MSc THESIS

DRIVERS AND BARRIERS OF FOOD REFORMULATION IN THE FOOD INDUSTRY

Evidence from established Dutch food companies

WAGENINGEN UR
For quality of life

Evelyn van der Werf
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Drivers and barriers of food reformulation in the food industry. Evidence from established Dutch food companies.

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Preface

Hereby I proudly present my Master thesis. This thesis was written as part of my Master programme: “Management, Innovations and Life Sciences”. I wrote this thesis at the “Management Studies” chair group at the Wageningen University. While studying the drivers and barriers of food reformulation, I learned from the drivers and barriers I faced during my thesis project.

My great interest in healthy nutrition, the food industry, innovation and convincing consumers to eat healthier products were all aspects that drove me during this thesis. Initially, these interests were the main driver to start this project and to come up with this subject specifically. It was a great learning experience to visit food companies during my thesis, as I am very interested to work within the food industry. This project provided me some valuable contacts and it was a unique way to get to know different companies.

During the thesis I took a pause to start an internship. I found the internship that fulfilled all my interests and I could not miss this opportunity. Next, I combined writing my thesis with working part-time at a restaurant of an elderly home. Because of these activities my thesis project took some more time. However, I am very glad with the choices I made during this project and I am very pleased with the end result.

There are a couple of people that I would like to thank for their support during the thesis project. First of all, I want to thank my first supervisor Valentina Materia and second supervisor Frances Fortuin for their guidance, expertise and valuable feedback during the process. Valentina, thank you for supporting me in making the thesis really my own project. Furthermore, I always enjoyed our meetings full of interesting discussions. Frances, thank you for your enthusiasm about this subject and providing me with contacts to start up the interviews.

Next, I want to thank Anton Buningh for helping me getting the right contacts to plan interviews with. I value the time and effort you have put in to address your own contacts in order to help me.

Finally, I would like to thank all the professionals I have interviewed for my thesis. It was a great experience to learn from your expertise. My thesis would not have been completed without your help, your willingness to share information, and the time you took for me.

I hope you will enjoy reading this thesis,

Evelyn van der Werf

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Abstract

Food reformulation is a type of innovation where salt, sugar or fat content within a food product is reduced. Research on food reformulation has mainly been performed in the field of public health: research from a company perspective is lacking. This study aimed to get insight into the drivers and barriers of food reformulation for food companies, studied in the Dutch food industry.

From the literature research into food innovation management we produced as a result a categorization of drivers and barriers useful for this study. Five categories related to the food company were defined: the external environment, organisational environment, financial environment, food technology environment and the consumer environment. Semi-structured interviews with eleven Dutch food companies were held to capture the drivers and barriers of food reformulation within the five environments. The interview transcripts were coded and analysed between cases.

Most of the drivers of food reformulation play a role in the beginning of the innovation process and were found in the external and organisational environment. These included retailer pressure, governmental agreements, a health trend in the market and the company's vision and innovation strategy. Most of the barriers play a role during the development and marketing phase of the innovation process and were found in the financial, food technology and consumer environment. These included flavour problems, a consumer distrust for sweeteners, additives and claims, a higher price of alternative ingredients and the clean label trend.

Keywords: innovation drivers; innovation barriers; food reformulation; Dutch food industry; food innovation management.

Management Summary

Nowadays the goal of innovation in the food industry is mainly to develop healthy-, convenient- and high quality food products. While rates of obesity and other diet-related diseases are still high, there is a consumer- and societal need for healthier food products. This creates an opportunity for the food industry to improve the products by reducing salt, sugar or fat, which in literature is defined as food reformulation. Research on food reformulation has been performed mainly in the field of public health: research from a company perspective is lacking. This study aimed to get insight into the drivers and barriers of food reformulation for food companies. The Dutch food industry was chosen as research area since the Dutch government recently agreed on a food reformulation policy. However, the results of this policy in the Netherlands are not promising and the committed companies are lagging behind on schedule.

A deep study of food innovation literature produced five categories of the drivers and barriers related to the organisation: the external environment, organisational environment, financial environment, food technology environment and the consumer environment. These categories formed the foundation for the empirical analysis, which consisted of semi-structured interviews. In total, eleven interviews were held among food companies in the Netherlands. The goal of these interviews was to capture the drivers and barriers of food reformulation experienced by Dutch food companies. The selected companies are operating in different sectors in the food industry and have different sizes. The interviews were recorded and transcribed afterwards. These interview transcripts were analysed by content analysis. The findings were compared between cases and the main drivers and barriers were defined for each environment.

Within the external environment we found five drivers for food reformulation: retailer pressure, governmental/sector agreements, a health trend, competition and external sources. Label/claim regulation and the lack of conformity about norms were found as barriers. Within the organisational environment, the company vision and innovation strategy were drivers, whereas a lack of innovation capabilities, knowledge and the company priorities could hamper food reformulation. No drivers were found in the financial environment, while a higher cost price and higher price of alternative ingredients were indicated as barriers for food reformulation. A driver found in the food technology environment was being able to reformulate in small steps. Barriers found in the food technology environments were: the influence on shelf-life, flavour problems, the clean label trend and negative health effects of alternative ingredients. Finally, we found that within the consumer environment a consumer demand for healthier products was a driver for food reformulation. A distrust for sweeteners, additives and claims, the risk of losing consumers and a high consumer expectations were found as barriers in the consumer environment.

We developed a framework which shows where in the process of innovation the drivers and barriers of food reformulation played a role. Most of the drivers of food reformulation play a role in the beginning of the innovation process where they can really start up the process. These drivers were found in the external environment and the organisational environment. The companies in this study used an open way to innovate by collaborating with research institutions to gain knowledge and with suppliers of ingredients to work together on reductions. Companies that were strongly driven by organisational factors showed high commitment during the process and they made sure all barriers were tackled. Most of the food reformulation barriers played a role during the development and

marketing phase of the innovation process. An increased cost price, difficulties in maintaining quality and flavour of the food product and consumer distrust in reformulated food products were barriers that companies faced. The Dutch government policy stimulated companies in the beginning of the innovation phase but lacked guidance and support to overcome the barriers in the development and marketing phase.

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1. Introduction

1.1. Background

Innovation is one of the most important processes to reach a competitive advantage in the food industry (Capitanio, Coppola, & Pascucci, 2010; Grunert et al., 2005). Within the food industry, innovation takes place in many different processes: from using new ingredients and designing new food products, to developing new packages and new distribution strategies (Earle, 1997). This can make the innovation process complex. Both process- and product innovation are applied, but also organisational innovation can be found in food companies. Furthermore, the innovations can take place when developing a totally new product or process and when improving an existing product or process.

Traditionally, innovation in food companies was mainly aimed at reducing production costs, therefore it was more process-oriented. Nowadays the goal has shifted towards developing healthy-, convenient- and high quality food products, which requires more product-related innovations (Aguilera, 2006). These product innovations are responding to consumer needs and therefore creating a competitive advantage for the food companies (Meulenberg & Viaene, 2005).

One type of innovation that is directed towards developing healthier food products is food reformulation. This is the reduction of unhealthy ingredients in food products, such as sugar, salt and saturated fats (van Raaij, Hendriksen, & Verhagen, 2009). Food reformulation policies are potentially effective in reducing the consumer intake of these unhealthy ingredients and related diseases (Capacci et al., 2012). This is promising, since the rates of obesity and other diet-related diseases are still high. To illustrate, 39% of the adults worldwide was overweight in 2014, and even 13% was obese (WHO, 2016c). Furthermore, the number of adults with diabetes has risen from 4,7% in the year 1980 to 8,5% in 2014 (WHO, 2016b). Finally, cardiovascular diseases cause most deaths globally (WHO, 2016a). Overweight, obesity, diabetes and cardiovascular diseases are all diseases that are preventable by maintaining a healthy diet (WHO, 2016a, 2016b, 2016c). The food industry can support consumers with maintaining a healthy diet by making the processed food products healthier.

The importance of the production of healthier food products is supported by policymakers. To illustrate, the United Nations developed the ‘sustainable development goals’, consisting of 17 goals to transform the world in the next 15 years in order to improve people’s lives all over the world (United Nations, 2016b). One of these goals is to “ensure healthy lives and promote well-being for all at all ages” (United Nations, 2016a). A more specific example is the European Union Strategy on nutrition, overweight, and obesity-related health issues (European Commission, 2007). This strategy encourages the food industry to – amongst others – improve recipes of food products.

A policy on a national level is the Dutch agreement of improved product composition, initiated in 2014 by the Dutch government and four other parties related to the food industry in the Netherlands (Rijksoverheid, 2014). The goal of this initiative is to reduce the amount of salt and calorie content (sugar and saturated fat) of food products in the Netherlands, in order to create a healthier product range.

1.2. Problem analysis

The Dutch agreement of improved product composition stimulates the reduction of salt and calorie content (from sugar and saturated fat) in food products. However, the reduction of salt, sugar and fat in food products cannot be achieved by simply removing these nutrients. Some nutrients have a technical or functional role in the food product, which must be replaced with another nutrient that can take over this role. Furthermore, it is important to keep customers satisfied by maintaining the flavour or texture of the product (Buttriss, 2013). These are only two aspects that play a role when making a food product healthier, but many more aspects might influence this process.

The Dutch food reformulation policy is an interesting case since recently it was concluded to be not very successful. The responsible Dutch Minister agreed that the self-regulation has failed and the agreements made were only moderately ambitious (Schippers, 2016). Even though multiple manufacturers had agreed to join this project, they are running behind on schedule and there are still big milestones that need to be achieved.

Most of the research that is performed into food reformulation is on policy-level or evaluates the impact on public health. However, research into food reformulation activities within food companies is lacking. These are the actors that are responsible for the food products and thus mainly determine the impact of the reformulation activities. Research into food reformulation on a company level can contribute to a better understanding of the process.

This study aims to add insights into food reformulation literature from a food company perspective. To do this, we use the Dutch Food Industry as research environment to gain insights in the drivers and barriers that the companies experience during food reformulation. Studying this Dutch case can contribute to the food reformulation literature, specifically to the knowledge gap of food reformulation in companies.

1.3. Research objective and research questions

We aim to contribute to the existing literature of food reformulation providing insights into the drivers and barriers of food reformulation from a food company perspective. To do so, we use the experiences of companies in the Dutch food industry that are engaged in food reformulation. The research objective is described as:

The research objective of this study is to add new insights to the literature on drivers and barriers of food innovation, specifically in the domain of food reformulation, by analysing these drivers and barriers in the innovation process of companies in the Dutch food industry.

The general research question of this research is formulated as follows:

> What are the main drivers and barriers of food reformulation in established Dutch food companies operating in different sectors of the food industry?

In order to answer the general research question, two sub questions are formed for the literature research and the empirical study.

(1) Which main drivers and barriers of food innovation can be found in the literature?
(2) Which main drivers and barriers of food reformulation in the Dutch food industry can be found when analysing a set of Dutch food companies?

1.4. Thesis outline

The theoretical background of this study is presented in chapter two. Chapter three elaborates on the research environment of this study: the Dutch food industry. The methodology that is used for the empirical study is described in chapter four. Chapter five presents the results of the empirical study and chapter six discusses these results. Finally, the main conclusions of this study are presented in chapter seven.

2. Theoretical background

This chapter describes the theoretical background of the current study. This chapter gives a background in food innovation and the main drivers and barriers for food innovation. Section 2.1 describes the main concepts of food innovation management. Section 2.2 will elaborate on the main drivers and barriers for food innovation.

2.1. Food Innovation Management

Definition of Innovation

Innovation has been defined in many different ways in the literature. Already in 1934, Schumpeter defined innovation as "the creation of new combinations" (as cited in Batterink & Wubben, 2006). It was only since the 1960s that innovation appeared as research field in scientific studies. With the rising number of studies into innovation, also the definitions of innovation developed as shown by the next examples.

> *"An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption"* (Rogers, 1995, p. 11)

> *"Innovation represents the core renewal process in any organisation"* (Bessant, Lamming, Noke, & Phillips, 2005, p. 1)

> *"Innovation is the successful exploitation of ideas"* (DTI, 2004, p. 5).

> *"An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations"* (OECD, 2005, p. 46)

The definitions of Schumpeter (1934), Rogers (1995) and Bessant et al. (2005) focus mostly on the newness as important characteristic of innovation. This is a key part of innovation and the degree of newness can vary per innovation. The definitions of DTI (2004) and OECD (2005) go beyond the earlier mentioned definitions and they add the importance of exploiting or implementing the innovation. A clear difference between the definitions mentioned here is the field of application. The latter two include the business environment in which innovation can take place. Finally, the OECD definition includes the different types of innovation and therefore this is the most complete definition of innovation.

Smith (2009b) distinguishes three basic categories where innovation can be applied: products, processes and services. Product innovations and service innovations are typically aimed at consumers, whereas process innovations are directed to the processes within the company. Innovation within the food industry can be applied to the entire chain: during harvesting, processing, production as well as during distribution. In addition, it can be focused towards technology, quality of food, product formulation or to the consumer needs. This diversity of possibilities of innovation result in a rather complex process (Earle, 1997).

Traditionally the innovation processes in the food industry have been largely focused on the reduction of production costs and in this way were process-oriented innovations. Recently, the innovations have shifted from process-oriented to product-oriented. The current innovations in fact answer consumer needs, resulting in healthier products of higher quality (Aguilera, 2006). Companies that are able to create such products that meet consumer needs are able to increase their competitiveness (Omta & Folstar, 2005).

Within the food industry, most of the product innovations are incremental rather than radical (Capitanio, Coppola, & Pascucci, 2009). This means that small improvements are made or new variations on the existing products are introduced into the market. Food reformulation is also an incremental innovation since the main concept of the product stays the same.

Food reformulation

Food reformulation is a type of innovation where the composition of the food product is changed, with the goal to improve the quality of the product or make it healthier for the consumer (Buttriss, 2013). Characteristics such as the texture or flavour of the products are maintained. Examples of food reformulation are reduction of salt, sugar, saturated fats, or removal of trans-fats in food products. Other types of innovations with the goal of making products healthier are food enrichment, food supplementation or the production of functional foods. In these types, certain ingredients are added to the product in order to give them a particular benefit or health-promoting effect (van Raaij et al., 2009). In this study we only focus on the reduction of certain ingredients that have negative health effects when consuming too much. The reduction of these ingredients may also mean that they are replaced by other ingredients. For example, sugar can be reduced in a product with sweeteners being added to maintain flavour. Food reformulation in this study is defined as the reduction of salt, sugar or fats in food products.

Food reformulation policies exist that stimulate this innovation process among the food industry (Capacci et al., 2012). The goal of these policies is to create a healthier product assortment. Food reformulation can help the consumer to eat healthier because it improves the nutritional value of commonly consumed foods (van Raaij et al., 2009).

Previous research into food reformulation is mainly performed in the area of public health. In these studies, reformulation initiatives are evaluated and the effectiveness of reformulation policies are discussed.

Leroy, Requillart, Soler, and Enderli (2016) used scenario analysis to assess the influence of food reformulation on health outcomes. The scenario analysis concluded that 2408 to 3597 diet-related deaths per year could be avoided by reformulating food products, assuming that all food companies commit to certain nutritional targets. However, this study recognizes that nowadays the company commitment is limited and thus the impact on public health is small. Production costs or investments can be reasons for this limited commitment according to van Raaij et al. (2009) and (Buttriss, 2013). However, these studies did not examined these barriers for food reformulation within the companies.

Food reformulation is potentially an effective way to reduce excessive intakes of unhealthy ingredients. This holds for both mandatory and voluntary agreements (Capacci et al., 2012). Though, the research of Gillespie et al. (2015) concludes that a mandatory agreement to reduce salt in

processed food products has a higher potential to reduce coronary heart disease mortality compared to voluntary agreements made with the industry.

The research of Webster, Dunford, Hawkes, and Neal (2011) defined the main characteristics that were important in existing salt reducing policies. These included leadership and strategic approach, baseline assessment and monitoring, and implementation strategies. All characteristics are related to the policy itself, and not to stakeholders involved in the process.

Most of the research on food reformulation is positive about the potential of the improvement on public health. However, it is unlikely that food reformulation alone is the solution to the diet-related diseases (Buttriss, 2013). Collaborations, collective agreements and stimulation of changes within the whole food industry are recognized as important contributors for successful food reformulation (Leroy et al., 2016).

2.2. Drivers and barriers of food Innovation

Since literature on drivers and barriers of food reformulation is lacking, we studied the drivers and barriers of food innovation in general. This helps us getting familiar with this field of study and to set up the interviews with which we want to gain knowledge about drivers and barriers of food reformulation. This section first describes how drivers and barriers of innovation can be defined, how they can be categorized and which main drivers and barriers can be found within food innovation literature.

Definitions and categories

Innovation drivers are aspects that support innovation processes to meet future challenges that are set by for example research, policy, or the company itself (Galanakis, 2016). It is a challenge for companies to find the best way of managing innovation processes. The drivers of successful innovation have been studied before and can be assigned to different factors. From a strategic perspective, drivers for successful innovation can be divided into internal drivers and external drivers (Ritter & Gemünden, 2004; Schlegelmilch, Diamantopoulos, & Kreuz, 2003). The internal drivers are related to attitudes of senior management, information technology departments, employees, and marketing (Hidalgo & Albors, 2008). The external drivers are related to the network of the company and inter-organisational collaborations (Ritter & Gemünden, 2004).

Innovation barriers are obstacles that hamper innovation processes in the company (Loewe & Dominiquini, 2006). The barriers towards food innovation may explain why some companies cannot become successful in innovation. Barriers can be subdivided into revealed barriers and deterring barriers (D'Este, Iammarino, Savona, & von Tunzelmann, 2012). Revealed barriers describe the difficulty of the innovation process and the learning experience of the company that is engaged in innovation. In short, these are the barriers that the company faces while actively engaged in innovation. In contrast, deterring barriers describe the difficulties that prevent companies from engaging in innovation. Both type of barriers are included in this study.

Studies on food innovation have enriched the general literature with specific drivers and barriers of food innovation. A review of this literature results in a categorization of the drivers and barriers useful for this report. First, most drivers and barriers are related to the external environment, organisational

environment and financial environment of the food company (Batterink & Wubben, 2006; Martinez & Briz, 2000). However, the food technology environment of the food product and the consumer knowledge of a food company are also important aspects with regards to driving or hampering innovation (Stewart-Knox & Mitchell, 2003; Stewart-Knox, Parr, Bunting, & Mitchell, 2003). This literature study resulted in the next five categories:

- External environment
- Organisational environment
- Financial environment
- Food technology environment
- Consumer environment

These five categories form the foundation for the empirical part of this study. The following subsections explain the drivers and barriers of food innovation for each of these five categories.

External environment

Drivers

With regards to the external environment, one of the drivers for food innovation is **pressure from food retailers** (Fortuin & Omta, 2009; Grunert et al., 2005). Food retailers are important purchasing parties with high bargaining power and as such, it is important to take their demands into account (Fortuin & Omta, 2009). If food retailers demand more healthier products, this may stimulate food producers to innovate their products. Next, **competitive advantage** is a driver for food innovation (Fortuin & Omta, 2009; Martinez & Briz, 2000; Sporleder, Hooker, Shanahan, & Broring, 2008). Competitive advantage is crucial for companies and their brands and products to survive in the market. The development of healthier food products by competitors can therefore drive the food company to also innovate its food products. Furthermore, **governmental legislation** can be a driver for food innovation (Costa & Jongen, 2006). The government is empowered to decide upon restriction of ingredients and as such, to stimulate companies to change their products. An example of governmental policy is the Dutch agreement on improved product composition. The government stimulates the food companies to reduce salt, sugar and fat in food products. However, this agreement is self-regulating and therefore there are no direct consequences for the companies. Finally, companies in the food industry are highly dependent on **external information sources** for innovation (Avermaete et al., 2004; Sarkar & Costa, 2008). The incorporation of new knowledge can enhance the innovation processes. Examples of such external sources are research institutions and business relationships (Martinez, 2013).

Barriers

Four barriers of food innovation were found in the external environment of food companies. **Difficulties with regulations or standards** can be a barrier to innovation (Batterink & Wubben, 2006). For example certain regulations or standards cannot be feasible for a company, which creates barriers for the process. Second, a **lack of retail communication** can hamper innovation (Stewart-Knox et al., 2003). Without communication the needs of retailers and the offers from the food company cannot be aligned. Next, a **lack of availability to external sources** can be a barrier for food innovation (Martinez & Briz, 2000). External sources can be unavailable for companies when for example the company does not have the right sources in their network or if they cannot afford to consult external sources. Finally, the **underutilization of open innovation** can form a barrier to food innovation. Open

innovation is potentially interesting for the food industry because of its many chain and network links (Fortuin & Omta, 2009).

Organisational environment

Drivers

According to Avermaete et al. (2004), having **research and development activities** and a **market orientation** are important drivers for food innovation. Research and development activities are important for technological change, while a market orientation increases the chances of innovation success. The study of Costa and Jongen (2006) emphasises that the **exchange of knowledge** between the research and development department and marketing department is also a driver for food innovation (Costa & Jongen, 2006). Only with a successful collaboration between these departments, the needs of the consumer can be converted into a successful food product.

Barriers

Within the organisational environment of the food company, ten barriers were found. According to Fortuin and Omta (2009) the most important barriers to food innovation are related to lagging behind in certain innovation capabilities. These capabilities include the **promotion of innovation** among employees by incentives and rewards, the use of **patents and licensing** to protect innovations, the use of **key performance indicators** to monitor the innovation process, and the **knowledge companies acquire** from the innovation process. Other barriers for food innovation are insufficient innovation competences, a lack of **skilled personnel**, an **internal resistance to change**, and a **small innovation potential** (Batterink & Wubben, 2006; Martinez & Briz, 2000). Finally, Costa and Jongen (2006) mention the absence of three aspects as barriers to food innovation: a **sequential innovation approach**, an **innovation guideline** for the implementation of consumer oriented food development, and **cooperation and exchange of knowledge** between the departments of research and development and marketing.

Since some of the mentioned barriers have overlap or are related, we have categorized these ten barriers into two broad themes (summarized in Table 1). Most of the barriers are related to a **lack of innovation capabilities**, while the other barriers are more related to a **lack of innovation strategy**.

Lack of innovation capabilities	Lack of innovation strategy
Lack of promotion of innovation among employees by incentives and rewards	Lack of key performance indicators to monitor the innovation process
Lack of using patents and licensing to protect innovations	Lack of sequential innovation approach
No knowledge acquired from innovation process	Lack of innovation guidelines
Lack of skilled personnel	Lack of cooperation between research and development and marketing
Internal resistance to change	
Small innovation potential	

Table 1 Subdivision of organisational barriers into two broad themes.

Financial environment

Drivers

Two drivers for food innovation were found within the financial environment. The **shortened product life-cycles** of food products can be a driver for innovation (Jongen & Meulenberg, 1998; Raquel, Elsa, & Luísa Paula, 2016). By introducing new or improved products, new product life-cycles are initiated and in this way the profitability of the company is maintained. A reformulated product can be an improved product for which the product life-cycle is renewed and in this way it might maintain profitability. In general, revenue is the value that companies want to capture with innovation (Smith, 2009a). Therefore, **capturing revenue** can also drive a food company to innovate.

Barriers

An initial barrier for food innovation occurs when there is **no financial need** for a company to innovate (Martinez & Briz, 2000). Furthermore, if the **financial risk** is perceived as being excessive, it can hamper the innovation process before starting it (Martinez & Briz, 2000). Next, a **shortage of financial resources**, **a too high innovation expenditure**, and **uncertainty about costs and benefits** are barriers for food innovation (Batterink & Wubben, 2006; Martinez & Briz, 2000).

Food technology environment

Drivers

The **development of new scientific knowledge and technologies** create new opportunities for food companies. Increased knowledge in the field of nutrition and health has led to more awareness of the relationship between health and certain foods (Jongen & Meulenberg, 1998). Furthermore, novel technologies are developed in for example the field of thermal heating or artificial ingredients (Christensen, Rama, & Tunzelmann, 1996; Galanakis, 2016). The development of knowledge and technologies can improve food products and can therefore function as driver for innovation. Next, **food safety and quality** are drivers for food innovation (Batterink & Wubben, 2006). Changing safety regulations require action from the manufacturers. The same holds for quality standards of the products. If the quality is not reaching the required standard, or if the environment demands higher quality, this can stimulate the producers to innovate their product.

Barriers

Three barriers to food innovation were found within the food technology environment. First of all, a **lack of technical information** can be a barrier to food innovation (Martinez & Briz, 2000). If knowledge is not present in-house it cannot stimulate the innovation process directly. The knowledge can be acquired from external sources, however this might have financial consequences and it requires effort in searching the right partners. Next, **texture problems** can form a barrier to the innovation process (Stewart-Knox et al., 2003). The texture and also **flavour** can be influenced when changing the recipe or production process of the food product. Furthermore, the team that is involved in the **recipe development** can hamper the innovation process (Stewart-Knox et al., 2003). A recipe made by the manufacturer itself stimulates the innovation process and is more likely to be successful, compared to a recipe made by the retailer.

Consumer environment

Drivers

Consumer needs are evolving and thus companies must adapt their products to these needs. Therefore, the **needs of consumers** form a driver for food innovation (Christensen et al., 1996; Raquel

et al., 2016). **Knowledge about the market and consumers** are associated with food product success (Stewart-Knox & Mitchell, 2003). The current market demands healthier food products, as explained in the introduction of this report. This demand could stimulate the food industry to reformulate their food products.

Barriers

Two barriers to food innovation were found in the consumer environment. A **low customer responsiveness** towards the food product is a barrier to food innovation (Batterink & Wubben, 2006). This is not positive for the sales of the product and thus for the company. The second barrier to food innovation is a **limited market acceptance** of the new product. Consumers have the belief that the taste of a product is sacrificed when it is made healthier (Raghunathan, Naylor, & Hoyer, 2006). This can cause consumers to not accept the reformulated product any longer. Furthermore, this belief creates an additional challenge of how to communicate reformulation towards the consumers.

Overview of drivers and barriers

Figure 1 shows all the drivers and barriers found in the literature study in one figure. This figure forms the foundation for the empirical study.

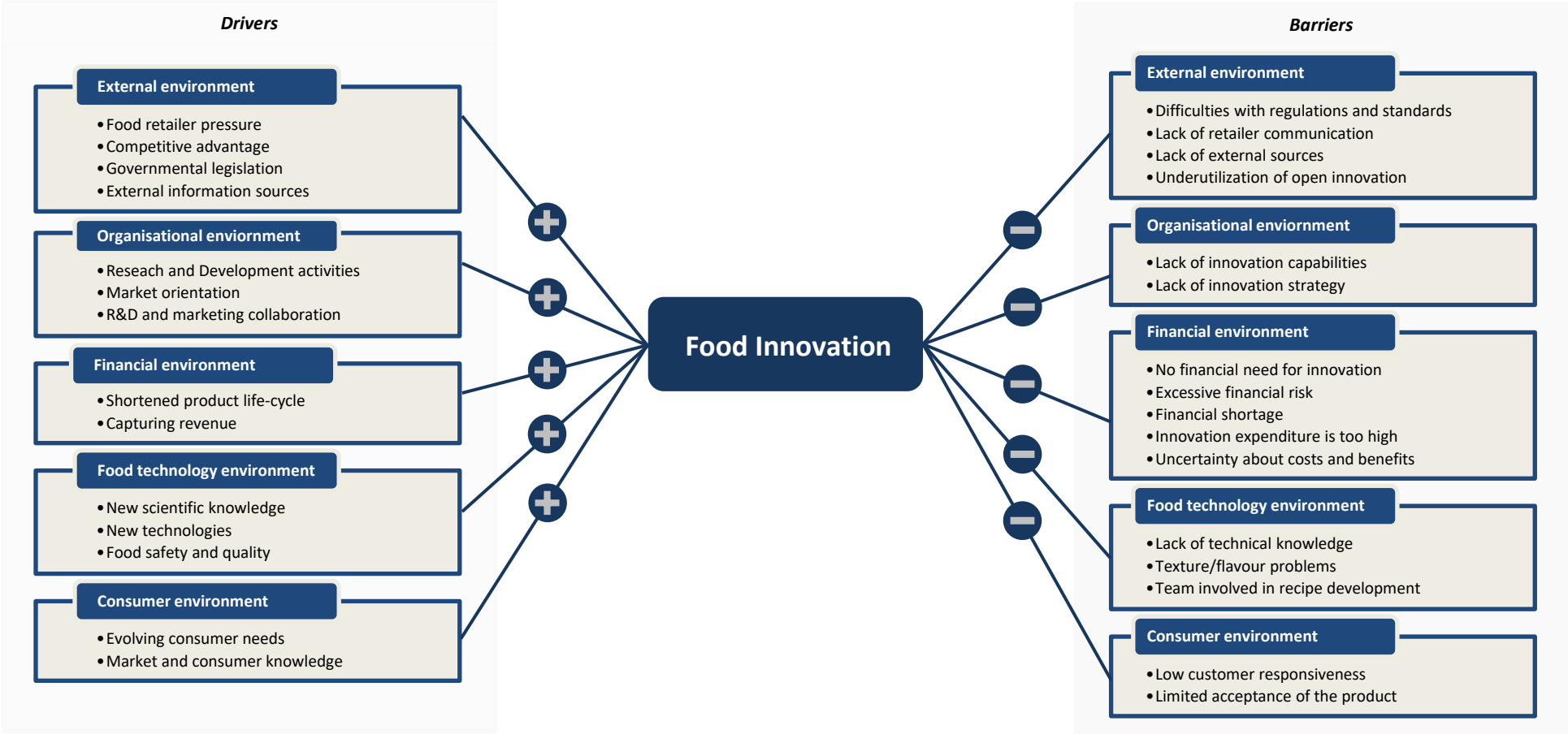

Figure 1 Overview of the drivers and barriers of food innovation that were derived from the literature study.

3. Research environment: Dutch food industry

This chapter describes the research environment in which the empirical study is performed: the Dutch food industry. Section 3.1 provides background information about this industry to be able to put the findings in the right perspective. Section 3.2 elaborates on the Dutch policy on food reformulation (Dutch agreement on improved product composition).

3.1. Dutch Food Industry

The current study is performed in the Dutch food industry. The reason for this industry was described in the introduction chapter. In short, the Dutch agreement on improved product composition is stimulating the Dutch food industry to reduce salt, sugar and fat in their food products. However, there are mixed results and the industry is running behind on schedule.

The Dutch food industry as defined in this study, are all food producing companies in the Netherlands including the beverage industry. In the Netherlands, the industry accounts for 6055 companies that contribute to a total net sales of 65 billion euros (Statline, 2017a, 2017c). This makes the food industry one of the biggest industries in the Netherlands.

The size of a company can be defined by the number of employees. We distinguish four different company sizes according to the definition of the European Union (Eurostat, 2016).

- Micro companies, with 1 to 9 employees.
- Small companies, with 10 to 49 employees.
- Medium companies, with 50 to 249 employees.
- Large companies, with more than 250 employees.

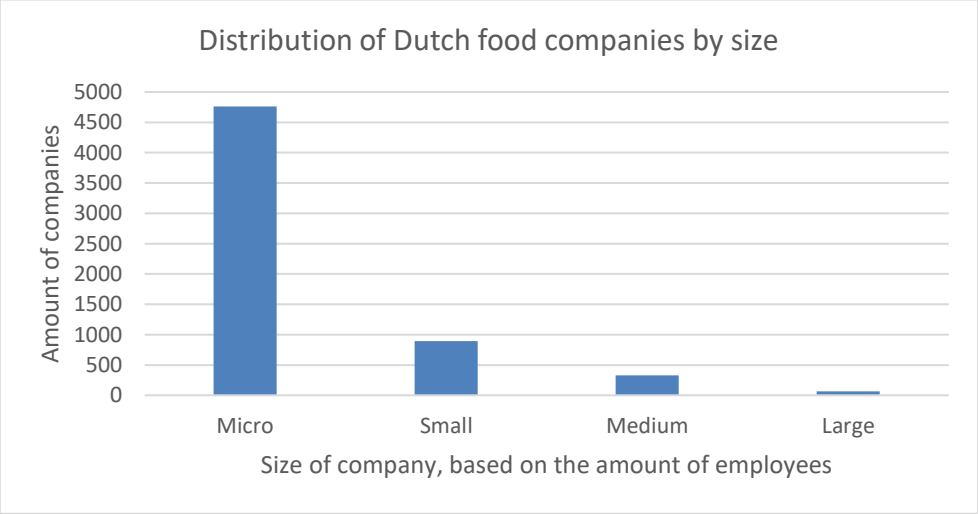

Figure 2 Number of companies in the Dutch food industry, showed by company size (Statline (2017b), author's calculations).

Figure 2 shows the distribution of company sizes within the Dutch food industry. A total of 94% of all companies are micro and small companies, 5% is classified as medium sized company and only 1% as large company. The number of companies in the Dutch food industry has been growing since 2011 at an average of 4% per year. The micro companies show the highest growth with 5,7% yearly (FNLI, 2017).

We mentioned earlier that innovation is an important process to reach competitive advantage in the food industry. Despite this, the research and development (R&D) investments within the Dutch food industry have been decreasing for the last three years, while R&D investments in the whole Dutch industry are increasing. Still, the Netherlands belongs to the top three countries with the highest R&D expenses in Europe (FNLI, 2017).

The food industry can be divided into multiple specialized sectors, such as the meat industry or the dairy industry. Figure 3 shows the main sectors in the Netherlands, with the amount of companies and their net sales. The graph shows that the bread and pasta sector has the highest number of companies, however this does not result in the highest net sales. The dairy sector and meat sector have high peaks with regard to net sales.

Next to differences in amount of companies and net sales, we can distinguish more or less processed food products. The products that are more processed have more opportunities to reduce salt, sugar or fat, compared to natural products like vegetables and fruit. Therefore, not every sector will be equally involved in the reduction of salt, sugar or fat.

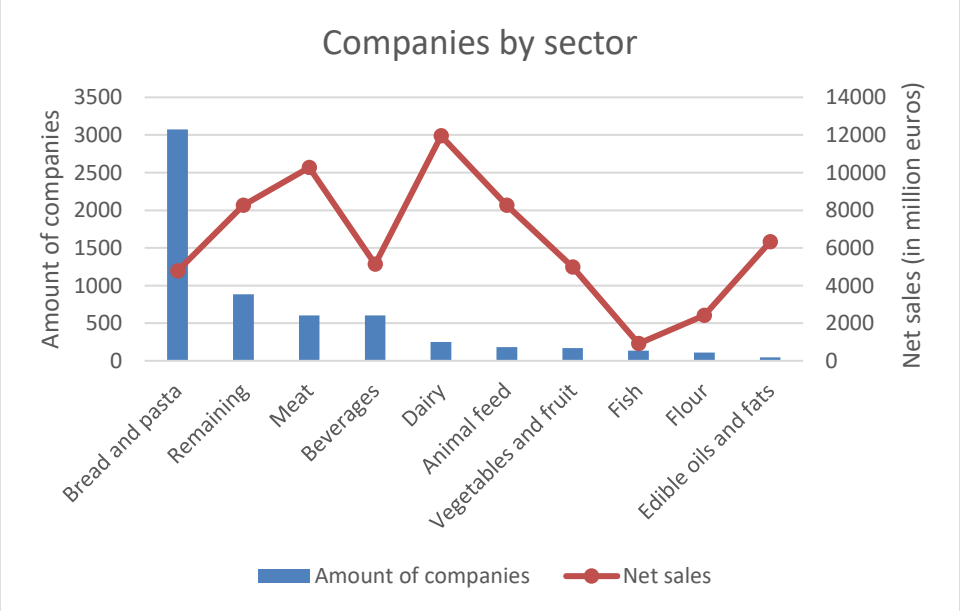

Figure 3 The amount of companies and net sales are shown for the different sectors in the Dutch food industry (Statline (2017a), author's calculations).

3.2. Dutch agreement on improved product composition

The Dutch agreement on improved product composition was signed in 2014 by the Dutch Ministry of public health, welfare and sport, together with four other parties related to the food industry in the Netherlands. Agreements were made for different product groups and they are carried out step by

step within the period from 2014 to 2020. The prioritization of the agreements is based on the level of consumption, the achievable improvements, and the products that are meant for children (Akkoord verbeterde productsamenstelling, 2016b). The first focus was to start with the products that contribute most to the intake of salt, sugar and fat. As an example, milk products contribute most to the consumption of mono- and disaccharides and therefore this is a product group for which agreements were made in the first year (Akkoord verbeterde productsamenstelling, 2016c). Within such a product group, norms will be set for particular products in this group. The agreements are made by the organisation of the Dutch agreement, however the food industry is designated as responsible to improve their products (Akkoord verbeterde productsamenstelling, 2016a).

4. Methodology

This chapter describes the research methods that are used. Section 4.1 describes the case study design that is used to collect the data for this study. Next, section 4.2 provides information about the interview set-up and the method of analysis is described in section 4.3.

4.1. Case study design

As a research strategy, case study design can be characterized by examining "a contemporary phenomenon in its real-life context" (Yin, 1981, p. 59). Case studies allow for a more in depth analysis of one or a small number of phenomena. Therefore, case studies can be based on single or multiple cases depending on the amount of data that is needed to reach the research objective (Dul & Hak, 2008). An advantage of multiple cases is that it provides more information than a single case study and is therefore more powerful (de Vaus, 2001). The multiple case study design was chosen as appropriate research strategy for this study, since the aim is to capture drivers and barriers of food reformulation using insights of multiple companies.

There are different methods for selecting the right sample for a study. Qualitative research relies on small samples that are studied in depth. Therefore a careful selection is needed to find the specific cases that contain the characteristics relevant for the research. While only small samples are studied it makes sense to select the cases in which "the process of interest is transparently observable" (Eisenhardt, 1989, p. 537). The study presented here is qualitative, with a particular interest in food companies that are engaged in food reformulation processes. This non-random way of selecting cases is called purposeful sampling (Patton, 1990) and is applied in this study.

We aim to find the drivers and barriers of food reformulation in Dutch companies. The list below shows the three criteria that were used in our sampling strategy to find the right cases.

The companies must:

1. Operate in the Dutch food industry
2. Engage in food reformulation activities
3. Be willing to cooperate to the interview

Companies were approached via different ways. Via the network of the supervisors of this study we found two companies to interview. Via the researcher's network five companies were found. Four companies were found by contacting them without any network link. These companies were approached by phone or email. The most common reason for companies to reject our interview request was a lack of time or lack of engagement in food reformulation. In total we found eleven companies willing to participate to the study. The positions of the interviewees varied by company, however they were all involved in the process of food reformulation (summarized in Table 2).

The companies that were selected are operating in different sectors of the Dutch food industry. We decided to include all sectors in the search for companies, to get a realistic view on the whole industry. We aimed to include a mixture of companies operating in different sectors and having different sizes.

Position of interviewees	Amount of interviewees with this position
Company owner	3
Production director	1
R&D manager	2
Innovation manager	1
Product developer	3
Lead product design	1
Total	11

Table 2 Summary of the different positions of the interviewees and the amount of interviewees with this position.

4.2. Interview design

The current study uses interviews as data collection method. Interviews allow to go into the experiences and attitudes of an interviewee about certain events (Yin, 2009). By using interviews, we can capture the experienced drivers and barriers of food reformulation from the perspective of different companies. For this study, semi-structured interviews were used. In this type of interview the respondent is encouraged to talk about certain topics that are pre-determined by the researcher (Rowley, 2012). This approach was chosen, in order to get the most information from the respondents themselves instead of restraining the conversation with structured questions.

At the beginning of the interview, general information about the company was collected, for example size of the company and the amount of employees. This information was included to put the findings in the perspective of the company and make reliable comparisons between the different companies. Next, questions about the main drivers and barriers were based on the categories defined in the literature review: the external environment, organisational environment, financial environment, food technology environment and the consumer environment. We asked the interviewee what the main drivers and barriers were for each environment, by repeating the next questions:

1. What are the main **drivers** for food reformulation coming from the **(…) environment**?
2. What are the main **barriers** for food reformulation coming from the **(…) environment**?

In total, ten questions were asked to identify the main drivers and barriers in all five categories. The aim of these general questions was to motivate the respondents to discuss the drivers and barriers they view as important. In this way the interviewees are less confined by the questions and this limits steering towards specific answers. Though, a topic list was made as guideline for the interviewer so that no relevant information could be missed (Appendix A). The topic list was a summary of the drivers and barriers we found in the literature of food innovation (Chapter 2). These topics were only used if the interviewee did not considered them in the answers and when they seemed relevant for the case.

Ten interviews were performed in Dutch, as this was the mother tongue of all these interviewees. One interview was performed in English, since this interviewee did not speak Dutch. A privacy statement was signed by all respondents before the interviews started, in which privacy issues of the data collection and analyses were addressed (Appendix B). Furthermore, agreements were made with the interviewees on receiving the final thesis. The interviews were recorded on a digital audio recorder

and transcribed afterwards. The transcripts of all interviews are filed as separate document next to this thesis together with the signed privacy statements.

4.3. Method of analysis

The transcripts of the interviews were analysed using content analysis strategy. This research method is appropriate to analyse textual data, like interview transcripts (Hsieh & Shannon, 2005). Furthermore, it can be used when having a small set of samples (Tangpong, 2011). The content analysis of this study can be divided into three steps.

During the first level of coding, fragments within the transcripts of the interviews were labelled with one of the five predetermined categories or were labelled as background information, such as the amount of employees. Any relevant information that could not be labelled with the predetermined categories was given a new label. Labelling with the predetermined categories enabled a comparison with the drivers and barriers found in these categories in the literature. Two new labels were made for information related to the reformulation strategy, and responsibility of food reformulation.

During the second coding level, the labelled fragments were divided into drivers or barriers within each category. Then, all labelled fragments were inserted in a table according to their environment and being a driver or barrier. This table allowed for a structured analysis and comparison of the drivers or barriers per environment. The fragments were analysed and fragments with comparable topics were grouped.

Finally, in the last level of coding all topics were compared between cases and within environments. In this phase the broad concepts were defined, such as 'flavour problems'. This cross-case analysis made it possible to discover novel findings within the data (Eisenhardt, 1989). Table 3 shows an example of the different levels of coding.

Text fragments	Level 1 coding	Level 2 coding	Level 3 coding
"I want to be the first in the market with these products"	External environment	Driver	Competition
"looking at what the competitors are doing"	External environment	Driver	Competition
"Salt replacers influence flavour"	Food technology environment	Barrier	Flavour problems
"It is difficult to maintain the flavour of the original product".	Food technology environment	Barrier	Flavour problems

Table 3 The different levels of coding applied in the content analysis of the interview transcripts.

5. Results

This chapter shows the results of the interviews. Section 5.1 describes the background information about the companies that were interviewed. The following five sections provide the main results for each of the five environments: the external-, organisational-, financial-, food technology-, and consumer environment. Finally, some additional findings are described in section 5.7 and the chapter ends with a figure that summarizes the results. All results described in this chapter are based on the eleven interviews that were performed and therefore are hardly generalizable to a wider audience.

5.1. Background information

The first questions of the interviews were aimed at getting background information about the companies. Table 4 shows the overview of companies that were interviewed for this study with their main characteristics.

	Sector/product	Type of reduction	Company size	Family/corporate	Private label/branded
1.	Cookies	Salt, sugar, fat	Small	Family	Private label
2.	Meat products	Salt and fat	Large	Corporate	Private label
3.	Sauce	Fat and sugar	Large	Family	Both
4.	Beverages	Sugar	Large	Corporate	Branded
5.	Cheese	Salt	Medium	Corporate	Private label
6.	Sauce	Sugar	Medium	Family	Branded
7.	Ready-made meals	Salt	Medium	Family	Both
8.	Candy	Sugar	Large	Corporate	Branded
9.	Cookies	Sugar and fat	Large	Family	Branded
10.	Ready-made meals	Salt, sugar, fat	Large	Family	Both
11.	Milk products	Sugar	Small	Family	Branded

Table 4 The main characteristics of the companies that were interviewed for this study.

5.2. External environment

Within the external environment, we found five main drivers and two main barriers for food reformulation. Figure 4 summarizes the drivers and barriers of food reformulation in the external environment. These seven findings are explained in the next paragraphs.

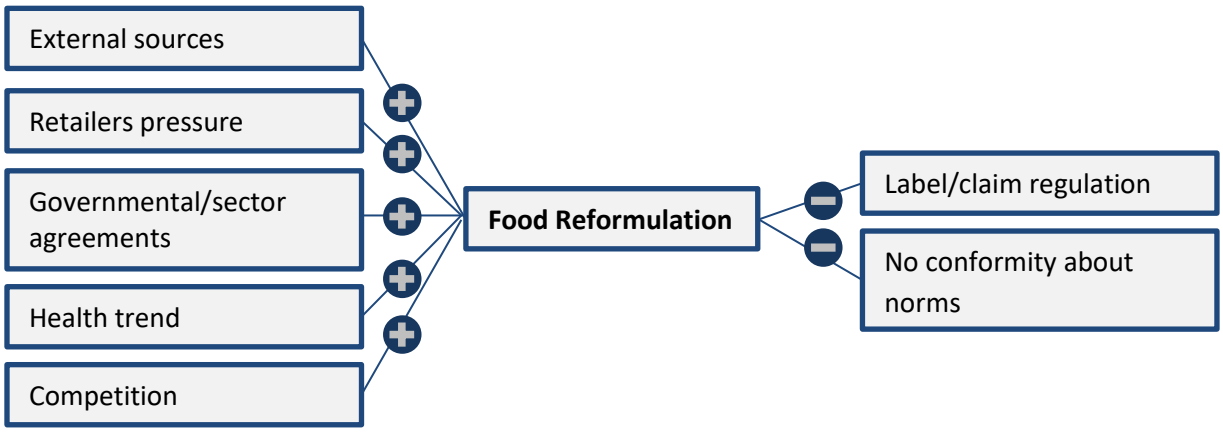

Figure 4 Drivers and barriers of food reformulation in the external environment derived from the interviews.

External sources ***-driver-***

Collaborations with research institutes was mentioned by four companies as a driver for food reformulation. The goal of these collaborations was to gain knowledge about the process of food reformulation. Nine companies mention a collaboration with ingredient suppliers as a driver for food reformulation. Often the ingredients that are bought via these partners can also be reduced in salt, sugar or fat level. If the ingredients can be reformulated by the supplier, the food company may have to reduce a smaller amount of salt, sugar or fat. Furthermore, better knowledge of the ingredients can help the food company in the food reformulation process. To clarify, two companies explained the added value of collaboration with ingredient suppliers:

> *"They are also busy with the trends in the market like sugar reduction, so you get a lot more alternatives" (company 11).*
>
> *"One of our main suppliers of bouillon powders has developed a clean-label bouillon powder specifically for us, where the amount of salt was also reduced" (company 10).*

The collaboration with the research institutes and with ingredients suppliers are external sources that support food companies in the process of food reformulation.

Retailer pressure ***-driver-***

A driver for food reformulation for the majority of the companies is the retailers pressure to produce improved products. Some retailers start projects together with companies to get the improved products on the shelves, other retailers just mention their demands towards the food companies. One of the companies did mention that the views and demands between retailers can differ. The few companies that did not feel retailers pressure as driver for food reformation mentioned multiple reasons for this. The pressure was still too low, other factors were better drivers, or the companies were already ahead of this process: they had produced reformulated product before retailers asked for it.

Governmental/sector agreements ***-driver-***

The agreement of improved product composition, initiated by the Dutch government, influenced the companies in different ways. Only a few companies knew about this governmental agreement and mentioned it as direct driver for food reformulation. Three companies mentioned sector agreements as driver for food reformulation: the sauce, beverage and cheese sector (company 3, 4 and 5). Here,

agreements were made within the specific sectors and the agreements were communicated towards all members of these sectors. These agreements probably result from the governmental agreement, but here the sectors take responsibility and stimulate the members. The cheese sector is also actively monitoring the progress of the companies to check if they achieve the target. Next, an example shows how this sector stimulates the company to engage in food reformulation:

> *"We have a 5 year plan to reduce 30% salt in cheese. This is agreed with the whole sector and we want to conform to this, even run in front. In the end the companies that have successfully reduced salt are mentioned in communications and media. So we do not want to take the risk to miss that publicity" (company 5).*

Two companies mentioned the governmental regulations of the United Kingdom as driver for food reformulation in the Netherlands. Both companies are internationally oriented and are also producing in the UK. These companies used their experiences from the UK regulations and apply them in the Netherlands, as they expected this trend to come to the Netherlands. This was explained by one of the companies in the following way:

> *"The UK government has strict targets how much sugar, salt, and saturated fats you can have in products and how much they want to reduce it by. The aim at the moment is to bring the Dutch targets in line with the UK targets, just because we want to be one step ahead" (company 9).*

Health trend ***-driver-***

Six companies mentioned the health trend in society, the public opinion or consumer demand as driver for reformulation. Most of these companies have direct contact with consumers via for example social media, events, consumer test panels, or internal consumer insights teams, where they noticed this trend. Other companies are more focused towards their professional customers and do not have direct contact with consumers. These companies indicated less that the health trend was a driver for food reformulation. The next two quotes show both of the mentioned experiences regarding the health trend.

> *"In the end, it is the public opinion and media that make salt reductions 'a topic', therefore we are driven to make these products" (company 5).*

> *"To be honest, I did not really receive the question directly from consumers. Consumers demand nice products, they do not ask for sugar. The people that do find sugar important already choose other products" (company 4).*

Competition ***-driver-***

A form of competition in the sector was mentioned by four companies as driver for food reformulation. Two of them have the ambition to be the first in the market with the improved product and in this way gain competitive advantage. The other two mention the action of other companies in food reformulation, which drives them to also engage in food reformulation. All four companies keep a close eye on the competitors. Company 8 talks about the influence of competition at food reformulation in the following way:

> *"If we see this gap in the market, we will not tell our competitors to help them, no then we want to be the first in the market" (company 8).*

Label legislation ***-barrier-***

The legislation around claims on labels was a barrier in the process of food reformulation for three companies. First, with reformulation comes an adjusted label, because the nutritional values are adapted. The barrier for this is explained by the quote of company 7 below. Second, claims on packaging material were indicated as a way to inform consumers about the reduction of salt, sugar or fats in their products. However, there are strict rules for using claims on packages. It was indicated to be difficult applying claims on labels within food reformulation, as explained by company 9.

> *"If you want to reduce in small steps you have to adjust the label with each reduction step" (company 7).*
>
> *"If you want to claim something on the package you have to reduce it by a certain percentage compared to your previous recipe. So if you don't do it by at least that, you are not allowed to say on the package that this has less sugar than before" (company 9).*

Either by reformulating step by step or all at once, the amount that is needed to be reduced before a claim can be applied can be too high. Consequently, the companies cannot always use claims to inform consumers about their reduced level of salt, sugar or fat.

No conformity about norms ***-barrier-***

Two companies mentioned that a barrier in this process is that there is no conformity about norms in the industry. For certain product groups, norms about salt, sugar and fat are set by the Dutch Agreement of Improved Product Composition. However, not all product categories are discussed in this agreement (yet). One of the interviewed companies produces ready-made meals and for some meals norms are set (Italian and Oriental meals), but for others there are no norms yet (Dutch meals). This company is looking one step ahead and is already reducing salt in Dutch meals. They have set their own target, based on the agreement made for the Italian and Oriental meals. However, they are unsure if their own targets will match the targets set in the future in the agreement. No conformity about norms can lead to large differences in e.g. salt levels within one category of products because some producers are reformulating the product and some are not. Furthermore, norms also differ between countries. For companies that operate in different countries it can be difficult to know which target to use during the reformulation process. The lack of conformity about the norms is explained as follows:

> *"For some product groups there are no norms yet, this makes it difficult to work on it if you want to. Furthermore, if one producer is reducing and the other not, it creates confusion among consumers" (company 10).*

Two other companies also named the lack of conformity about norms, but did not specifically mentioned it as barrier. The company that produces candy is also reducing the amount of sugar to a certain norm, while candy is not discussed in the Dutch Agreement of improved product composition. They have set their own reduction norm. The other company is reducing sugar in cookies, for which no official norms are set. This company has set their own targets, based on the norms that were set in the UK. As mentioned by company 10, if other companies in these sectors are not reducing their salt, sugar or fat levels, this can create confusion among consumers.

5.3. Organisational environment

Within the organisational environment, we found two main drivers and three main barriers for food reformulation. These five findings are explained in the next paragraphs. Figure 5 summarizes the drivers and barriers of food reformulation in the organisational environment.

Figure 5 Drivers and barriers of food reformulation in the organisational environment derived from the interviews.

Vision related to healthy products ***-driver-***

Four companies mentioned that producing healthy or healthier products was a part of the company's vision and in this way a driver for food reformulation. Two of these companies have written this specifically in their annual report or website, and this indicates the importance of food reformulation for these companies. Two small companies mention that their own personal interest (of the entrepreneur) in healthy foods was a driver to experiment with food reformulation. One of these companies explained this in the following way:

> *"We internally have interest in this topic and therefore we have started the process. We want to make products that you can eat on a daily basis" (company 11).*

Innovation important in strategy ***-driver-***

Innovation can be an important part of a company's strategy. This was mentioned by four companies as driver for food reformulation, being a type of innovation. When innovation is an important part of the business strategy, the company is often more experienced with innovation processes and food reformulation can be applied just as any other type of innovation.

> *"I think innovation is in our blood, everyone tries that every day again when he/she gets up from bed" (company 3).*

Company priorities ***-barrier-***

Setting the right priorities was mentioned by two companies as a barrier for food reformulation. One factor that hampers food reformulation is a lack of time. Company 10 mentioned the existence of many projects which are all important. Because of limited time, projects need to be prioritized and the food reformulation process is not always the number one priority. The priority ranking of a small company clearly shows how the process of food reformulation can be postponed:

> *"As a small company, I need to make sure that the factory is running. If someone is sick or a machine is broken, I first need to fix that" (company 1).*

Lack of innovation capabilities ***-barrier-***

Three companies mentioned they lack or have small research possibilities. Examples mentioned are research capabilities to test new recipes on small scale or to perform sensory tests with consumers.

Furthermore, a medium sized company mentioned the difficulty to compete with the large players of the industry that have very large R&D departments. On the contrary, a large company mentioned that their test-scale equipment facilitates food reformulation. Multiple companies mention collaboration between marketing and R&D to facilitate food reformulation, however these are not main drivers for food reformulation.

Lack of knowledge ***-barrier-***

The last barrier we found was a lack of knowledge about the process of food reformulation, which was mentioned by three companies. First, missing technical knowledge about the method to reduce salt, sugar or fat in the products was mentioned as barrier. Second, marketing knowledge was mentioned as a barrier when it was not known how to communicate that the product is reformulated to consumers in the right way. This lack of marketing knowledge was mentioned during the interviews:

> *"So how I should sell the new product, I have no idea. How do you communicate lowered calories to consumers?" (company 1).*

5.4. Financial environment

Within the financial environment, no drivers were found that characterized the food reformulation process in the companies we studied. Company 4 explains this in the following way:

> *"For food reformulation I would not say that the financial aspect or making profit is the intrinsic driver. It is more related to produce healthier" (company 4)*

The drivers in the other environments are stronger related to food reformulation. Only one company mentioned the possibility of increasing sales by attracting new consumer groups as a potential driver. However, this was not something that belonged to the main drivers of their process. The other companies did not mention this as driver and probably see food reformulation more as a responsibility rather than an opportunity.

We did find two main barriers for food reformulation. These findings are explained in the next sections. Figure 6 summarizes the barriers of food reformulation in the financial environment.

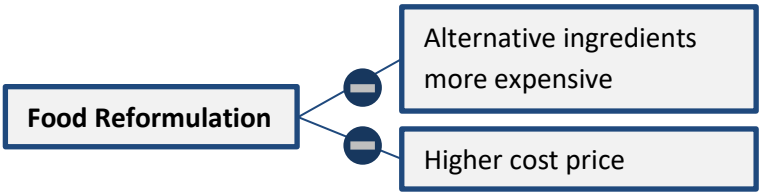

Figure 6 Drivers and barriers of food reformulation in the financial environment derived from the interviews.

Alternative ingredients more expensive ***-barrier-***

In the process of food reformulation salt, sugar or fat can be reduced. Often these nutrients need to be replaced by other ingredients. The majority of the companies indicate that these alternative ingredients are more expensive compared to the original ingredient: salt, sugar or fat. Consequently the cost price of the product will increase using these alternative ingredients, which creates a financial barrier for the process.

"Salt costs between 6 and 10 cents per kilo, the average salt replacer costs 2 euros per kilo. Retailers don't want the cost price to go up, so that makes it difficult to replace the salt" (company 2)

Interestingly, the beverage producing company mentioned that the use of sweeteners instead of sugar was actually cheaper for them. The price per weight of sweeteners is higher compared to sugar. However they need less sweeteners than sugar in the beverages when maintaining the same level of sweetness and in this way the sweeteners were cheaper to use compared to sugar.

Increased cost price ***-barrier-***

In an ideal world the products are reformulated and keep the same price so that consumers still buy the products. However, not only the price of alternative ingredients gives a higher cost price, also the development of the reformulated product costs money. Every new product development process requires investments, however in the case of food reformulation there are development costs for existing products. The development costs, together with the higher price of ingredients, can increase the cost price, which was mentioned by three companies as barrier.

"In the beginning we pay the development costs ourselves. In the end, the retailer will pay the price we ask, but this will be paid by the consumer that buys the cheese in the supermarket" (company 5).

A positive aspect with regard to this barrier is mentioned by company 10, that healthier products may cost a little bit more nowadays. This could overcome the financial barrier for companies in the future.

5.5. Food technology environment

Within the food technology environment, we found one main driver and four main barriers for food reformulation. These five findings are explained in the next paragraphs. Figure 7 summarizes the driver and barriers of food reformulation in the food technology environment.

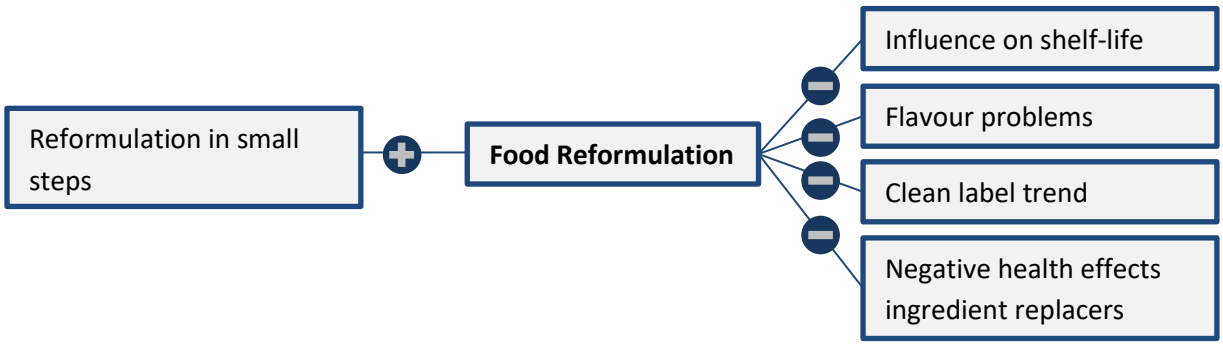

Figure 7 Drivers and barriers of food reformulation in the food technology environment derived from the interviews.

Reformulation in small steps ***-driver-***

Two companies are reducing salt in their products in small steps. They mention this as driver for food reformulation, because in this way consumers can get slowly used to the adapted taste. Next to this driver, the majority of the companies did not mention specific food technology drivers for food reformulation.

Influence on shelf-life ***-barrier-***

Food reformulation can negatively influence the shelf-life of the product. All three companies that mentioned the shelf-life as barrier were reducing salt in their products. Salt is a preservative, so it can be expected that a reduction of salt will influence shelf-life. For one company this shortened shelf life appeared not to be a big problem, but the other companies had to add other ingredients to keep the same shelf-life.

> *"Meanwhile, we can make bacon for the retail industry at 3% and 2.8% salt. So then we almost reduced 40% salt. The shelf life is shortened from 6 weeks to 4 weeks, but the retailers can then live with that" (company 2).*
>
> *"You have to add other conservation ingredients to keep the same shelf life. Otherwise you get problems within the supply chain" (company 10).*

Flavour problems ***-barrier-***

The majority of the companies mention an aspect regarding flavour as barrier for food reformulation. The influence of ingredient reduction on flavour, the influence of ingredient replacers on flavour, and the changed mouth feel of the products after reformulation were mentioned as barriers relating flavour. The goal of food reformulation is to keep the same flavour, and these barriers make this difficult. Two companies find the flavour most important, and have little faith in maintaining the right flavour after reformulation.

> *"Process-wise it is more difficult to reduce salt, and keep the same flavour, compared to making a new product with less salt because then the consumer has no reference product" (company 7).*
>
> *"Now the sauces are perfect, you do not have to add any spices or salt (…) I belief that products will be less tasty after reductions. We want to produce tasty products" (company 6).*

Clean label ***-barrier-***

As described before, often alternative ingredients are used in the process of food reformulation. Next to the health trend described, there is also a trend of producing clean label products and keeping the product as natural as possible. However, this means that for the food reformulation process it can be difficult to find alternative ingredients, because these have to be natural ingredients without an E-number. Five companies mentioned that this trend of producing clean labels and using natural ingredients is a barrier for food reformulation. This is explained by a company in the following way:

> *"We have excluded all conservation ingredients for our clean label products. This means that reduction of salt will bring more technological issues" (company 6).*

Negative health effects of ingredient replacers ***-barrier-***

Two companies mentioned that the ingredient replacers have negative health effects. This is an interesting finding, since the food reformulation process exists to make products healthier. Both companies are reducing sugar in their products and the alternative ingredients that have negative health effects are sweeteners or sugar replacers. It is contradictory if sugar is reduced to make the product healthier, while the alternative ingredient has negative health-effects.

"Energetically you have reduced sugar, yes, you have reduced energy. However if you put in too much polyol then you will get diarrhoea. That is not healthy at all, but that applies to many sugar substitutes" (company 8).

5.6. Consumer environment

Within the consumer environment, we found one main driver and four main barriers for food reformulation. These five findings are explained in the next paragraphs. Figure 8 summarizes the driver and barriers of food reformulation in the consumer environment.

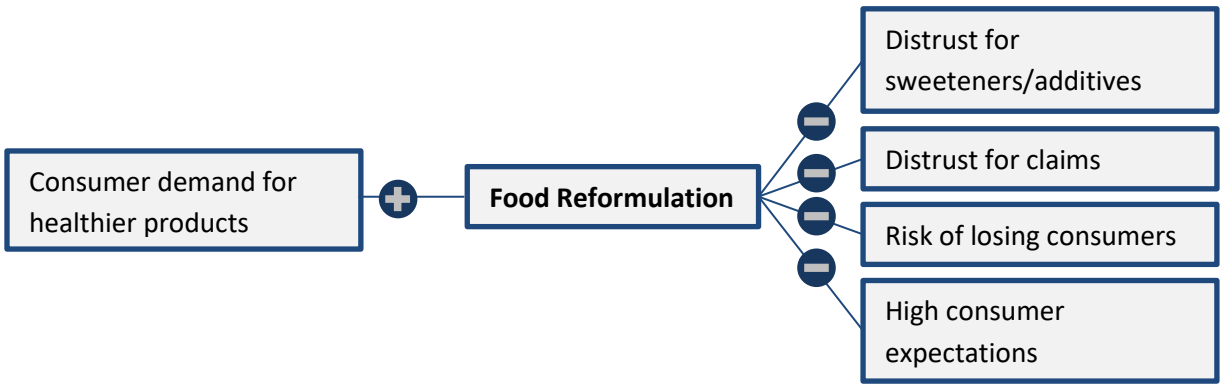

Figure 8 Drivers and barriers of food reformulation in the consumer environment derived from the interviews.

Consumer demand for healthier products ***-driver-***

The consumer demand for healthier products is a driver for food reformulation. This was specifically mentioned by two companies, however it is very much related to the health trend that was also mentioned as driver in the external environment. Interesting is that two other companies mentioned they did not feel a direct demand of consumers for reformulated products.

Distrust for sweeteners / additives ***-barrier-***

Three companies mentioned that the distrust of consumer related to sweeteners or artificial additives form a barrier in the process of food reformulation. This is related to the clean label/natural trend that forms a barrier in the food technology environment. Consumers distrust sweeteners or artificial additives, which makes products with these ingredients difficult to sell to consumers (barrier in consumer environment). In the food technology environment this trend is a barrier because it is difficult to find appropriate alternative ingredients that can replace salt, sugar or fat.

Distrust for claims ***-barrier-***

A distrust or misunderstanding of claims by consumers was noted by four companies as a barrier for food reformulation. A company can be successful in the reduction of salt, sugar or fat, but the question how to communicate this towards consumers is difficult. Two companies explained how this distrust can be a barrier in food reformulation:

"Distrust is formed by products that claim to become fat-free while sugar is increased with 200%" (company 1).

"Low-salt can suggest that the product does not taste good" (company 2).

Company 5 specifically mentioned to not use claims on their packages after reformulation. This sector (cheese) does not use claims and this makes it easier for all companies. The company acknowledges the difficulty of using a claim for food reformulation, because consumers expect a less tasty flavour. In this case, because the whole sector is not using claims, they can reformulate without communicating this specifically to the consumers.

Risk of losing consumers ***-barrier-***

Two companies mentioned the risk of losing customers as barrier for food reformulation. Food reformulation is a process in which an existing product is changed. If the consumer notices any difference, there is a chance that these consumers stop buying the product.

High consumer expectation ***-barrier-***

Consumers demand the same or better quality if a product is reformulated. Two companies mentioned that this high demand can create a barrier in the process of food reformulation. This is also related to the flavour problems mentioned as barrier in the food technology environment. When the flavour differs, consumers will notice and demand a better product.

> *"So again from consumers, the barriers or challenges would be that they want healthier products, so less sugar less salt or less fat in the product, but they want it either to taste the same or taste better" (company 9).*

5.7. Additional findings

We have found some additional results related to the process of food reformulation next to the drivers and barriers found in the five specified categories. These findings are related to the strategy used for food reformulation and the responsibility of this process. These results are explained in the next sections.

Strategies

We can distinguish two strategies that the studied companies applied in food reformulation. The first strategy is when the original product is reformulated and this new product replaces the old product in the market. The second strategy is when the original product is reformulated and this new product is brought into the market next to the original product (Figure 9). The majority of the companies interviewed replaced their original product with the reformulated product. Three companies produced reformulated products next to the original products. An example is an existing candy, which is now also put on the market with a 30% less sugar variant.

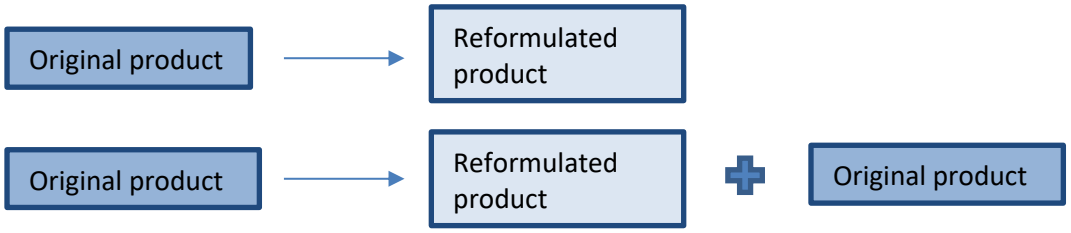

Figure 9 Two strategies for food reformulation found in this study.

Responsibility

During multiple interviews, the subject of responsibility was mentioned. None of the companies that mentioned this aspect of responsibility could indicate one responsible actor for this issue. In the discussions the responsibility shifts between the government, the manufacturer and the consumer. The government can set up taxes or regulations in which products have to be made healthier, or unhealthy products become more expensive. Food companies can take responsibilities by reformulating products, however the costs involved in this process are not attractive for the company. Finally, the consumer is in the end responsible for its own food intake. The confusion about not knowing who is responsible for the reduction of salt, sugar and fat makes this process even more difficult.

Other possible solutions to this issue were also addressed. One company mentioned that educating children in 'nutrition' would contribute to a healthier eating pattern and thus less diet-related diseases. Another company mentioned to involve people's lifestyle into this discussion, because only with reformulation the obesity problem would not be tackled.

5.8. Overview of drivers and barriers

Figure 10 summarizes the drivers and barriers found in the empirical study.

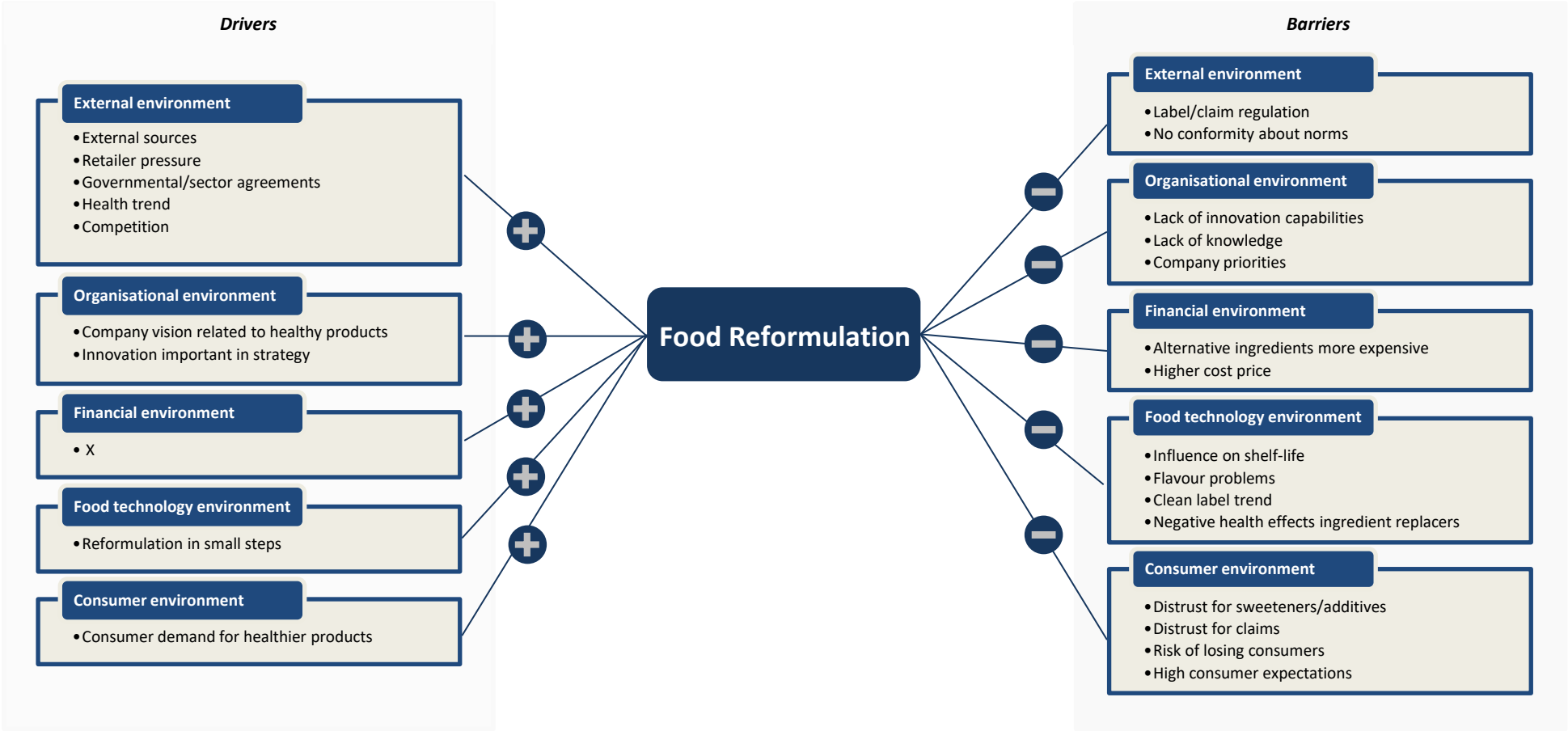

Figure 10 Overview of the drivers and barriers of food reformulation that were derived from the empirical study.

6. Discussion

This study started with a literature research into the drivers and barriers of food innovation in general. With the empirical study we studied the drivers and barriers of food reformulation, experienced by food companies in the Netherlands. The main differences that we found between literature and our empirical study are discussed in section 6.1. Next, the drivers and barriers of food reformulation are inserted in a new model, that allows us to understand in which part of the innovations these drivers and barriers play a role (section 6.2).

6.1. Drivers and barriers: literature versus empirical research

We started this study with a literature research into the drivers and barriers of food innovation, since literature on food reformulation from a business perspective was lacking. This study resulted in a categorization of environments useful for the empirical study and a list of drivers and barriers of food innovation in general. The literature study allowed us to set up a clear interview guide, that was able to capture the drivers and barriers of food reformulation. During the empirical study we found multiple drivers and barriers of food reformulation. Next, we discuss these main findings and clarify differences we found with the food innovation literature.

External environment

The drivers that were found in the literature research were all confirmed by the study presented here. A government agreement was found as driver for food reformulation, however not for all companies. Often the companies knew about the Dutch government agreement via the sector they operate in or via retailers.

Retailers have high power in Europe and consequently the pressure from retailers on the food industry is high. Especially small- and medium sized companies are negatively affected by the imbalance of power because they do not have the power or financial power to go against them (CIAA, 2008). The risk of not reformulating products is that the retailers stop buying the company's products and go to competitors. Competitors action can therefore also be a reason to reformulate.

A new driver that was identified was the health trend that is stimulating companies to produce healthier products. It is obvious that this driver was not found in the general food innovation literature, since healthiness of products is not a driver for all type of innovations. However, food reformulation is a type of innovation where healthiness of the products is key and therefore this is a plausible finding.

The barriers found in this study are related to the regulations and standards that were found in the literature research. Label and claim regulations can hamper food reformulation. We did not found that a lack of retailer communication, lack of external sources and underutilization of open innovation could hamper food reformulation (Fortuin & Omta, 2009; Martinez & Briz, 2000; Stewart-Knox et al., 2003). An explanation could be that most of the companies have collaborations with research institutes and the suppliers of ingredients and therefore use an open process to innovate. These are great sources of knowledge regarding food reformulation, and this may explain why the companies do not experience a barrier in finding the right partners or sources of knowledge. The collaborations with research institutes and ingredient suppliers were even indicated as drivers in this process. Collaborations with

research institutes were mainly used to gain more knowledge about the process. Collaborations with the suppliers of ingredients go beyond gaining knowledge. Often the suppliers of ingredients are also innovating their products and they are reducing salt, sugar or fat in their ingredients. As an example, the cookie producer uses a marmalade as filling, which is a high contributor to the sugar content of the cookie as a whole. Collaborating with the marmalade supplier means that a part of the sugar reduction is taking place at the marmalade supplier, whereas the cookie producer has to 'only' focus on reducing sugar in the cookie itself. The collaborations with ingredient suppliers we found in this study work in this way, so they are improving their own ingredients and they provide knowledge about the application of the ingredients.

A lack of conformity about the norms is found to be a barrier in this process. This was found within the Dutch market but also between the Dutch and UK market. The main norms for reformulation are determined by the Dutch agreement on product composition. However, they have not defined norms for all product groups and we found in this study that this creates a barrier. Furthermore, some companies experienced differences in norms between the Netherlands and the UK. For companies that produce products for both countries it can be difficult to set one target.

Organisational environment

The drivers found in the organisational environment are related to the innovation strategy and the vision of the company. Some of the companies indicated that producing healthier food products is a part of their vision. This is in line with Corporate Social Responsibility (CSR) activities that are adopted by companies more and more in the last years (van de Poel et al., 2017). CSR is defined by the European commission as "the responsibility of enterprises for their impacts on society" (European Commission, 2011, p. 6). Applying a food reformulation strategy can therefore be part of a company's CSR strategy where the company reduces the unhealthy ingredients like salt, sugar and fat (Marotta, Simeone, & Nazzaro, 2014).

The barriers are related to capabilities and knowledge as we also found partly in the literature. Although we previously mentioned that within food reformulation an open process to innovate is often applied, some companies did mention that not having a small research and development department or lacking knowledge could hamper food reformulation. However, the companies that mentioned these barriers also have collaborations with research institutes or ingredient suppliers to gain knowledge, or to use research and development capabilities of the ingredient suppliers. Therefore, the barrier of lacking capabilities or knowledge can be solved by other parties. Still, these aspects were mentioned as barrier by a few companies since they expect to be more successful when having more capabilities and knowledge themselves.

Other barriers we found were related to the company priorities or the innovation strategy. Within small companies the problem most often is that there is no financial room for this development, or broken equipment or sickness among employees can hamper the process. Within large companies, the problem can be that there are multiple projects and that time has to be divided.

Financial environment

We did not find any financial aspect that stimulates food reformulation. With other innovations, often a driver is to capture revenue (Smith, 2009a). However, food reformulation is another type of innovation with a social aspect where profit is not the main goal. As we have seen in the interviews, the barriers can be high development costs and that alternative ingredients are more expensive. At

this point a conflict of interest can exist between contributing to a healthier product portfolio on the one hand and the company goal to make profits on the other hand (Reeve & Magnusson, 2015).

Food technology environment

In the food technology environment one driver was found. Reformulation of the product in small steps was found to stimulate food reformulation. This strategy has been applied within salt reduction programmes already, where salt gradually was decreased in products without informing consumers about this reduction (Zandstra, Lion, & Newson, 2016).

We found more barriers than drivers in the food technology environment. In the literature on food innovation we found that texture and flavour problems can hamper the innovation process (Stewart-Knox et al., 2003). We also found that the change of the recipe can influence shelf-life and flavour negatively and these are both aspects that need to be constant to guarantee identical product quality to the consumer.

The clean label trend was also found to hamper food reformulation. Consumers nowadays are considering the different ingredients of the foods they eat more and more. This evoked the trend of clean label, which is an umbrella term for different categories of foods such as natural, organic, and free from additives (Asioli et al., 2017). Often salt, sugar or fat is replaced with alternative ingredients during food reformulation. However, the clean label trend makes it more difficult to find ingredient replacers that are also natural, organic or not an additive.

Some ingredient replacers, such as sweeteners can have negative side-effects when consuming too much. This is a barrier for food reformulation, since the goal is to make the products healthier. It would therefore be conflicting to add such ingredients as replacement for example sugar. According to Das and Chakraborty (2016) high intake of certain sweeteners can cause gastrointestinal problems and dental caries. Therefore they argue that both sugar and sweeteners have to be consumed in minimal amounts within an optimal diet.

Consumer environment

The drivers that we found in the consumer environment are consistent with the drivers of food innovation we found in the literature. Evolving consumer needs is a driver for innovation within the food innovation literature. An example of such an evolving consumer need is the demand for healthier products, which we found in the interviews as driver for food reformulation. However, only two companies mentioned – among others - a consumer demand for healthier products as driver for food reformulation. A possible explanation for this low number is that we found that food reformulation is not only stimulated by a consumer demand, but also stimulated by for example government, industry sectors and retailers. Therefore, a low consumer demand does not mean that food reformulation is not stimulated, the company can be driven by other aspects.

Interesting to notice is that the two companies that did feel the consumer demand for healthier products, did not mention barriers related to the consumer environment such as the distrust for the products or the high expectations. One of the companies is known for its natural products and therefore it is possible they already attract a more conscious consumer. The other company is producing a candy with 30% less sugar, which is sold next to the regular candies. They attract a different target group for these candies. It can be expected that these specific target groups have other expectations regarding these products and therefore the companies do not encounter the barriers .

We found more barriers for food reformulation compared to food innovation in general. A limited acceptance of the product was found in the literature, and related to this we found that a distrust for sweeteners and additives, distrust for claims, and high consumer expectations are barriers for food reformulation. The distrust for sweeteners, additives, and claims on the package are in line with the clean label trend we mentioned before, where consumers are more aware of the ingredients of the products (Asioli et al., 2017). Using sweeteners, additives or claims on packages can lead to a lower acceptance of the product, which was found as barrier in the literature on food innovation. Moreover, we found that high consumer expectations regarding food that is reformulated is a barrier. If the product cannot meet the consumer expectations, the product will not be accepted by the consumer.

Finally, the risk of losing consumers forms a barrier for food reformulation. Normally a goal of new product development can be to increase the market share or the profitability (Rudder, Ainsworth, & Holgate, 2001). However, with food reformulation an existing product is changed. It is a challenge to convince the current consumers of the reformulated product, however there is a risk that certain consumers will not buy the product anymore. This can be related to the earlier mentioned barriers that limit the acceptance of the product.

Food reformulation strategy

We distinguished two strategies for food reformulation from this study. First, the original product is reformulated and only this reformulated product is placed in the market. Second, the reformulated product is placed in the market next to the original product. From a public health point of view, the first strategy would be the most effective in reducing salt, sugar and fat levels in consumers' diets. With this strategy the consumers have no other choice than buying the product they used to, only this product contains less salt, sugar or fat. When applying strategy two, the problem is that consumers still have the choice. The reformulated product might be more expensive because of the higher cost price and this will make the original product the easy choice.

Food reformulation would be most successful if reductions are applied within the whole product sector. If only one product has a decreased salt-level, consumers will notice this and may buy the competitors product. The reformulated product will not survive in the market (Webster et al., 2011). So, not only all food companies should reformulate among the whole category, also only the reformulated products should be placed in the market to increase the chances of success of these products.

6.2. Drivers and barriers in the innovation process

We argue that the drivers and barriers we found not only can be attributed to different environments, but also to different phases of the innovation process. It is interesting to show the drivers and barriers within the process for two reasons. First, the drivers and barriers that occur before the process starts can determine whether the company actually starts food reformulation. This might be interesting for policymakers, because they can anticipate the policy to these drivers and barriers. Second, the drivers and barriers that companies face during the process might be interesting for the companies themselves, so they can anticipate to these drivers barriers beforehand.

In the introduction of this report we indicated that innovations nowadays have the goal to develop healthy-, convenient, and high quality food products (Aguilera, 2006). Such innovations respond to

consumer needs and therefore utilize the demand-pull principle, where the market demand forms the motivator for innovation (Di Stefano, Gambardella, & Verona, 2012). Food reformulation is reacting on market demands since it is directed towards developing healthier food products and supported by policymakers. We want to apply the phases of the demand-pull model to the drivers and barriers of food reformulation. This allows us to see where in the process of innovation the drivers and barriers play a role and thus how they influence the process. Four basic phases are distinguished in this model: the expressed market needs; research and development; production; and marketing (Martin, 1994).

Figure 11 shows the drivers and barriers of food reformulation found in this study, linked to the different phases of the innovation process. The environments where the drivers and barriers belong to according to this study are also shown in the figure. A main distinction was made between the organisational and external environment. The financial, food technology and consumer environment were allocated within the organisational environment. Even though these drivers and barriers originally belong to these three environments, they are dealt with within the organisational environment. As an example, the flavour problems that occur when reducing salt, sugar or fat (food technology environment) play a role in the recipe development and therefore the company itself has to solve this issue. The one organisational driver (consumer demand for healthier products) is allocated within the external environment, since it is a driver coming from outside the company.

Most of the drivers can be found in the beginning of the innovation process and these are either external or organisational drivers. Most of the barriers play a role during the development phase of the process and during the last phase, where marketing should bring the product to the consumers.

If we consider the start of the food reformulation process, we see that either organisational factors or external factors drive the innovation process. We experienced that the companies that have high organisational drivers are very committed during the whole process of innovation. We saw that reporting a food reformulation strategy in the company vision or in official company documents drives the process. These companies are committed to the process and will solve the problems they face during the process. If for example the cost price of the product is increasing, it is often accepted because the companies feel the responsibility to deliver these products.

Companies can also start food reformulation because of external pressures. These can be direct needs from the market, like consumer demand for healthy products or competition. This stimulates the company as any other market need, like a demand for a new flavour. However, governmental agreements and retailer pressure can also drive food reformulation. With the external drivers we see more difficulties with solving the barriers in the process. An example where companies struggle with is an increased cost price and therefore a decreased profit margin on the product.

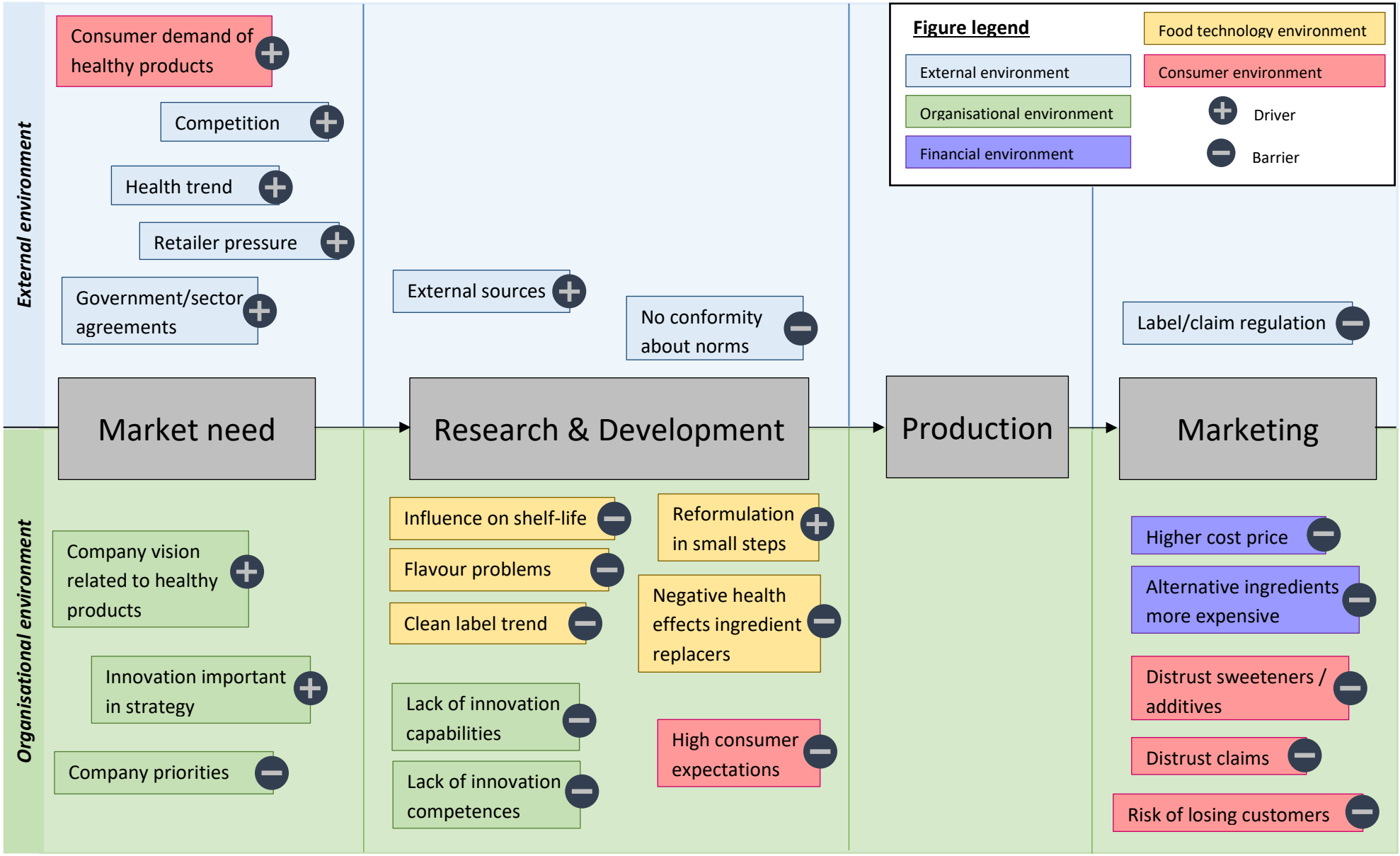

Figure 11 Drivers and barriers of food reformulation showed in the different phases of the demand-pull innovation process

Governmental agreements can drive companies to start food reformulation. However, the Dutch Agreement on improved product composition showed disappointing results. In the shed of this study we can suggest a possible explanation. As we see in our framework this government stimulation is happening in the beginning of the process. The Dutch agreement can be the reason companies start reformulating. However, during the process they have to overcome multiple barriers and in this phase they are on their own. The lacking responsibility might play a role here, since the companies do not always encounter themselves as responsible for improving the public health. A better support system during the research and development and marketing phase of food reformulation might improve results from a policy like the Dutch Agreement on improved product composition.

7. Conclusions

This final chapter shortly describes the main conclusions of this study. Next, the limitations of the study are discussed and finally we provide some recommendations for further research.

7.1. Main conclusions

This study aimed to add insights to the food reformulation literature by analysing the main drivers and barriers of food reformulation in Dutch food companies. We have compared the drivers and barriers of food innovation in general with the drivers and barriers of food reformulation found in this study. Furthermore, we developed a framework which shows where in the process of innovation the drivers and barriers play a role.

Multiple differences between food innovation literature and our interviews were found. We did not found any financial drivers for food reformulation, whereas in food innovation capturing revenue is an important driver. Other drivers were found to be more important for food reformulation, such as governmental agreements, retailer pressure and a company vision related to healthy products. Within the food technology environment, maintaining flavour was found to be an important barrier, since small changes in flavour might lead to a loss of consumers. This reflects an important characteristic of food reformulation: when reformulating food products, the goal is to satisfy the current consumers of the product by maintaining the flavour, quality and price.

Most of the drivers of food reformulation play a role in the beginning of the innovation process. These drivers can really initiate the food reformulation process, and are found in the external environment and the organisational environment. The companies in this study used an open way to innovate by collaborating with research institutions to gain knowledge and with suppliers of ingredients to work together on reductions. Companies that are strongly driven by organisational factors are highly committed during the process and they make sure that all barriers are tackled.

Most of the food reformulation barriers play a role during the development and marketing phase of the innovation process. An increased cost price, difficulties in maintaining quality and flavour of the food product and consumer distrust in reformulated food products are barriers that companies face.

Government policies such as the Dutch agreement on improved product composition stimulate food reformulation in the food industry, mainly at the beginning of the innovation process. However, companies face multiple barriers in the development of reformulated products and in this phase engagement of the government is lacking. More guidance and support might help to increase the success rate of the agreement.

7.2. Limitations

This study has a couple of limitations which might have affected the results. We will discuss limitations related to the research method, the study sample, and the generalizability of the study.

First of all, using interviews as research method might bias the results. Interviews give the possibility for the interviewees to give socially desirable answers. The knowledge of the interviewer can influence the conversation with the interviewee. By using the open character of the questions, we tried to let the interviewees talk most and to not steer towards certain answers. Next, the analysis of the interview data is performed by the researcher. These interpretations are subjective and dependent on the researcher. This can bias the results of this study.

Next, we have interviewed eleven companies. Due to the time restraints of this study, we were not able to include more companies. The specific set of companies we interviewed determined the results of this study. It might be possible that a different set of companies would have led to other results. However, we did make sure that there was a good distribution in company sizes and sectors. A larger sample size would strengthen the results and would also allow to examine differences in drivers and barriers between sectors or company sizes.

Finally, we performed a qualitative study which most often does not allow for a broad generalizability towards a bigger sample size. With the eleven companies we interviewed within different sectors, we cannot directly apply our results on the Dutch food industry as a whole. However, the findings we have presented match with the exploratory character of this study and can form the basis for further research into this topic.

7.3. Recommendations for further research

We performed an exploratory study into the drivers and barriers of food reformulation in Dutch food companies. As we mentioned before, eleven companies were interviewed for this study. We recommend further research into the drivers and barriers we found. This could be done by expanding the amount of companies to be interviewed, or by testing the current drivers and barriers with a qualitative research design in a large set of companies. In both cases, when the sample size is larger, differences in drivers and barriers between company sizes or industry sectors can be tested. This will allow policymakers to adjust policy or support programs to different type of companies.

We noticed that within companies still a lot is unknown about the marketing part of the food reformulation process. The question companies have is how they should communicate the reformulation of the products to the consumers. As we found out, some companies do not communicate anything on the changed products, while others mention for example ‘improved recipe’ on the product. Further research could investigate which type of communication works best for food reformulation and thereby support companies with the marketing of reformulated food products.

We studied food reformulation only from the perspective of the food companies. However, we acknowledge that the food companies are only one of the actors in the whole process of food reformulation and more general, in the societal need for healthier food products. As also indicated by some companies, it is not always clear who is responsible for the public health in this case. The Dutch policy on food reformulation is a self-regulating policy in which companies are made responsible for the reduction of salt, sugar and fat. Further research could examine food reformulation policies, or the Dutch reformulation policy in particular, and find out what determines the success or failure of the policy.

Finally, the consumer perspective on the need of healthier products could be studied. With food reformulation, healthier products are imposed on consumers. However, consumers can also contribute to a healthier lifestyle by making healthier food choices themselves. Activities like food education on schools or nutritional information on food packages could be studied to find out if such programs can increase the public health together with a food reformulation policy.

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Appendix A Interview Topic List

1. Background information
   - Age of the company
   - Yearly revenue
   - Amount of employees
   - Family-owned/corporate

2. Description of case
   - Type of innovations
   - Motivation for food reformulation
   - Innovation process (stage-gate/trial & error)
   - In-house/outsourcing (knowledge, production, materials)

3. External environment: Drivers & Barriers
   - Dutch agreement on improved product composition
   - Retailer's pressure / communication
   - Competition within sector
   - Governmental legislation / regulations and standards
   - Need for external sources
   - Open innovation

4. Organisational environment: Drivers & Barriers
   - Research & development activities
   - Market orientation
   - Cooperation of R&D and marketing
   - Innovation capabilities:
     - Teamwork and communication
     - Skilled personnel
     - Internal stimulation of innovation – incentives & rewards
     - Knowledge acquired about process
     - Internal resistance to change / innovation potential
     - Patenting/licensing
   - Innovation strategy:
     - Using KPI
     - sequential approach
     - Innovation guidelines

5. Financial environment: Drivers & Barriers
   - Financial need for innovation / capturing revenue
   - Shortage of financial resources
   - Costs of innovation: high/hard to estimate/uncertain

- Financial risk

6. Food technology environment: Drivers & Barriers
    - New technologies/knowledge
    - Food safety & quality
    - Texture/flavour of the product
    - Who is involved in recipe-development
    - Knowledge of technology

7. Consumer environment: Drivers & Barriers
    - Consumer needs for product
    - Knowledge about market and consumers
    - Consumer response/acceptation

8. Additions/suggestions
    - Additions/suggestions from interviewee

Appendix B Privacy Statement

WAGENINGEN UR
For quality of life

Management studies

DATE
December, 2016

STUDENT
Evelyn van der Werf

SUBJECT
Master Thesis Interview

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PRIVACY VERKLARING

TITEL ONDERZOEK:
"Drivers and barriers of healthy food innovation in different sectors of the food industry. Evidence from established Dutch food companies"

Ik ben ervan bewust dat het opnamemateriaal van het interview uitsluitend gebruikt wordt voor de analyse en verslag van het bovengenoemde onderzoek.

Ik doe vrijwillig mee met het onderzoek en heb het recht om mijn deelname aan het interview eerder te beëindigen als ik dat zou willen.

Gegevens en resultaten van het onderzoek zullen vertrouwelijk worden verwerkt in het onderzoek en niet aan derden worden verstrekt. Uw bedrijfsnaam wordt op de volgende manier in het onderzoek gebruikt:

- ☐ Anoniem
- ☐ Bij naam

Naam: _____

Datum: _____

Handtekening: _____