave the way for new horizons when positioning the product on the shelf.”

In summary, contribution of industrial designer to the product development process is significant. This contribution has an impact on product where designers play an important role, and their creativity and courage will also affect the process and change it. Industrial designers have potential to think in three-dimension, to look at the process holistically and from a non-conventional point of view, going beyond the limits. Therefore, they contribute to the idea-concept development, modeling, sale and marketing strategies, ergonomics of the product, suitability of the category, brand integration, product design, consumer understanding, exposing the product and advertisements to the target group.

#### **4.7.9. The challenges that industrial designer may face in the food design process**

In this section, problems that an industrial designer may face with are argued.

Nadire Şule Atılğan declares that: “The designs change according to the volume and physical properties of the products. They all need to be compatible under production conditions. Hence, making accurate calculations is the way for avoiding potential problems, but making inaccurate calculations is the source of problems.” Gamze Güven supports Atılğan’s idea and she says: “In chocolate design, the products should not be broken on the production line and during transportation. The intermediate thicknesses and gaps need to be designed accordingly.”

Serdar Maraşlı, classifies problems in four part, these parts are; first, understanding the consumer, second; knowing the material, third; knowing how to use the material; fourth, to receive product approvals by the top management. Sinan Çaysever has more positive approach to problems stating that these are usual issues within the process and necessary for the progress. He says that:

You do a lot of hard work. Maybe you do a hundred jobs. As a result, maybe one or five of them are correct. The pleasure of that positive result is very remarkable. There are a lot of negativities in the human life, but the positive results you have experienced make you forget the negativity. But negative things have to teach you.

Finally, Emir Altınok emphasizes problems as equipment, legislation and consumer needs and wants.

In summary, main problem for designers is calculations about the product and process to maintain the progress, whether features of machine are proper or not for the design, whether thickness of the product is suitable for the design or not. Although designers demonstrate the calculation as a main problem, food engineers indicate various problems such as understanding the consumer, equipment, etc. Designers may not be familiar with specific technical issues but, as they declare, the design of the product should be compatible with production conditions. Therefore, in designing process they have to be aware of the potential problems and take precautions to be away from them. In order to achieve that, they have to understand consumer very well, be informed about technical issues such as capabilities of machines and legislation.

#### **4.7.10. Expected position of industrial designers in the food product development process**

In this section, it is questioned which parts of the food product development process designers can be involved in.

Designers Şule Atılğan and Gamze Güven clarify that they preferred being involved in the process from the very beginning. They justify that if they are not, the design cannot go beyond just a shape/form. The designer should be the part of the essential team. Industrial designers should be involved in the food industry. When they are involved from the very beginning, they have the chance to analyze the consumer very well and take many consumer routing tests. They listen to target group first-hand. Hence, it becomes an efficient cooperation. At this point, Gamze Güven makes a complaint about engineers that designers are suppressed by engineers and engineers prevent designers from flying creatively.

Contrary to the complaints of Güven, Serdar Maraşlı as a food engineer supports the role of designer as the same with their position in the food product development process. Maraşlı says that:

Designers should be involved at every step of the process, from idea developing to the end with us; R & D, production development and technology, sales and marketing. We all must be able to work with each other at an interdisciplinary ground and exchange ideas. You cannot put a designer in a too much routine. It should not be simplified and limited strictly. We need to show them the big picture. We need to listen to them and let them free.

Similarly, Banu Esgin says: “Designer should be involved in the process of product development from the very beginning to the very end.” Contrary to Maraşlı and Güven, Emir Altınok thinks that industrial designers should be involved in food companies as a consultant in the development process. Merely Sinan Çaysever has a different opinion about the position of industrial designer in a food company. He states that: “There is no need to work with a designer while working on the prototypes. If the company is doing something very special, it will bring you a cost advantage. The project can be outsourced to a designer.”

In summary, all interviewees mentioned above but one food engineer agree on the long-term cooperation between industrial designer and food engineer throughout

every step of the process. The one that opposes to this idea thinks that companies that develop a small number of products will not need full-time designers. He declares that before hiring a full-time industrial designer, it should be considered whether it is cost effective when considering total food development projects. One designer mentioned that companies that hire full-time industrial designers, still need to get consultancy from industrial designers who work freelance. She thinks that a full-time designer may lose its creativity with the pressure of corporate culture and be subjected to over-orientation by a hierarchical structure. For this reason, an external designer can bring about creative solutions and ideas in an independent free working environment. On the other hand, for all the interviewees, consultancy of designers is needed from the beginning to the end. Expected position of industrial designers comprises the whole food product development process (R&D, production development, technology, sales, marketing etc.). Industrial designers should be part of the essential team and they should not be put in a too much routine, they should be free and comfortable.

## CHAPTER 5

### CONCLUSION

In this section, firstly, the research questions are reviewed, and the results of the study are presented. It is continued with the following sections; limitations of the study, implications of the study and recommendations for further research.

#### **5.1. Research Questions Revisited**

The overall objective of this study is to understand the potential contribution of industrial designers to the product development process in food industry through chocolate products. The survey results prepared within the scope of the research questions.

##### **5.1.1. What can industrial design bring to the food industry?**

To answer this question, the literature was reviewed in detail and ideas of industrial designers and food engineers were examined. It was seen that while in old times adequate importance was not given to industrial design due to lack of equipment, inadequacy of technology and cost problems, the same thing cannot be said for now. The importance of the industrial design comes into sight with the globalizing world and how industrial design affects the food industry.

On the other hand, progress of industrial design in the food industry is still staggering. Companies who are above the certain capacity are more able to use opportunities of industrial design and they are also more aware of why industrial design is crucial. Hence, it can be said that industrial design brings new and fresh points of view in food industry which the wishes of consumer are underlined by industrial designers. This is a new concept, which correlates food and its appearance, eating experience, its touch and the sound while it is breaking. Industrial designers design products more attractive

with their professional perspective and bring about small retouches, thus companies which make huge profits start to discover the significance of industrial design.

### **5.1.2. How does an industrial designer contribute to the process of industrial food product development?**

, As discussed in the above, industrial designer who works for the process of industrial food product development puts demands of consumer at the center of him/her design and s/he makes contributions following demands of consumer. In order to understand and guess what consumers want, industrial designer has to contribute to the process from the beginning to the end. Contribution of industrial designer is about the shape/form of the product and/or packaging of the product which appears that it seems there is no need of technical knowledge about food production process, but actually, industrial design has an impact on technical side of the food production. Therefore, not only for the shape/form but also for technical process, industrial designer has a contribution to the whole process.

The initial acting step of the design process can be defined as receiving briefs and starting contact with consumers. Since the customer behavior and satisfaction are the most vital factors for creating novel products; initially, either the verbal or written briefs are taken by company marketing division and field researcher and given to the designer. These brief documents principally encompass the objects related with customer set data, the objectives and projected conclusions.

The next point in the production process is the design research which begins with the detailed examinations and product-based research activities associated with chocolate itself. Industrial designers emphasize the food quality, the key materials inside the product and the manufacturing process of the chocolate-based food. Similar foods to the chocolate such as cracker and jellies are as well defined as a significant issue to work on it. Separately from these issues, studies for packaging design and accompanying selling place visits, observations, discussions and focus group sessions



with the intention of apprehending buyers' behaviors can be examined in this phase of the food product process.

The third issue can be stated as the concept development which contains creating preliminary design thoughts and notions, and visualization of these factors. Afterwards, the design options can be discussed among the design team. The fourth aspect is the demonstration of product to the customer that entails the offering of design choices, assessment and the selection of the options with getting responses from the customers or the retailers.

The final stage can be defined as adjustments and finalization of the product which comprises revisions of the designated design options relied on the comments taken from consumers and the selection of the ending option along with manufacturing demo and trial with integration to various other sizes.

#### **5.1.2.1. What creative solutions does an industrial designer bring to an industrial food product?**

Industrial designers can collect data effectively to be implemented in the development phases and they have diverse creative perceptions and perspective on the project. This powerful capability of them can be located at the center of design phases in order to integrate their valuable expertise. From the very beginning to the end, industrial designers can bring innovative ideas which help producers to solve problems easier. For example, the ability of designers to understand and analyze consumers and their experiences can be useful during market research. They can broaden the horizons of food engineers with creative suggestions in the development of new products. They can bring different solutions to the shortcomings experienced during the launch of a new product since they do not have routine operational blindness. Designers can contribute to the development of new products' sales strategies, such as different location recommendations, different advertising tactics, and shelf designs.

### **5.1.2.2. How do the creative solutions that an industrial designer bring about to change the product?**

Design tools for providing data collection, increasing development inspiration and teamwork, communication and management aspects play a crucial role in development of food product. Industrial designers constantly evolve and modernize the development phases as a result of feedbacks from internal meetings, returned data from customers and analysts.

### **5.1.3. How do these two different disciplines; industrial design and food engineering contribute to each other?**

Food engineers cannot see the perspective of an industrial designers for the reasons of professional expertise. They are two different disciplines that can only complete each other. So, what they each focus on is different. The biggest difference comes from industrial design is the creative perspective. They almost do not need to see or touch in order to think about them. They have the capability to imagine products or projects that they are working on in 3D. Because they are raised with these motives and skills, their education is very different from that of a food engineer. On the other hand, engineers generally need to touch, read, and see in order to decide, think or solve the problem at hand. They are on the technical side of process coming from their skill set.

As designers and food engineers collaborate, the knowledge of designers about the food sector increases, so does the number of designers who can see the problems in production conditions in more detail, and with this awareness they can design products that can be easily adapted to production conditions.

### **5.1.4. How do food engineers and industrial designers work in collaboration? What are the factors and limitations in this collaboration?**

The food engineer can give the designer an insight and brief into what s/he has developed. How the process is done, how it can be done. The food engineer can show

when s/he knows the product better, s/he can perhaps highlight a feature which s/he is not aware of. The food engineer can add a subtle nuance that only s/he can add, and the industrial designer can bring it to the fore and present it as an ad. Perhaps, s/he can make something that is not in the eyes of the consumer. Industrial designer shapes ideas of the food engineer and give them another perspective which is based their creative skills. The food engineer shows the industrial designer what is happening in the sector and what is happening in the background. A food engineer's perspective can change with feedback and teachings from industrial designer.

Finally, food engineer and industrial designer should work together at every step of the product development. Food engineer works on issues related to food quality such as product quality, materials compatibility; industrial designer develops the product in terms of eating experience etc., then transmits this data to the food engineer and interprets it again. In this way, they develop mutual information exchange and a two-way communication.

#### **5.1.5. How should the industrial food sector involve industrial designers in the food design process and what kind of tasks and positions can they deliver and hold?**

Industrial designers have the huge capability of modifying and improving the related issues in food sector such as food appearance, content, packages and tableware etc. This high modification capacity enables them to adapt alterations in the food merchandises, logistic and storage arrangements. As a result of this effort, long-term improvements can be achieved. Additionally, project-based product development can be carried out with designers to be included from the very beginning of the process.

#### **5.2. Implications of the Research**

As a result of the study it is interpreted that industrial designers have a great potential to contribute to the process of food product development in many ways. Although existing food manufacturers do not involve industrial designers in product

development processes yet widely, they are believed to bring different perspectives and creative solutions at many points through the process. Especially, considering that pioneering food companies launch many new products every year, it is seen by the examples that they need industrial designers to differentiate from competitors, to meet consumer needs in the right way and with the right product at the right time. However, another important point here is how industrial designers will be involved in the process and how they will work in collaboration with food engineers. For this reason, factors affecting consumer perception were determined through product development process. In these steps, the potential contributions of industrial designers, the necessary collaborations and possible consequences are brought together in the *Table 5. 1* and presented as the output of this study. In this table, product design is categorized in four stages; idea generation, concept development, plan and design, launch and produce.

- **Idea generation:** This step is considered in four stages:
  - Market research
  - Consumer data research (needs, global trends etc.)
  - Competitor, supplier, retailer etc. research
  - Brainstorm ideas.

These product development stages have decision points that affect perception of consumers:

- Marketing strategies
- Right product (needs, global trends etc.)
- Accurate timing
- Promotion of the product.

In these decision points, industrial designers can contribute to;

- Conducting field research
- Understanding and analyzing consumer
- Identifying consumer needs

- See global trends and consumer needs in advance
- Determining the sine qua non of the product
- Product character creation.

In idea generation stage, the marketing department and industrial designers should work with consumer research centers together. In particular, consumer analyzing methods of both marketing and designing disciplines should be combine and utilized.

Since understanding the consumer is one of the exit points of the product development process, the most accurate result would be reached not only by the marketing department but also industrial designer's perspective. Points that the marketing department cannot see can be seen. Perhaps new markets and trends that could not have been thought before could be created. This gives the manufacturer a great advantage in terms of making a difference in existing products, analyzing the consumer correctly and anticipating the needs that the consumer does not even notice.

- **Concept Development:** This step is considered in eight stages:
  - Content of the product
  - Texture of the product
  - Visual design of the product
  - Packaging design
  - Shelf life determination
  - Regulation control
  - Focus group test for adjustments
  - Determination of prototype product as reference product.

These product development stages have decision points that affect perception of consumers:

- Price of the product
- Packaging design

- Graphic design of the package
- First impact of visuality
- Sensorial experience
- Trustworthiness of the product
- Right product (needs, global trends etc.).

In these decision points, industrial designers can contribute to;

- Creating new product ideas
- Brainstorming about the content of the product
- Designing the form of the product
- Designing the sense of touch
- Designing the light reflects from the product
- Designing the sound of chewing or breaking
- Designing the packaging
- Evaluating ideas from the consumers and making design adjustments
- Highlight the product features that attract the consumer's interest.

In concept development stage, should work in collaboration with food engineers from the very beginning. Food engineers should feed designers with specific information for each product, as designers will need. Industrial designers should be able to evaluate the feedback on their designs in the light of the knowledge on technical issues. This should be an information exchange between the two disciplines.

At this stage in which the new product concept is developed, thanks to industrial designer's creative, the manufacturer would not only differentiate the product from other competitors' products, but also raise the brand identity in terms of creativity. Industrial designer develops the factors that enable the consumer to buy the product continuously by directing the perception that the product awakens in the consumer and ensures that the product is sold more and

stays long-term in the market. Industrial designers can work with food engineers to bring the product to a different point in each parameter of the product. In this process, the perspective of food engineers on product design would be changed and foundations of a fundamental change is laid.

- **Plan and Design:** This step is considered in four stages:
  - Equipment adjustments for large scale manufacturing
  - Determining purchasing units (ingredients, packages etc.)
  - Production of prototype product in industrial scale
  - Time plan for launch, advertising and target markets

These product development stages have decision points that affect perception of consumers:

- Accurate timing
- Trustworthiness of the product.

In these decision points, industrial designers can contribute to;

- Practical solutions by different points of view coming from their discipline.

In plan and design stage, the basic technical information required during the serial production of the prototype product should be shared with industrial designers. In this section, food engineers and mechanical engineers should work elbow to elbow. The points that the designer may need should be transferred to the designer in a timely, clear and understandable manner.

Industrial designer can meet the need for equipment by creating creative solutions where investment is required. They can reduce the loss of time and money that can be experienced during the product launch by bringing a different and practical perspective to the problems that would be experienced during product startup.

- **Launch and Produce:** This step is considered in five stages:
  - Launching the product
  - Selling strategies (product positioning, promotions etc.)

- Distribution strategies
- Advertisement activities
- Cost saving (production, ingredients etc.).

These product development stages have decision points that affect perception of consumers:

- Advertisement activities
- Promotion of product
- Sale strategies
- Positioning of the product on the shelf in the market.

In these decision points, industrial designers can contribute to;

- Product positioning
- Stand designs
- Providing creative solutions related to advertising activities in line with the character of the product.

In launch and produce stage, experts in charge of sales and distribution, marketing department and industrial designers should work together. They must collaborate on how different suggestions of an eye that has followed the process from the very beginning to the end can be adapted to the field. Assuming that industrial designer has been involved in the design of the product from the very beginning, they would be the ones who know the character of the product and its counterpart in the consumer. Therefore, they can develop creative ideas about how the product will be positioned next to which competitors' products. A different point of view regarding the sales strategies of the product, which can read the consumer, would help the product to be more visible and differentiated from other products in the market.



Table 5. 1: Table of the potential contributions of the designers, the necessary collaborations and possible consequences

Product Development Process	Decision Points That Affect Perception of Consumers	Contribution of Industrial Designers	Collaboration with Industrial Designers	Possible Consequences
<i>Idea Generation</i>				
Market research	Marketing strategies Right product (needs, global trends etc.) Accurate timing Promotion of the product	Conducting field research Understanding and analyzing consumer Identifying consumer needs See global trends and consumer needs in advance Determining the sine qua non of the product Product character creation	The marketing department and industrial designers should work with consumer research centers together. In particular, consumer analyzing methods of both marketing and designing disciplines should be combine and utilized.	Since understanding the consumer is one of the exit points of the product development process, the most accurate result would be reached not only by the marketing department but also industrial designer's perspective. Points that the marketing department cannot see can be seen. Perhaps new markets and trends that could not have been thought before could be created. This gives the manufacturer a great advantage in terms of making a difference in existing products, analyzing the consumer correctly and anticipating the needs that the consumer does not even notice.
Consumer data research (needs, global trends etc.)				
Competitor, supplier, retailer etc. research				
Brainstorm ideas				
<i>Concept Development</i>				
Content of the product	Price of the product Packaging design Graphic design of the package First impact of visual Sensorial experience Trustworthiness of the product Right product (needs, global trends etc.)	Creating new product ideas Brainstorming about the content of the product Designing the form of the product Designing the sense of touch Designing the light reflects from the product Designing the sound of chewing or breaking Designing the packaging Evaluating ideas from the consumers and making design adjustments Highlight the product features that attract the consumer's interest	Industrial designers should work in collaboration with food engineers from the very beginning. Food engineers should feed designers with specific information for each product, as designers will need. Industrial designers should be able to evaluate the feedback on their designs in the light of the knowledge on technical issues. This should be an information exchange between the two disciplines.	At this stage in which the new product concept is developed, thanks to industrial designer's creative, the manufacturer would not only differentiate the product from other competitors' products, but also raise the brand identity in terms of creativity. Industrial designer develops the factors that enable the consumer to buy the product continuously by directing the perception that the product awakens in the consumer, and ensures that the product is sold more and stays long-term in the market. Industrial designers can work with food engineers to bring the product to a different point in each parameter of the product. In this process, the perspective of food engineers on product design would be changed and foundations of a fundamental change is laid.
Texture of the product				
Visual design of the product				
Packaging design				
Shelf life determination				
Regulation control				
Focus group test for adjustments				
Determination of prototype product as reference product				
<i>Plan and Design</i>				
Equipment adjustments for large scale manufacturing	Accurate timing Trustworthiness of the product	Practical solutions by creative perspective of the discipline	The basic technical information required during the serial production of the prototype product should be shared with industrial designers. In this section, food engineers and mechanical engineers should work elbow to elbow. The points that the designer may need should be transferred to the designer in a timely, clear and understandable manner.	Industrial designer can meet the need for equipment by creating creative solutions where investment is required. They can reduce the loss of time and money that can be experienced during the product launch by bringing a different and practical perspective to the problems that would be experienced during product startup.
Determining purchasing units (ingredients, packages etc.)				
Production of prototype product in industrial scale				
Time plan for launch, advertising and target markets				
<i>Launch and Produce</i>				
Launch the product	Advertisement activities Promotion of product Sale strategies Positioning of the product on the shelf in the market	Product positioning Stand designs Providing creative solutions related to advertising activities in line with the character of the product	Experts in charge of sales and distribution, marketing department and industrial designers should work together. They must collaborate on how different suggestions of an eye that has followed the process from the very beginning to the end can be adapted to the field.	Assuming that industrial designer has been involved in the design of the product from the very beginning, they would be the ones who know the character of the product and its counterpart in the consumer. Therefore, they can develop creative ideas about how the product will be positioned next to which competitors' products. A different point of view regarding the sales strategies of the product, which can read the consumer, would help the product to be more visible and differentiated from other products in the market.
Selling strategies (product positioning, promotions etc.)				
Distribution strategies				
Advertisement activities				
Cost saving (production, ingredients etc.)				



### **5.3. Limitations of the Research**

Since the subject of the research included the product development processes of the food companies, the interviewed experts had hesitations about providing confidential information. Therefore, at the end of the interviews, information that might contain some confidential information had to be eliminated. Occasionally, interviewees avoided answering some questions that they thought might contain confidential information.

Because the researcher is working in a food company, she chose not to contact the product development teams of competing companies in the same country. For this reason, three of the four food engineers interviewed were selected from product development experts working in the same company. As the researcher resides in Eskisehir, she had difficulty in meeting with her advisor at the thesis stage. She also traveled across cities to meet industrial designers face to face. This situation was a compelling factor in making time plans.

Due to the small number of industrial designers working with food companies, only two of them could be interviewed. Both of them have participated in the process of chocolate product development before. In this regard, the research has been examined through chocolate product development.

Since this study is handled from the perspective of the manufacturer and the industrial designer, it includes detailed views of both sides. However, the consumer could not be examined in the effects of products designed by a food designer.

Since the interviews were conducted in Turkish with participants whose native language is Turkish; it took much longer to translate and analyze all conversations in English. On the other hand, the original voices of the participants did not take part in in the manuscript.

There are not many studies about industrial designers involved in product design processes in food companies. The lack of documentation and study of this subject was a limitation factor in literature review part.

#### **5.4. Recommendations for Further Research**

The scope of this study includes the perspectives and practices of the manufacturers and industrial designers. Further studies can be conducted to reveal the perspective of consumers.

This study is conducted with the contribution of food engineers of a single food company in Turkey. Further studies can be repeated with more industrial designers and more food engineers from different companies to provide a wider perspective.

As chocolate is an artisanal product, industrial designers in artisanal chocolate design that is produced in industrial scale would be investigated for further research.

The points where industrial designers can contribute to food design process can be further explored through different issues and as an output a guideline can be prepared for industrial designers to work in this field.

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## APPENDICES

### A. ENGLISH GUIDELINE OF INTERVIEW DONE WITH INDUSTRIAL DESIGNERS

Table A. 1: *English guideline of interview done with industrial designers*

<b>Introduction: Industrial designers in food industry</b>
<p>I am Gizem Evcen, a M.Sc. student at the Department of Industrial Design, METU. Before the study, I would like to give you some information about the purpose of my research within the scope of my master's thesis. This study is about how a designer and a food engineer can work collaboratively in the process of industrial new product development, and how the designer will contribute to this process.</p> <p>The interview data will be used for academic purposes only. If you wish, your personal information will be kept confidential, however, it would be useful to discuss the findings of the work using the name of the designer. Thank you for your time.</p>
<b>1. Professional background of designers</b>
<ul style="list-style-type: none"><li>▪ Could you tell us briefly about your professional background? In which sectors, what kind of designs have you worked on so far?</li><li>▪ Have you collaborated with the food industry before?<ul style="list-style-type: none"><li>- How did you decide to work in the field of food as a designer?</li></ul></li><li>▪ Did you ever work on chocolate design?<ul style="list-style-type: none"><li>- Would you tell us your story about working on chocolate design?</li></ul></li></ul>
<b>2. Idea of merging food and design</b>
<ul style="list-style-type: none"><li>▪ How do you define 'food design'?</li><li>▪ How do you think the design of a food product effects the perception of consumers?</li><li>▪ Can you explain that on chocolate product?</li></ul>
<b>3. Key elements of chocolate designing process</b>
<ul style="list-style-type: none"><li>▪ What are the differences between designing chocolate product and others?</li><li>▪ How is the chocolate product designing process?<ul style="list-style-type: none"><li>- What kind of brief are you given?</li><li>- How do you develop your first design ideas?</li><li>- In which stage do you receive feedback?</li></ul></li><li>▪ What are your goals through chocolate design as a designer?</li><li>▪ What do you think are the key elements while designing a chocolate product?</li></ul>

- Are these elements affecting the perception of consumers on the product?

#### **4. Potential contribution of industrial designers to the food industry**

- How an industrial designer improves a chocolate product developed by a food engineer?
  - What features do you think the designer can contribute to the product besides the visual characteristics of the product?
- At what stage does a food engineer needs a designer to develop chocolate products?
  - What do you think their expectations might be?
- How would you make changes if you were a food engineer at the same time? These changes may be the visual of the product, the product design method, or other steps you encounter in the food design process.

#### **5. Collaboration of food engineers and industrial designers**

- What do an industrial designer and a food engineer have in common while designing the food product? What are the differentiating aspects?
- On what issues should a designer and a food engineer feed each other?
- In brief, how do you interpret briefly food engineer and designer collaboration as a designer collaborates with industrial food companies?
  - How do you think food engineer and the industrial designer work together?

#### **6. Challenges in food designing**

- Is the level of technical information needed in the field of food more than the other products you design?
  - Would you explain required information while designing a chocolate product?
- Do you experience difficulties in the process of food designing due to the fact that your discipline is different from food engineering?
  - What kind of difficulties do you have in designing chocolate?
  - How do you get past them?
  - Can you give an example?
- What do you think are the elements that a designer needs a food engineer while designing a food product?

#### **7. Places of industrial designers in the food industry**

- What do you think is the role of an industrial designer in development of chocolate product?
- When do you think a food engineer needs a designer in the process of the chocolate design?
- What are the expectations of the company that you work with from you?

- Do you think that the food industry leading companies should hire industrial designers?
  - What should be the designer's job description?
  - What to expect from them, what should not be expected?
- Who else do you think should be involved in the food design process?

## B. TURKISH GUIDELINE OF INTERVIEW DONE WITH INDUSTRIAL DESIGNERS

Table B. 1: *Turkish guideline of interview done with industrial designers*

<b>Giris: Gıda sektöründe endüstriyel tasarımcılar</b>
<p>Ben Gizem Evcen, yüksek lisans yaptım. ODTÜ Endüstri Ürünleri Tasarımı Bölümü öğrencisi. Çalışmamdan önce, yüksek lisans tezi kapsamında araştırmamın amacı hakkında size biraz bilgi vermek istiyorum. Bu çalışma, bir tasarımcının ve bir gıda mühendisinin, endüstriyel yeni ürün geliştirme sürecinde işbirliği içinde nasıl çalışabileceği ve tasarımcının bu sürece nasıl katkıda bulunacağıyla ilgilidir. Çalışma sırasında bahsedilen gıda ürünü paketlenmiş, endüstriyel olarak üretilen ürünleri kapsamaktadır.</p> <p>Görüşme verileri yalnızca akademik amaçlarla kullanılacaktır. Dilerseniz kişisel bilgileriniz gizli tutulacaktır, ancak işin bulgularını tasarımcı adını kullanarak tartışmak yararlı olacaktır. Zaman ayırdığınız için teşekkürler.</p>
<b>1. Tasarımcıların profesyonel geçmişi</b>
<ul style="list-style-type: none"><li>▪ Bize profesyonel geçmişinizden kısaca bahseder misiniz?</li><li>▪ Çikolata tasarımı üzerine çalışmakla ilgili hikayenizi anlatır mısınız?</li></ul>
<b>2. Gıda ve tasarımı birleştirme fikri</b>
<ul style="list-style-type: none"><li>▪ “Yiyecek tasarımı” nı nasıl tanımlarsınız?</li><li>▪ Bir çikolata tasarımının tüketici algısını nasıl etkilediğini düşünüyorsunuz?</li></ul>
<b>3. Çikolata tasarım sürecinin temel unsurları</b>
<ul style="list-style-type: none"><li>▪ Çikolata ürün tasarımı ile diğerler tasarladığınız endüstriyel ürünlerin tasarımı arasında ne gibi farkları vardır?</li><li>▪ Çikolata ürün tasarım sürecinden bahsedebilir misiniz?<ul style="list-style-type: none"><li>- Size ne tür bief veriliyor?</li><li>- İlk tasarım fikirlerinizi nasıl geliştiriyorsunuz?</li><li>- Hangi aşamada geri bildirim alıyorsunuz?</li></ul></li><li>▪ Çikolata tasarımı ile ilgili bir tasarımcı olarak ne gibi hedefleriniz vardır?<ul style="list-style-type: none"><li>- Bir çikolata ürününü tasarlariken ann-kilit unsurların neler olduğunu düşünüyorsunuz?</li><li>- Bu unsurların tüketicilerin ürün üzerindeki algısını etkilediğini düşünüyor musunuz?</li></ul></li></ul>
<b>4. Endüstri tasarımcılarının gıda endüstrisine potansiyel katkısı</b>
<ul style="list-style-type: none"><li>▪ Bir endüstriyel tasarımcı bir gıda mühendisi tarafından geliştirilen bir çikolata ürününü nasıl daha ileri tasir?<ul style="list-style-type: none"><li>- Tasarımcının, ürünün görsel özelliklerinin yanı sıra ürüne hangi özellikleri sağlayabileceğini düşünüyorsunuz?</li></ul></li></ul>



- Bir gıda mühendisi çikolata ürünleri geliştirmenin hangi aşamasında bir tasarımcıya ihtiyaç duyar?
  - Gıda mühendisinin bir tasarımcıdan beklentilerinin ne olacağını düşünüyorsunuz?
- Aynı zamanda bir gıda mühendisi olsaydınız piyasada bir tasarımcı eli değmeyen bir ürünlerde nasıl değişiklikler yapardınız?

#### **5. Gıda mühendisleri ve endüstriyel tasarımcıların işbirliği**

- Bir endüstriyel tasarımcı ve bir gıda mühendisinin gıda ürünlerini tasarlarken ortak noktaları nelerdir? Farklılaşan yönleri nelerdir?
- Bir tasarımcı ve gıda mühendisi hangi konularda birbirlerini beslemeli?
- Endüstriyel gıda şirketleriyle işbirliği yapan bir tasarımcı olarak gıda mühendisi ve tasarımcı işbirliğini nasıl yorumluyorsunuz?
  - Sizde gıda mühendisi ve endüstriyel tasarımcı birlikte nasıl çalışmalı?

#### **6. Gıda tasarımında zorluklar**

- Gıda alanında ihtiyaç duyulan teknik bilgi düzeyi, tasarladığınız diğer ürünlerden daha mı fazla?
  - Bir çikolata ürünü tasarlarken gerekli bilgileri açıklar mısınız?
- Disiplininizin gıda mühendisliğinden farklı olması nedeniyle gıda tasarımı sürecinde zorluklar yaşıyor musunuz?
  - Ne tür zorluklar yaşıyorsunuz?
  - Bu zorlukları nasıl aştınız?
  - Bir örnek verebilir misin?
- Bir tasarımcının bir gıda ürünü tasarlarken bir gıda mühendisine ihtiyaç duyduğu unsurlar nelerdir?

#### **7. Endüstri tasarımcılarının gıda endüstrisindeki yeri**

- Bir endüstriyel tasarımcının çikolata ürününün geliştirmedeki rolün sizce nedir?
- Bir gıda mühendisinin gıda tasarım sürecinde bir tasarımcıya ne zaman ihtiyacı olduğunu düşünüyorsunuz?
- Birlikte çalıştığınız gıda firmalarının sizden beklentileri nelerdir?
- Sizce endüstriye yön veren gıda firmalarında endüstri ürünleri tasarımcısı çalışmalı mı?
  - Tasarımcının iş tanımı ne olmalı?
  - Onlardan ne beklenmeli, ne beklenmemeli?
- Gıda tasarım sürecine başka kimlerin dahil olması gerektiğini düşünüyorsunuz?

## C. ENGLISH GUIDELINE OF INTERVIEW DONE WITH FOOD ENGINEERS

Table C. 1: *English guideline of interview done with food engineers.*

<b>Introduction: Industrial designers in food industry</b>
<p>I am Gizem Evcen, a M.Sc. student at the Department of Industrial Design, METU. Before the study, I would like to give you some information about the purpose of my research within the scope of my master's thesis. This study is about how a designer and a food engineer can work collaboratively in the process of industrial new product development, and how the designer will contribute to this process. The interview data will be used for academic purposes only. If you wish, your personal information will be kept confidential, however, it would be useful to discuss the findings of the work using the name of the designer. Thank you for your time.</p>
<b>1. Professional background of designers</b>
<ul style="list-style-type: none"><li>▪ Can you tell a little bit about yourself?</li><li>▪ Why did you choose to be in the process of product development?</li></ul>
<b>2. The idea of combining food and design</b>
<ul style="list-style-type: none"><li>• As a food engineer, how do you contribute to new product designs in the food industry?</li><li>• How do you define “food design”?</li><li>• How do you think a chocolate design affects consumer perception?</li></ul>
<b>3. Basic elements of chocolate design process</b>
<ul style="list-style-type: none"><li>• Could you tell us a little bit about your product development process?<ul style="list-style-type: none"><li>- What elements do you take into account in the product development process?</li></ul></li><li>• What are the challenges in the food design process? Which decision points are important?</li><li>• Are these decision points influencing the consumer's perception of the product?</li></ul>
<b>4. Potential contribution of industrial designers to the food industry</b>
<ul style="list-style-type: none"><li>• What kind of contribution do a designer contribute to the food industry in the process of developing a new product?</li><li>• What do you think is the role of an industrial designer in product development? How can a designer take a product further developed by food engineers and contribute?</li><li>• If you were a designer at the same time, how would you make changes to the untouched products in the market? This can be a product visual, a product design method, or other problems you encounter in your food design process...</li></ul>

### **5. Food engineers and industrial designers cooperation**

- Were there any projects in which you collaborated with a designer?
  - Where did this need come from? Can you explain?
- How do you think he should work with a designer? How should the designer be involved in product development?
- What do an industrial designer and a food engineer have in common when designing food products? What are the differentiating aspects?
- What issues do food engineering and industrial design nourish each other?

### **6. Difficulties in food design**

- What are your problems in the product development process?
  - Can a designer help a food engineer at these points?

### **7. The role of industrial designers in the food industry**

- What are the factors that may prevent designers from working in the food industry by food companies? Why do designers think they are so far away from the food industry?
- Do you think the designer should work in the food companies that lead the industry?
  - What should be the designer's job description?
  - What to expect from them, what should not be expected?
- How does someone working in a leading food company like you interpret the cooperation of food engineer and designer?
- What other disciplines do you think should be involved in the product development process?

## D. TURKISH GUIDELINE OF INTERVIEW DONE WITH FOOD ENGINEERS

Table D. 1: Turkish guideline of interview done with food engineers.

### Giris: Gıda sektorunde endüstriyel tasarımcılar

Ben Gizem Evcen, yüksek lisans yaptım. ODTÜ Endüstri Ürünleri Tasarımı Bölümü öğrencisi. Çalışmamdan önce, yüksek lisans tezi kapsamında araştırmamın amacı hakkında size biraz bilgi vermek istiyorum. Bu çalışma, bir tasarımcının ve bir gıda mühendisinin, endüstriyel yeni ürün geliştirme sürecinde işbirliği içinde nasıl çalışabileceği ve tasarımcının bu sürece nasıl katkıda bulunacağıyla ilgilidir. Çalışma sırasında bahsedilen gıda ürünü paketlenmiş, endüstriyel olarak üretilen ürünleri kapsamaktadır.

Görüşme verileri yalnızca akademik amaçlarla kullanılacaktır. Dilerseniz kişisel bilgileriniz gizli tutulacaktır, ancak işin bulgularını tasarımcı adını kullanarak tartışmak yararlı olacaktır. Zaman ayırdığınız için teşekkürler.

### 1. Tasarımcıların profesyonel geçmişi

1. Bize profesyonel geçmişinizden kısaca bahseder misiniz?
2. Ürün geliştirme sürecinde olmayı neden tercih ettiniz?

### 2. Gıda ve tasarımı birleştirme fikri

- Siz bir gıda mühendisi olarak, gıda endüstrisindeki yeni ürün tasarımlarına nasıl katkıda bulunuyorsunuz?
- “Gıda tasarımı”nı nasıl tanımlarsınız?
- Bir çikolata tasarımının tüketici algısını nasıl etkilediğini düşünüyorsunuz?

### 3. Çikolata tasarım sürecinin temel unsurları

- Ürün geliştirme sürecinizden biraz bahsedebilir misiniz?
  - Ürün geliştirme sürecinde temel olarak hangi unsurları göz önünde bulunduruyorsunuz?
- Gıda tasarım sürecinde karşılaşılan zorluklar nelerdir? Hangi karar noktaları önemlidir?
- -Bu karar noktaları tüketicinin ürün üzerindeki algısını etkileyecek faktörler midir?

### 4. Endüstri tasarımcılarının gıda endüstrisine potansiyel katkısı

- Sizce bir tasarımcı gıda endüstrisine, yeni bir ürün geliştirme sürecinde ne gibi katkılar sağlar?
- Bir endüstriyel tasarımcının ürün geliştirmedeki rolü sizce nedir? Bir tasarımcı, gıda mühendisleri tarafından geliştirilen bir ürünü nasıl daha da ileri taşır, katkı sağlar?

- Aynı zamanda tasarımcı da olsaydınız piyasada tasarımcı eli değmemiş ürünlerde hangi noktalarda nasıl değişiklikler yapardınız? Bu ürün görseli olabilir, ürün tasarım yöntemi olabilir veya sizin gıda tasarımı sürecinde karşılaştığınız diğer sorunlarla ilgili olabilir...

#### **5. Gıda mühendisleri ve endüstriyel tasarımcıların işbirliği**

- Bir tasarımcı ile iş birliği içerisinde olduğunuz projeler oldu mu?  
- Bu ihtiyaç nereden doğdu? Açıklayabilir misiniz?
- Sizce bir tasarımcı ile nasıl çalışmalıdır? Tasarımcı ürün geliştirme sürecine nasıl dahil edilmelidir?
- Bir endüstriyel tasarımcı ve bir gıda mühendisinin gıda ürünlerini tasarlarken ortak noktaları, nelerdir? Farklılaşan yönleri nelerdir?
- İki farklı disiplin ona gıda mühendisliği ve endüstriyel tasarım hangi konularda birbirlerini besler?

#### **6. Gıda tasarımında zorluklar**

- Ürün geliştirme sürecinde sizin karşılaştığınız sorunlar nelerdir?  
- Bir tasarımcı bir gıda mühendisine bu noktalarda yardımcı olabilir mi?

#### **7. Endüstri tasarımcılarının gıda endüstrisindeki yeri**

- Gıda firmaları tarafından, tasarımcıların gıda endüstrisinde çalışmalarına engel olabilecek faktörler neler olarak görülüyor? Tasarımcılar gıda endüstrisine sizce neden bu kadar uzaklar?
- Sizce endüstriye yön veren gıda firmalarında tasarımcı çalışmalı mı?  
- Tasarımcının iş tanımı ne olmalı?  
- Kendilerinden neler beklenmeli, neler beklenmemeli?
- Sizin gibi önde gelen bir gıda firmasında çalışan biri, özetle gıda mühendisi ve tasarımcı iş birliğini nasıl yorumlar?
- Ürün geliştirme sürecinde başka hangi disiplinlerin sürece dahil olması gerektiğini düşünüyorsunuz?