



“The role of open innovation processes in responsible innovation integration for the development of healthier food products”

An exploratory research in the European food industry



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Abstract

The present research focuses on responsible innovation in the European food industry. Nowadays, the food sector has to confront great challenges like non-communicable diseases such as obesity and diabetes type 2. These challenges have created the need of an effective and applicable solution in food industry's practices. A way to accomplish this is the adoption of a more responsible behavior, while developing products. The integration of socio-ethical norms in such processes lies in the concept of responsible innovation that more and more companies want to implement today. However, the industrial application of those, is most of the times inevitable due to the disruptiveness it brings, in current business practices. The integration of responsible innovation in industry's context of innovation is argued to be the most efficient way (Long & Blok, 2017).

The objective of this study was to explore how can open innovation enhance/limit the integration of responsible innovation for the development of healthier products in the European food sector. That was approached through value sensitive design, as it permits values to be a part of the technical design. In this case, of the innovation design and because such a framework, it is argued to be in great alignment with the innovation process, which is the unit of analysis for the present study. A particular emphasis was given on the implementation of responsible innovation in food industry's contexts, through the stakeholder involvement and the adoption of voluntary standards in the form of FOP (Front of Pack) labels. FOP labels represent the objective standards that could easily introduce societal values in the development of food products. Furthermore, this thesis concerned companies that adopt an open innovation process model. The process model was operationalized looking at the activities that it entails, which are divided in two categories: technology exploration and technology exploitation.

A qualitative research was executed to accomplish the current project. The selected research strategies were a desk research at first sight, in order to acquire the appropriate background of the concepts that were used, followed by a case study design, to gain a full insight and proceed to an in-depth exploration of those in the food industry. Additionally, semi-structured interviews among innovation and product development managers/directors of the participating food firms were the main source of data collection.

Results show that open innovation has the potential to assist in the integration of societal values like human health and well-being. Thus, to open innovation can enhance responsible innovation for the development of healthier food products, through its technology exploration activities and particularly, through customer involvement and external networking. However, it can also impose several limitations concerning conflicting values among the different types of stakeholders that are involved and the time load that arises because of those activities. Furthermore, it is possible that the way the companies practice open innovation, can impose limitations, in the potential that this concept holds. For instance, as far as it concerns the tackling of certain

shortcomings that the mechanism of FOP labelling systems have, like transparency and trustworthiness issues. This is because in such practice the stakeholder involvement is very limited. Hence, the question that arises is if FOP labelling systems act as mechanisms or if they can represent useful inputs of responsible innovation integration in the food industrial contexts.

Preface

This thesis is written as a part of the Master Food Technology in the specialization of Food Innovation and Management at Wageningen University. It was under the supervision of the Management studies department in Wageningen University.

There are many people that I would like to thank for their contribution in completing this important research. First of all, I would like to thank Mr. Vincent Blok, Associate Professor at the Management Studies Group at Wageningen University. With his constructive feedback and passion for the subject, I accomplished to finish a research in a domain that I was not familiar before. Secondly, I am really grateful to Ms. Edurne Iñigo, Postdoctoral researcher in Management studies at Wageningen University. With her continuous assistance and feedback I was able to finish this research paper and she also helped me improve my research, writing skills and presentation skills.

Furthermore, I would like to thank Ms. Jilde Garst, Mr. Thomas Long and Mr. Léon Jansen for giving me the opportunity to cooperate with them and being willing and always available to help me whenever I had an emerging question regarding the research project.

I hope you will enjoy reading this report on the emerging concept of responsible innovation in the food industry.

Wageningen

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Summary

Non-communicable diseases, like obesity and diabetes are in a constant increase nowadays. Food industry is a highly connected sector to confront those grand challenges. An emerging and quite unexplored way to accomplish this, in the food industry practices is the adoption of a more responsible behavior, while developing products. The integration of socio-ethical norms in such processes lies in the concept of responsible innovation that more and more companies want to implement today. *“Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)”* (p.19 Von Schomberg 2013).

However, the industrial application of those is most of the times inevitable due to the disruptiveness they bring in the current business practices. The integration of responsible innovation in industry's context of innovation, it is argued to be the most efficient way (Long & Blok, 2017).

The objective of the present study was to explore how can open innovation enhance/limit the integration of responsible innovation for the development of healthier products in the European food sector. That was approached through value sensitive design as it permits values to be a part of the technical design. In this case of the innovation design and because such a framework, it is argued to be in great alignment with the innovation process which is the unit of analysis for the present study. A particular emphasis was given on the implementation of responsible innovation in food industry's contexts, through the stakeholder involvement and the adoption of voluntary standards in the form of FOP labels. FOP labels represent the objective standards that can easily introduce societal values in the development of food products. Furthermore, as this thesis concerned companies that adopt an open innovation process model that was operationalized looking at the activities that it entails, which are divided in two categories: technology exploration and technology exploitation.

A qualitative research was executed to accomplish this thesis project. The selected research strategies were: a desk research at first sight, in order to acquire the appropriate background of the concepts that were used, followed by a case study design, to gain a full insight and proceed to an in-depth exploration of those in the food industry. Semi-structured interviews among innovation and product development managers/directors of the participating food firms that belong to the European food sector were the main source of data collection for this study.

Results show that the participating companies understand and they are willing to tackle the grand challenges that they face nowadays through their product innovations. These companies have already adopted several

practices to integrate the values of human health and well-being in their processes in order to develop healthier and more responsible food products. However, it should be stated that the practice of FOP labels in the form of voluntary standards that could lead in more responsible innovations□ is not the case from an industrial perspective. This is due to the fact that FOP labels could lead to less attractive final products. In addition, stakeholders' involvement is very limited to a regulatory form, while practicing those systems. Consequently, FOP labels, looking at the sample companies of this study do not represent a means of responsible innovation implementation in the food industry.

Looking at the current innovation processes of the selected firms, it was observed that the model of open innovation has the potential to assist in the integration of societal values. Moreover, it can enhance responsible innovation integration in current industry's practices, through its technology exploration activities and particularly through customer involvement and external networking. All companies recognized the importance of stakeholder involvement for the development of products that serve the notions of human health and well-being. Stakeholders help them to better anticipate and confront several problems that arise during the innovation processes. However, it should be noted that their interactions concern mostly technicalities and marketing strategies rather than analysis of the ethical issues that a product innovation could bring.

in parallel, it was found that open innovation limits also societal values inclusion, as different types of indirect stakeholders like governmental agencies, universities/ knowledge institutions have different objectives and goals from the companies and the direct stakeholders, like suppliers, retailers/customers and companies, which belong in the food industry. These actors of the innovation process are more into commercially-driven innovations. Furthermore, the fact that nowadays companies seek for minimization of their innovation cycles, is also a reason why they are not willing to spend much time on discussions with other parties, which are in favor of socio-ethical innovations.

To conclude, all researched companies agreed that a coherent system has to be developed in the contexts of the food industry, regarding nutritional and health issues of food products. The companies agreed that this system could assist them in a better confrontation of the grand challenges that have to be faced presently, the non-communicable diseases.

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1. Problem definition

Non-communicable diseases (NCDs) such as obesity and diabetes type 2 are responsible for the death of 40 million people per year around the globe, according to the World Health Organization (WHO, 2009). Following an unhealthy diet is the main reason for these phenomena. A highly connected sector to lessen those issues is the food industry.

A way for food businesses to confront those issues has been found in their innovation processes. This could be achieved by embedding societal values□ like human health and well-being that are mostly related in the scope of tackling non-communicable diseases, in the design of their innovation processes (Burdick, 2014). Until the recent decades, the main concerns in such companies were cost reduction and profit boost. Nevertheless, nowadays, a more transparent and accountable food sector is required to tackle such health challenges as well. In this context, responsible innovation adoption via industry's practices could be an approach to deal with those phenomena (Burdick, 2014). This is because : *"Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)"* (p.19 Von Schomberg 2013)

Von Schomberg (2013) stated that the adoption of definitions and standards is of high importance as far as it concerns responsible development. Furthermore, according to him, the use of standards' not in a forced but in a voluntary manner, could be a mechanism for responsible innovation implementation, only if they reflect ethical considerations (Von Schomberg, 2013). Coming to the context of the food industry, one of the most popular tactics that follows today to tackle one of its greatest social challenges, the provision of healthier food, is front of pack labelling (FOP). According to WHO, food labelling is a global strategy on health, diet and physical activity (Kleef & Dagevos, 2015). Sharma et al. (2010) argued that self-regulation tactics, like food labelling, have a voluntary character and they are supposed to be socially responsible practices in the context of consumer's welfare (Sharma, Teret, & Brownell, 2010). As a result, it could be argued that FOP labelling represent an operationalization strategy for the implementation of responsible innovation in the food industry. However, there is a lot of discussion around the transparency and the trustworthiness of this mechanism, which increases the ambiguity to be considered as responsible innovation practices. These shortcomings are related to the way they are developed and if they correspond to the ethical aspects of human health and well-being.

Nevertheless, many studies agree that the way in which companies can apply and practice responsible innovation tactics is still ambiguous for several reasons, like compatibility with their business strategies and

difficulties in stakeholder management (Blok, Hoffmans, & Wubben, 2015; B. Koops, Oosterlaken, Romijn, & Jeroen, 2015; Long & Blok, 2017; Lubberink, Blok, Ophem, & Omta, 2017). An efficient and less disruptive approach could be trying to integrate responsible innovation in industry's context of open innovation (Long & Blok, 2017).

Linking with the inclusion of stakeholders in the innovation process, more and more food companies shift to open innovation processes. The main objective of those is to include external partners, named as stakeholders, in their innovation processes' to increase their efficiency and enforce their competitive advantage (Ford, Sureka, & Reid, 2012). Continuous interaction with relevant stakeholders and information exchange can contribute in the structuring of successful projects to deal with the grand challenges of today (Bigliardi & Galati, 2013).

Moreover, proactive stakeholder involvement, which is enhanced by open innovation models, could also alleviate the shortcomings that FOP labels hold' those of transparency and trustworthiness. If the guidelines for healthier product development are decided with third-party involvement at an early stage in the innovation process, FOP labels could be an efficient way to meet the demands of responsible innovation 'under the scope of open innovation. In other words, open innovation, which already exists as an industry practice, could enhance this mechanism regarding its appropriateness as a responsible innovation practice.

Research has shown that the already existing model of open innovation could be means of socio-ethical dimensions' integration (Grönlund, Sjödin, & Frishammar, 2010; Long & Blok, 2017). Long and Blok (2017) underlined that open innovation exploratory activities could help the implementation of responsible innovation, when socio-ethical aspects are considered.

Therefore, open innovation appears to be a promising tool to integrate responsible innovation in the food industry context focusing on two mechanisms of responsible innovation integration, according to Von Schomberg. These mechanisms are the multistakeholder engagement and the adoption of voluntary standards in terms of FOP labels. Thus, the aim of this study is to explore how open innovation contributes to responsible innovation integration in the food industry.

2. Objective

The objective of this study is to analyze how open innovation enhances or limits responsible innovation integration for the development of healthier food products in the European food sector.

In the beginning it is explored, what responsible innovation in the food sector is, when it comes to the confrontation of the referred grand challenges. A particular emphasis was given on the implementation of responsible innovation in food industry's contexts, via stakeholder involvement and the adoption of voluntary standards in the form of FOP labels. Then, as open innovation is an already existing industry

process, another aim was to explore its potential to facilitate responsible innovation integration in the food sector. This is executed looking at the opportunities that this model provides, as far as it concerns stakeholder involvement and its potential to face difficulties that arise, regarding the responsible innovation adoption in industry's contexts.

3. Main research question/ sub-research questions

The following main research question can be derived from the objective of this study and the problem definition, which was presented in section 1.

How can open innovation processes enhance/ limit responsible innovation integration, in the European food industry, for the development of healthier food products?

The sub-research questions that follow will assist in answering the main research question. After each question a small explanation is provided regarding the basis on which they have been generated.

SRQ1: *How are responsible innovation processes implemented in the food sector through voluntary standards, « FOP labels »?*

FOP labels have become more and more popular among food companies and their main objective is to help consumers in selecting healthier food products. Moreover, in the form of voluntary standards, they can be a mechanism of responsible innovation implementation in the food industry. However, little is known on how food firms practice this and if it corresponds to the notion of responsible innovation. The answer in this question will help in filling in the knowledge gap regarding the FOP labels as means of RI adoption in the innovation practices of food companies for the development of healthier food products.

SRQ2: *How does openness of innovation processes facilitate the integration of responsible innovation for healthier food products?*

As it was argued in the problem definition section 1, an efficient and less disruptive approach to integrate responsible innovation in industry's context could be through its current innovation processes. Open innovation is the main approach that companies follow nowadays. Thus, the answer to this question aims to figure out how the existing practice of open innovation can facilitate or not the implementation of socio-ethical norms for the development of healthier products in the food industry.

SRQ3: *How can different types of stakeholders contribute at each stage of the responsible innovation processes for the development of healthier food?*

Both, open and responsible innovation, concern many stakeholders, which are more or less active in those processes depending on their contribution. The answer to this question intends to explore how those actors

facilitate the development of healthier food products in a responsible way. Figuring out their actions in stages of the innovation process will enrich this answer.

Therefore, this study aims to further explore the extent at which open innovation can enhance the integration of responsible innovation in the food sector. All the sub-research questions will be answered using the received data from the conducted interviews. This is because, the present study is explorative, which means that little is known in this special field and the final aim is to contribute to the present literature. Reviewing the literature and secondary data will be also used to set the background and facilitate data analysis.

4. Key concepts and definitions

This chapter introduces the definitions of the concepts that will be used throughout this research. Those include: innovation, innovation process open innovation, responsible innovation, voluntary standards, food labelling, FOP labels, stakeholders and stakeholder engagement. Whenever these concepts are used in this research, those explanations will represent their background.

Innovation: “A process that provides added value and a degree of novelty to the organization and its suppliers and customers through the development of new procedures, solutions, products and services as well as new methods of commercialization” (Brem, 2008).

Innovation process: It is a formal scheme of a new product, from idea generation to launch (Dörner, Gurtner, & Schefczyk, 2009; G. Cooper, 2014). It is an activity closely related to the survival and growth of businesses and it involves certain steps such as searching, selecting and implementing in order to realize the initial idea into an economically viable product, service, process or business model.

Open innovation (OI): “A paradigm that assumes firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology”. In other words it is: “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively” (H. Chesbrough, 2015).

Responsible innovation (RI): “Responsible innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products in order to allow a proper embedding of scientific and technological advances in our society” (Von Schomberg, 2013).

Voluntary standards: Voluntary standards include private and public standards and their adoption is not compulsory. Governments, intergovernmental organizations, private companies or consortia, non-governmental organizations or multiple stakeholders are responsible for the creation of those standards. It is

argued that they can positively influence several economic, environmental and societal issues, when adopted (Meybeck & Redfern, 2014).

Food labelling: “Any written, printed or graphic matter that is present on the label, accompanies the food, or is displayed near the food, including that for the purpose of promoting its sale or disposal” (Hawkes, 2004).

Front of pack labels (FOP): They include labels, logos, symbols, icons, symbols or numeric tables and are found in the front of food package or they are shelf tagged. Their main target is to give the opportunity to consumers to decide, at a glance, for healthier food and beverage products (Kleef & Dagevos, 2015; Lupton et al., 2010).

Stakeholders: “ Any group or individual who is affected by or can affect the achievement of an organization’s objectives” (Freeman & McVea, 2001).

Stakeholder engagement: “Practices that an organization undertakes to involve stakeholders in organizational activities in a positive way” (Greenwood, 2007).

5. Literature review

The aim of this section is to present the concepts used to answer the research questions. The following sub-sections start with an introduction to the concept of innovation, section 5.1. Then, in section 5.2, open innovation is discussed, as it represents one of the most important models that will be used in this study. The existence of open innovation in the food sector is discussed in sub-section 5.2.1, while sub-sections 5.2.2 and 5.2.3 comment on the dimensions of open innovation that will assist in the operationalization of the model in the contexts of this study and in stakeholder involvement respectively. Section 5.3 introduces the concept of responsible innovation, which is the second most important concept of this research. Sub-section 5.3.1 argues on the existence of this model in the food industry. Further, subsection 5.3.2 presents the mechanisms of responsible innovation implementation that exist according to the literature. Sub-section 5.3.3 comments on value sensitive design and its relation with responsible innovation, as this framework will assist in approaching responsible innovation in industry’s contexts. Sub-section 5.3.4 further develops stakeholder involvement in responsible innovation. Section 5.4 concerns the voluntary standards and their adoption as a mechanism of responsible innovation implementation. Sub-sections that follow presents the FOP labels as voluntary standards and some of their shortcomings are also introduced. The last chapter of the literature review ends with an attempt to interconnect the concepts of RI and OI in food industry’s contexts, section 5.5.

5.1 Innovation process

Nowadays, companies seek for new innovation strategies, as they try to minimize their innovation cycles, decrease R&D costs, deal with the depletion of resources and the grand challenges of our days and confront changing consumer behaviors and the unstable business environment (Gassmann & Enkel, 2004; Traitler, Watzke, & Saguy, 2011). The optimization of the innovation processes plays a critical role in the sustainable growth of businesses.

The innovation process can be characterized as a multistage/multiphase process. Each phase is defined by the different tasks and responsibilities of the related actors and the methods that are required for innovation execution. Those phases are interconnected and interdependent (Gerybadze, Hommel, & Thomaschewski, 2010). The current literature provides many innovation process models to describe several issues related to this topic. Those can be distinguished in linear and non-linear models. It is argued that non-linear models are closer to reality. However, they are too complicated, when it comes to further make use of them in order to explore arisen issues in innovation processes like the proactive stakeholders' involvement or the integration of socio-ethical norms (Goodman, Korsunova, & Halme, 2017). As these will be the center of attention for the present study, a simplified version of the innovation process model will be utilized as the unit of analysis. This version will also help in the later step of discussion among the different approaches of the innovation process in the literature. A basic innovation process model includes three steps which are: idea generation/ research, product development and launch/commercialization of the final product as shown in Figure 1. This figure is derived from the steps that Chesbrough, Gassmann and Enkel use for describing open innovation process (H. Chesbrough, 2015; Gassmann & Enkel, 2004).



Figure 1: Simplified innovation process model

The global sustainability spirit that runs today's society is in need of openness and continuous interaction among several actors, when it comes to product development (West, Salter, Vanhaverbeke, & Chesbrough, 2014). Consequently, the concept of open innovation was born which is better explained in the next section.

5.2 Open innovation

The traditional innovation process is characterized as closed, since the ideas and the related to those projects are inserted in a predetermined way in the beginning, from the company's internal processes and then they are left into the market with a certain way. On the other hand, in the open innovation process

(Figure 2), ideas and projects can enter and leave the process in many stages and ways (H. Chesbrough, 2015). thereby, the main difference is that in closed innovation processes there is not any knowledge or idea exchange with the external environment at any point of the process until the final product reaches the market (Huizingh, 2011).

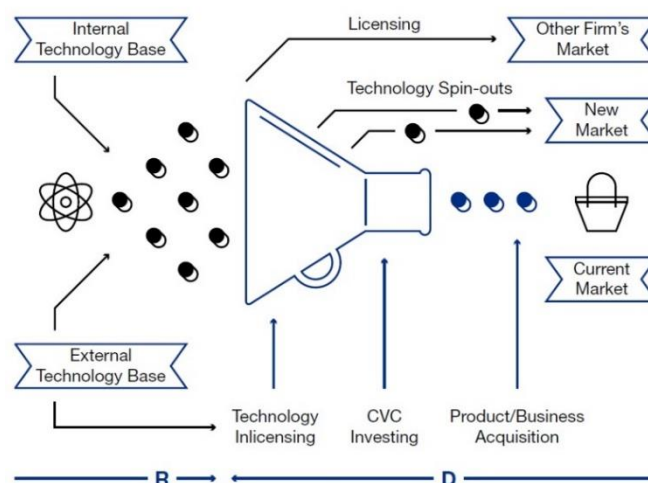


Figure 2: Open Innovation system (H. Chesbrough, 2015)

The next sub-section 5.2.1 comments on open innovation in the food industry, which is the interest of this study. Then, sub-section 5.2.2 comments on the dimensions of open innovation which structure the conceptual framework of this study. The final sub-section 5.2.3 elaborates on stakeholders' involvement in open innovation processes.

5.2.1 Open innovation in food industry

The existing literature regards food industry as traditional, mature, slow-growing, low-tech industry and conservative as far as it concerns the deliverables in the market (Bigliardi & Galati, 2013; Galati, Bigliardi, & Petroni, 2016). However, the grand challenges that run the world today like lifestyle changes, global augmentations and differences in food consumption patterns, society's reactions towards the consequences of food sector's activities for environmental, social and economic issues' have made food industry concerned for different kinds of issues apart from ways to minimize costs and make a profit. Food firms have set priorities that involve customer satisfaction, food safety, health and well-being, nutritious and high-quality food (Bigliardi & Galati, 2013; Galati et al., 2016). As a result, changes in their innovation processes and move to a more open system than the traditional closed one that they used to follow, are of great importance in order to tackle all those challenges, maintain and enforce their competitive advantage (Bigliardi & Galati, 2013).

Research has shown that the innovation pattern that guides food companies is more process oriented and especially related to stakeholder and technology adaptation, rather than radical innovative projects (Dries,

Pascucci, Török, & Tóth, 2014). Sarkar and Costa (2008) made an extensive literature review concerning open innovation in the agri-food sector. They found out that empirical data, which reveal that food companies approach open innovation in a different way than other manufacturing companies and that proxies are used as indicators of the openness of the innovation process. There was also a debate whether food firms change tactics through the innovation process from idea generation until the commercialization phase (Sarkar & Costa, 2008).

Many authors, who have elaborated in open innovation processes in the food industry, underline the importance of firms' relationship with their stakeholders in such processes. Van der Valk and Wynstra (2005) highlighted suppliers' role in product development processes in the Dutch food industry (van der Valk & Wynstra, 2005). Chen et.al (2011) emphasized the need for mutual innovation across the actors of the whole value chain from suppliers and customers to related organizations in order to acquire as much information as possible for a successful result (Chen, Chen, & Vanhaverbeke, 2011). Bigliardi and Galati (2013) presented a list with actors that a food company should cooperate with in open innovation models. Those actors included suppliers, universities, research labs, consultants or innovation's intermediaries, customers and companies from other industries (Bigliardi & Galati, 2013). Nevertheless, this part will be further discussed in the sub-section 5.2.3, which elaborates on open innovation and stakeholder engagement.

5.2.2 Dimensions of Open Innovation

The concept of open innovation as depicted in figure 2, is divided in two dimensions. Those are used for the operationalisation of this thesis. The first is called outside-in or inbound or purposive inflows of knowledge and it concerns practices of leveraging others' developments. For a specific firm's advancement in innovation processes, technical and scientific competences are required. Those could be provided by forming relationships with external organisations and being open to interactions with third parties. The second dimension is called inside-out or outbound or purposive outflows of knowledge. The last one takes place when a firm decides to form relationships with other organisations with a main objective of exploiting innovation opportunities (Chiaroni, Chiesa, & Frattini, 2011).

Each dimension refers to certain open innovation activities. The inside-out dimension, also known as technology exploitation, includes venturing in terms of spin-off and spin-out activities, outward licensing of intellectual property (IP) and involvement of people who are not related with R&D activities in the innovation initiatives. The outside-in dimension, known as technology exploration entails activities such as: customer involvement, external networking, external participation, outsourcing R&D, crowdsourcing and inward licensing of IP (van de Vrande, de Jong, Vanhaverbeke, & de Rochemont, 2009). Table 1 shows explicitly open innovation dimensions and their activities and mechanisms which are derived from van de Vrande (2009) (van de Vrande et al., 2009).

It is argued that these two dimensions are separated and in very limited cases and that they co-exist in an open innovation model of a company. It has been found, though that low-tech, more traditional industries like the food and beverage industry, generally encompass the outside-in dimension in their processes, whereas high-tech industries prefer inside-out open innovation (H. W. Chesbrough & Crowther, 2006; Chiaroni et al., 2011).

Table 1: Open innovation dimensions, description and activities (van de Vrande et al., 2009)

Open Innovation dimensions	Description	Activities/ mechanisms
<p>Outside-in (inbound)</p> <p>“Technology exploration”</p>	<p>Openness in company’s innovation processes through contribution of different kinds of external inputs.</p>	<p>-<u>Customer involvement</u>: provides great information to innovation processes and tools for successful product development.</p> <p>-<u>External networking</u>: it includes everything that concerns connections acquisition and maintenance. It has to do with formal and informal collaborative activities. Hence this new knowledge comes in companies in a rapid way.</p> <p>-<u>External participation</u>: aids the renaissance of abandoned innovations which did not seem promising. At the heart of is R&D outsourcing in order to acquire valuable external knowledge.</p> <p>-<u>Inward licensing of IP</u>: assists in internal research boosting by taking advantage of external innovation opportunities. So, patents licensing, copyrights and trademarks are some of the firms’ tactics.</p>
<p>Inside-out (outbound)</p> <p>“Technology exploitation”</p>	<p>Allows not relevant to company’s business models ideas and assets to reach the external environment in order to be exploited by other organisations.</p>	<p>-<u>Venturing</u>: provides great potential by starting-up a new venture based on internal knowledge and support as far as it concerns finance legal issues etc.</p> <p>-<u>Outward licensing of IP</u>: provides profits to the organisation that out-licences ideas and assets to other firms and the decision is a matter of anticipated revenues.</p> <p>- <u>Involvement of people who are not related with R&D activities in the innovation initiatives</u>: endorses the view of innovation, provides flourishing and inspiring suggestions and ideas to innovation processes.</p>

The main scope of open innovation is to include external partners - stakeholders - in their innovation processes, in order to make the innovation process more effective (Ford et al., 2012). Many authors argue that an organization's performance has a great potential to be increased, when their stakeholders' interests are well- managed (Ayuso, Ángel Rodríguez, & Enric Ricart, 2006). This could be approached in industry's contexts by open innovation processes, allowing this continuous and proactive interaction among the concerned actors (Gould, 2012).

5.2.3 Stakeholders and open innovation

Companies in every industry do not stand alone, they depend on different actors, in many different ways (Bremmers, Omta, Kemp, & Haverkamp, 2007). They are the key to achieve several objectives. Firms have many stakeholders and of different kind. Suppliers, employees and customers are internal stakeholders, while governments and NGO's are external (Blok et al., 2015). The challenge that they experience is to identify their stakeholders though (Ayuso et al., 2006). Each group of stakeholder can influence the concerned firm in different ways and levels that have to do with rhetoric, ethics, regulations, formal and market mechanisms (Madsen & Ulhøi, 2001).

It has been found that open innovation and stakeholder engagement are in great alignment, as far as it concerns their organizational processes. That is mainly because in both concepts the central organization aims to an information exchange with the external environment (Gould, 2012). Regarding to the scope of this study, the proposed process model of open innovation including stakeholder engagement, by Gould (2012), will be considered. This model is based on the idea of knowledge exchange, dialogue and relationship building, which are the key elements of this process (Gould, 2012). It could be argued that this reflects the general notion and practices of open innovation processes discussed previously. The advantages of stakeholder engagement are better exploited, when the organization decides to shift from a business centered stakeholder engagement that is more closed to a more open debate. This kind of openness is achieved, when companies clarify their goals and visions so that they can be immediately discussed by both parties (Busco, Frigo, Riccaboni, & Quattrone, 2015). Strong relationships can lead to a great competitive advantage for the organizations followed by a reputation, trust and innovation boost (Rodriguez, Ricart, & Sanchez, 2002). Information and knowledge sharing from both sides, mutual understanding and increased collaboration, are the results of such relationships. Dialogue is important to achieve this, since it provides insight into the desires of both sides and it can lead in win-win situations (Blok et al., 2015).

Companies consider three phases in the innovation process, where stakeholder engagement can occur. It is the initial phase, which includes the idea generation, the middle phase, where product development is appeared and the final phase, which is the commercialization of the innovation. It was found that stakeholders like NGO's are involved in the innovation process but in a strategic level and not in a product level. On the other hand, stakeholders like research institutes and universities can be engaged in the middle

phase under draconian measures (Blok et al., 2015). In general, stakeholder engagement occurs in the very initial steps of the innovation process and in the final phase, as a marketing strategy by the food companies (Blok et al., 2015).

The following table attempts to summarize the results of several studies concerning stakeholders' role, activities, type and the stage, in which they can appear in the innovation process. The first part of the table combines the findings of Agogue et al. (2013), Howell (2006), Goodman et al. (2017), Aarikka-Stenroos et al. (2013) and Thomas (2012) concerning the actors and their roles in the innovation process. As it was argued in those studies limited research has been executed on the specific roles and types of stakeholders in those processes. The second part of the table follows the same structure, while focusing more on sustainability aspects and it is derived by the study of Goodman et al. (2017).

Table 2: Stakeholders' role, activities, type and stage of appearance in the innovation process

PART 1			
Role	Activity	Type of stakeholder	Stage in innovation process
Brokers	<ul style="list-style-type: none"> -Information and knowledge provision scanning, foresight and diagnostics in societal and technical issues (Agogue, Ystrom, & Le Masson, 2013; Goodman et al., 2017; Howells, 2006). -Provide combination/connection of technologies and ideas in different ways for successful product development (Howells, 2006). -Standards setting, testing and evaluation /accreditation (Agogue et al., 2013). -Ensuring work relationships and collaboration between different types of stakeholders (Agogue et al., 2013; Goodman et al., 2017). -Help in commercialisation process for example by building trust and credibility (e.g. through universities), (Aarikka-Stenroos, Sandberg, & Lehtimäki, 2014; Agogue et al., 2013) 	Academia, NGOs	Idea generation, Development Commercialization
Intermediaries / intermediary firms/intermediary agencies	<ul style="list-style-type: none"> -Involves responsibility for technology and knowledge transfer to firms and users (Howells, 2006). -Facilitating the diffusion of new ideas from outside the system (Howells, 2006). -Assisting in solutions adaptation when a problem in innovations arises according to the need of final users (Howells, 2006). -Assisting to orient the science used in innovations according to socio-economic objectives (Howells, 2006). -Crowdsourcing and user involvement, structure and maintenance of innovation systems (Agogue et al., 2013) -All the activities that described in the role of brokers as in the research of Thomas (2012) there is no clear distinction between brokers and intermediaries (E. Thomas, 2012). 	Public and private organisations	Idea generation, development commercialisation
PART 2			

Role	Activity	Type of stakeholder	Stage in innovation process
Stimulator	-Involvement in the call for ideas and initial funding offers.	Public (e.g. public authorities, government)	Idea generation
Initiator	-Contribution in idea generation, initiation and inspiration across the innovation process.	Academia (e.g. universities, research institutions), NGOs	Idea generation
Concept refiner	-Providing feedback and technical knowledge in order to make the final product/service more acceptable and appealing.	Academia, NGOs, end users, private organisations, business	Development
Legitimator	-Providing credibility and trust among firms' innovations.	Academia, NGOs, public, end users,	Development, commercialisation
Educator	-Involvement in public's education on social/environmental issues that are considered in the firms' innovations.	Academia, NGOs, private organisations, public	Commercialization
Context enabler	-Enabling alterations in infrastructure policies and regulations to facilitate innovation entrance in the market.	Public, private organisations	Development, commercialization
Impact extender	-In sustainability contexts, includes involvement in enhancement of use of the product or service by promoting for example healthier or more sustainable eating.	NGOs, private organisations, public	Idea generation, development, commercialization

Concluding, this section aims to answer the main research question at first sight, by answering sub-research questions 2 and 3. The following section introduces the emerging concept of responsible innovation.

5.3 Responsible Innovation

The point at which science and innovation meet and espouse social norms is when the concept of responsible innovation is born. Despite the fact that terms such as 'responsible innovation' or 'responsible research innovation' date back more than a decade, only in the recent years they have acquired great recognition among the European Union and specifically through a policy context through the European Framework Programme for Research and Innovation "Horizon 2020" (Owen, Macnaghten, & Stilgoe, 2012; Von Schomberg, 2013).

The inclusion of ethics in the concept of responsible innovation gives a new approach to innovation in general. In such a notion, there is a balance among socio-cultural, economic and environmental aspects (B. J. Koops, Oosterlaken, Romijn, Swierstra, & van den Hoven, 2015). However, there is still much discussion on how to balance those aspects and how to integrate responsibility in innovation processes as the frameworks for this concept are developing on a continuous basis (Long & Blok, 2017).

Conducting research and innovation in response to societal needs depends on certain capacities, which are well-described by the developed dimensions of responsible innovation. Consequently, a proposed framework, which concerns those dimensions was derived by Stilgoe et al. (2013) and calls for continuous commitment of innovators to be anticipatory, reflective, deliberative and responsive. It is argued that those dimensions can be extremely helpful to governance (Stilgoe, Owen, & Macnaghten, 2013). The four dimensions that have been generated in this framework are: anticipation, reflexivity, inclusion and responsiveness. However, these dimensions do not provide simple guidelines that can be followed by companies and lead to successful integration of responsible innovation. These four dimensions reflect the complexity of this notion, when it comes to industry's contexts and the difficulties that arise, when it comes to its application, as they are well- studied in an academic and not in an industry context. It was evident that various actors and institutions are required, while addressing responsible innovation (Blok et al., 2015; B. J. Koops et al., 2015; Owen et al., 2012; Stilgoe et al., 2013). Managing an ecosystem like responsible innovation that includes many actors where some of them strongly and others loosely connected, is argued as an almost impossible challenge (Owen et al., 2012).

Another way, in which responsible innovation can be managed is through value sensitive design (VSD), as it will be illustrated in a following sub-section. Its relationship with responsible innovation will assist in the operationalization phase of this study. Value sensitive design provides an approach to better confront ambiguities and ethical issues like the ones that this study focuses on, such as human health and well-being, at an early stage in the innovation process. These issues can increase the possibilities on technological applications having positive effects on issues of human health and well-being (Burdick, 2014). The main objectives of VSD are: a) driving technology design and development in a way to better integrate societal values in them and b) promoting the early inclusion of different kinds of stakeholders into the process of technology design and development. Consequently, VSD, it is argued to be a suitable method for the support and promotion of responsible research innovation in industrial contexts (Burdick, 2014; van den Bosch, 2017).

Sub-section 5.3.1 comments on responsible innovation in the food sector. Sub-section 5.3.2 presents the way that responsible innovation will be operationalized in this study, using value sensitive design. Sub-section 5.3.3 elaborates on the existing mechanisms of responsible innovation with a main focus on multi-stakeholder involvement and the adoption of voluntary standards that are the center of attention of this study. Sub-section 5.3.4 argues on stakeholder involvement in responsible innovation.

5.3.1 Responsible innovation in the food sector

Nowadays, societal concerns like food safety and quality have made consumers and public in general, more concerned about their nutrition, and the food industry has tried to adapt to the new grand challenges. As a result, a transparent and accountable food sector is required. In this context, responsible innovation

adoption through industry's practices could be an approach to deal with those phenomena (Burdick, 2014). The attention in many studies is given in stakeholder involvement as the food industry consists of many companies and corporations that are directly or indirectly involved in their processes. Collaboration with all those related actors can lead to a more trustworthy relationship, which reflects responsible innovation's general scope (Blok et al., 2015; Burdick, 2014). However, the adoption of a more responsible behavior by food companies still generates many questions, especially as far as it concerns the practices and the models that they follow to achieve it (Blok et al., 2015; Burdick, 2014; Tempels, Verweij, & Blok, 2017).

Limited research has been done in the food sector concerning issues of responsible innovation and how companies try to approach this notion in their innovation processes. According to Burdick (2014), numerous leaders in the food sector include such practices in their Corporate Social Responsibility programs (Burdick, 2014). Furthermore, this study focuses on the ways that food industry's innovation processes could be fully integrated into the societal values from the early stages of their design (Burdick, 2014). Although, a direction that more and more food companies follow nowadays to tackle the challenges discussed in the introduction, is FOP labelling, which is going to be furtherly discussed in the next sections. The adoption of certain standards, guidelines and definitions is argued to be a fundamental mechanism for responsible development (Von Schomberg, 2013). In this point of view FOP labels in the form of voluntary standards seem very promising for responsible innovation implementation in food industry and this is argued extensively in section 5.4.

5.3.2 Implementation of responsible innovation

Five mechanisms have been identified for the implementation of responsible innovation, according to Von Schomberg (2013). Those are technology assessment and foresight, application of the precautionary principle, normative/ethical principles to design technology, like the creation and adoption of voluntary standards, such as FOP labels in food industry's contexts, innovation governance and stakeholder involvement and public engagement (Von Schomberg, 2013).

Multi-stakeholder involvement in such processes, like actors, who come from civil society, industry and research, is presented as one of the most important methods of innovation governance by many studies (Nathan, 2015; Owen, 2014; Stilgoe et al., 2013; Von Schomberg, 2013). Thus, it is further investigated in section 5.3.4 of this study. Furthermore, the adoption of standards and certifications such as labelling practices, is another promising and thriving method among manufacturers, who want to give a more ethical aspect in their projects and products, underlined by an outstanding legality (Owen et al., 2012). Section 5.4 explains further voluntary standards in responsible innovation. This method becomes more and more popular among food firms in the form of FOP labels, as the domain of interest in this study is the food sector.

5.3.3 Responsible innovation and value sensitive design

Value sensitive design (VSD) was first introduced in the last decade of the twentieth century as an approach of integrating human values like human well-being, human dignity, justice, welfare and human rights, into the design of the technology (Friedman, 1996). *“Value Sensitive Design is a theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process”* (Friedman, Kahn Jr., & Borning, 2006). Value Sensitive Design acts like a means of translation of the world of values and societal needs to the world of materiality. It provides the opportunity to transform the world by design, in order to respect more obligations and responsibilities on a moral level relating to the past. Van den Hoven (2015) argued that VSD is: *“a way of doing ethics at making moral values part of technological design, research and development”*. The meaning of the word value in such a framework concerns intangible things that an individual considers as important in life. Values in this context rely on the interests and desires of human beings within a culture (van den Hoven, 2015).

VSD is mainly practiced in Research and Development (R&D) environments like the one that this study focuses on, the development of healthier food products (Friedman et al., 2006). It is also relevant to all the innovations and the design of new technologies and technological artefacts, as its aim is to incorporate in them relevant public values by providing tangible solutions, when it comes to design changes and adjustments (Taebi, Correljé, Cuppen, Dignum, & Pesch, 2014; van den Hoven, 2015). Hence, if responsible innovation is aimed, public values like human health and well-being that are referred in this study, need to be integrated during the design process, which is the development of healthier food products in this case (Taebi et al., 2014).

In parallel, responsible innovation as a research strategy, provides great potential for projects to conduct and further develop VSD by better explaining concepts and methodologies. There is a consequential linkage between responsible research innovation and VSD, as the second can support the first by providing a concrete methodology to assess societal values, needs and expectations, in order to integrate the desired values into technologies (Simon, 2016). VSD is a way to actually operationalize social values, within an ethical design process. It could provide a methodological stance that can assist to bridge the gap between responsibility and design in the food sector that concerns this study. It could be stated that VSD is the means of transport of responsible innovation in industry's practices. The main issue that makes VSD more suitable as a framework to approach responsible innovation is the fact that it is in great alignment with the innovation process, which is the unit of analysis of this research. Looking at responsible innovation and its operationalization in industrial contexts, it is difficult to apply its dimensions as such, in the current industry practices, as this concept has been mostly explored in academic contexts. So, in terms of this thesis, responsible innovation's considerations will be used as requirements for investigating how can the design

and the development of food products better serve the needs of human health and well-being (van den Hoven, 2015).

Application of VSD framework to approach responsible innovation

The aim of VSD is to systematically incorporate diverse human values in the design of new technologies. Nonetheless, this is challenging, since in order to achieve a successful application of such a framework, the values of all relevant stakeholders have to be incorporated into the design process. Nevertheless, this can automatically lead to many controversies. Subsequently, ethically acceptable projects emerge only when a plurality of stakeholders' values are considered, which can alleviate potential conflicts among them (Aad Correljé, Eefje Cuppen, Marloes Dignum, 2014; Taebi et al., 2014).

The values for the design of the processes cannot be taken for granted or being fully specified *ex ante*. This situation is evolving in a way that emerging values can appear during the design of a particular project due to the interaction between different kinds of stakeholders. This is always an issue, when it comes to innovation and development processes. However, there is not a method that could be followed in order to capture all the possible emerging values in such processes, as it is an ongoing situation (Taebi et al., 2014). Linking to the above, the key feature of VSD is stakeholders' interaction. Its main purpose is to connect people, who are responsible for the design of a process with people who think about and understand the values of the stakeholders that are affected by the systems (van den Hoven, 2015).

In the contexts of this thesis, VSD framework will be used as an approach to tackle today's grand challenges, the non-communicable diseases (e.g. obesity, diabetes type 2). Those issues could be confronted, if the societal values of human health and well-being are incorporated in the design of the food companies' innovation processes, resulting in the development of healthier food products. By doing so, ethical issues could be addressed in the different steps of the innovation processes. Although, it is expected that different values will emerge during the analysis of the results, human health and well-being represent the starting points in this research, regarding the scope of the study. Furthermore, the general objective of this research will be enforced by using VSD as the key feature of this framework is stakeholders' involvement. The relationships among them could be enhanced through VSD application, since it provides a baseline for mutual respect of their missions, visions and goals which could lead to high awareness of access to healthier food choices for society.

5.3.4 Stakeholder engagement in responsible innovation

Limited research has been executed, concerning stakeholder engagement in responsible innovation. Berg (2017) stated that a broad range of non-economic stakeholders is needed to be engaged by companies, which want to assure the responsible character of their products (Berg, 2017). Research has shown that stakeholder involvement is fundamental, when businesses aim to incorporate social and environmental

aspects in their innovation processes, in order to deal with the grand challenges of nowadays. Blok et al. (2015) stated four features of stakeholder engagement in responsible innovation that were developed by the four dimensions of responsible innovation. Those are: transparency, interaction, responsiveness and co-responsibility. Transparency is achieved when there is an information and knowledge exchange. Interaction between parties, is another feature, which is about to construct the same objectives for the innovation process. It is argued to be a dynamic process, in which commitment is fundamental to deal with the complexity of the grand challenges of today and fill the gaps between the different interests. Responsiveness among societal actors and innovators is about innovating with society. It is about letting them efficiently direct the innovation process. Co-responsibility, the last feature, is about sharing the innovation risks and being mutual responsive to each other (Blok et al., 2015).

In the research of Blok et al. (2015), it was also mentioned that open innovation model can help in the embedment of responsible innovation dimensions in a company's practices (Blok et al., 2015). This lies in this study's fields as well.

To sum up, this section introduced the concept of responsible innovation and the main themes that this study will focus on regarding it; stakeholder involvement and voluntary standards' adoption through FOP labels. Moreover, the suitability of VSD framework was presented, as an approach to responsible innovation integration in industry's contexts, as it is more related to the innovation process, which is the unit of analysis in this study. Furthermore, background information for answering the second and the third sub-research-questions, was provided.

The next section comments on voluntary standards and their adoption as a responsible innovation practice. In the contexts of the food industry those are represented by FOP labels. FOP labelling is a very popular practice among food firms and it could also serve many advantages in responsible innovation implementation. However, this mechanism holds some reservations. Although, it is argued that through active stakeholder involvement in open innovation processes could give solutions to those. The following section explicates better this concept.

5.4 Voluntary standards adoption as a responsible innovation practice

Von Schomberg (2013) observes that the adoption of standards, definitions, certifications and other self-regulation measures are fundamental requirements for responsible development. They represent a new form of governance. Although they need to be further developed, they have a great potential for the future', when the massive production of new products will make the situation unmanageable, for governments and related agencies. It is also underlined that they should integrate ethical considerations and not just technicalities. Furthermore, it is suggested that the proactive involvement of third parties for verifications

and certifications of those procedures is thought to be of great importance, in order to overcome issues of transparency and trustworthiness that might be present (Von Schomberg, 2013).

Voluntary standards include private and public standards and their adoption is not compulsory. Governments, intergovernmental organizations, private companies or consortia, non-governmental organizations or multiple stakeholders are responsible for the creation of those standards. It is argued that they can positively influence several economic, environmental and societal issues, when adopted (Meybeck & Redfern, 2014).

Voluntary standards for sustainability have been already studied in the literature, as responsible innovation is an emerging concept, especially in the food industry which is still under research. Those standards take into consideration elements that are meant to preserve natural resources and they include producers, while they are developed and adopted, which leads to social and economic sustainability. Voluntary standards are usually perceived as means to make consumption and production more sustainable, as they have the ability to deliver positive economic, environmental or social impacts. A condition that makes those standards successful is the consideration of the objectives of all the related actors (Meybeck & Redfern, 2014). This comes in great alignment with the framework that the present thesis uses to approach responsible innovation in the food industry, the VSD. It is argued that these kind of standards, in the form of FOP labels, in the food industry could represent objective considerations, which could lead to the development of healthier food products. The use of front pack labels as voluntary standards is further explained in the coming section 5.4.1.

5.4.1 Front of pack labels

As mentioned in the introduction, non-communicable diseases (NCDs) like obesity and diabetes type 2 are responsible for the death of 40 million people per year around the globe, according to the World Health Organization (WHO, 2009). Therefore, there is an increased emphasis in health and wellness promotion globally. Hence, numerous strategies have emerged for ameliorating consumers' food choices and behaviors. A promising method among the actors of the food industry is food labelling.

In general, FOP labels help the consumers in the decision moment to better understand the quality of the product and choose the healthier one (Julia & Hercberg, 2016). Secondly, FOP labels urge food companies to reformulate or develop more nutritious products, which will be allowed to carry the nutrition label. Thirdly, they encourage governments to influence public health in a simple and voluntary way between producers and consumers (Kleef & Dagevos, 2015). It could be argued then that they represent normative/ethical principles to develop healthier food products in the context of responsible innovation as discussed before. However, they hold several shortcomings, which are discussed in paragraph 5.4.2.

5.4.2 Front of pack labels as voluntary standards and Responsible Innovation

FOP labels could represent a kind of innovation governance for responsible innovation in the form of voluntary standards. Sharma et al. (2010) observed that self-regulation tactics like food labelling, have a voluntary character and they are supposed to be socially responsible practices in the context of consumer's welfare (Sharma et al., 2010).

FOP nutrition labelling is not mandatory and each food firm is free to decide whether to adopt such systems or not (FSA, 2013; Hawkes, 2010). Council Directive 90/496/EEC (as amended by Commission Directive 2003/120/EC) states that "nutrition labelling is voluntary until a nutrition claim is made in the labelling, presentation or advertising of a foodstuff" (Hawkes, 2010). However, those systems are based on recognized health and scientific criteria (L'Abbe, McHenry, & Emrich, 2012). In particular, governments around the world find themselves responsible in developing regulations and standards on nutrition labelling (Hawkes, 2010).

Literature findings for the relation between FOP labels and responsible innovation are still very limited, when it comes to real practices. However, in a report from FAO it was underlined the importance of applying a holistic approach concerning voluntary standards in general. For a voluntary standard to succeed, the coordinated effort of production, organization, marketing, certification, finance and institutions is required, as it is impossible for those systems to be independent (Meybeck & Redfern, 2014). FAO also argues that multi-stakeholder involvement from the beginning is crucial for their future success. Written agreements that clarify the responsibility of each stakeholder in the creation and implementation of standards were found to be of great importance. Furthermore, proactive collaboration between value-chain actors enhances the adoption and the compliance with standards (Meybeck & Redfern, 2014).

5.4.3 Front of pack labelling systems and categories

Wartella et al. (2010) distinguished FOP labels into three categories. There are the nutrient-specific systems, where the information is provided in percent daily values (%DV) or guideline daily amounts (%GDA), the existence of traffic colors is possible to indicate the "high", "medium" or "low" amount of certain nutrients. The second category is called summary indicator systems, which are based on the depiction of a particular symbol, score or scheme to indicate the nutritional information of the product. Finally, there are the food group information systems, which are symbols of a certain food groups or ingredients, like whole grains (Wartella, Lichtenstein, & Boon, 2010). Every existing system has its advantages and disadvantages and there is a lot of discussion around them (Koen, Blaauw, & Wentzel-Viljoen, 2016; Vyth, Steenhuis, Roodenburg, Brug, & Seidell, 2010).

Front of pack labels are developed by different actors in the food industry. Food manufacturers choose to design those schemes to support their products. General Mills, Kellogg's, Kraft and PepsiCo are some of the

companies, which proposed their own labelling systems. Non-Governmental Organizations (NGOs) can also create labels concerning the nutritional value of food products. Government agencies, retailers, consortiums of non-industry and industry experts have also developed many different systems. In some of those systems the criteria that are used are publicly available, while in others are not. Nevertheless, most of the times FDA, NAS and EC regulations are the basis for the criteria creation of those labels (Wartella et al., 2010).

5.4.5 Implications of front of pack labels

WHO states that strategies for substantial reduction of deaths and diseases caused by unhealthy diets and minimum physical activities could be achieved when major stakeholders are included, worldwide (WHO, 2009). Those stakeholders should come from both private and public sector. Coordinated efforts from health ministries, government institutions responsible for food policies, industry, commerce, media or finance could lead in a holistic approach of the problem which will end in successful solutions. Close monitoring and evaluation are needed for the constant effectiveness of those strategies (WHO, 2009). However, there is a lot of discussion concerning those systems among their key stakeholders, as far as it concerns issues of trust, transparency and governmental pressure (Grunert & Wills, 2007; Kleef & Dagevos, 2015).

Opinions on the true motivations of companies to adopt FOP labels are divergent, as some believe that firms do this in the context of self-promotion strategies and others, that they do it because they really feel responsible for consumers' diets (Kleef & Dagevos, 2015). Furthermore, another study focused on the credibility and transparency of those systems. It was argued that credibility and transparency of the labels depends on who is responsible for those (Grunert & Wills, 2007). Trust among consumers is also achieved when the used criteria for a label are publicly available. This is also accomplished when consumers see that they share similar values and interests with the related stakeholders. Industry, in general, is perceived as less trustworthy because of profit motivations that may hide behind the labelling systems that they use (Kleef & Dagevos, 2015).

Concerning credibility, a research revealed that when there is an approval from an international or national organization in health and nutrition area, the adopted food labelling system is characterized by high credibility among the consumers (Feunekes, Gortemaker, Willems, Lion, & van den Kommer, 2008). Good regulation can also reduce possible doubts among consumers (Kleef & Dagevos, 2015). It was also stated that a uniform FOP labelling format among food products, on a European level, is highly challenging for food manufacturers (Feunekes et al., 2008).

Another issue that concerns the transparency and trustworthiness of FOP labelling is related to the food lobby groups. It is widely known that food lobby groups are constituted by food companies, food producers and trade associations, which spend millions every year in lobbying the European Union. All the food lobby groups have a strong interest in policy issues concerning human health and nutrition as well as food labelling

(Ainger & Klein, 2016). There are many of them in the European Union and one of the most famous is the FoodDrinkEurope. Their main goal is to deal with the grand challenges that the food sector faces today, like the one that this study explores, non-communicable diseases, by assisting the food industry, the policy makers and civil society to work together towards this (FoodDrinkEurope, 2017).

Nevertheless, there is a great controversy on how those groups work, when it comes to defend human health and welfare. It is argued that they put profit margins and money in a front run by behaving aggressively, when it comes to mandatory sugar reductions, sugar taxes and food labels that help consumers make healthier choices. Relating to this thesis main concern, the FOP labels, there are many examples, where those food lobby groups tried to avoid certain types of labels. A great example is the traffic labelling system, which was invented in the UK and a similar to this that was generated in France that is called 5-Colour Nutrition Label (5-CNL) by proposing alternatives that, as they supported, take into account different variables as portion size, eating occasion and frequency of consumption. As a result, it is understood that those kind of tactics and strategies possibly show the potential harm to citizens' information, when public health proposals oppose the economic growth of food industry (Julia & Hercberg, 2016).

Linking to the above, a wider and more transparent stakeholder involvement is a crucial part in amelioration of those implications. So, it could be stated that openness of innovation processes could assist to tackle those issues of credibility, transparency and trustworthiness, though, and it will be further discussed in the next section 5.5.

5.5 Interconnection of RI and OI

Food industry has to deal with the several challenges of our days like obesity and similar diseases, which are highly connected with human nutrition. The acquisition of a more responsible behavior in industry's practices is crucial to tackle those phenomena. However, the integration of socio-ethical norms for the development of healthier and more responsible, products for the public is most of the times inevitable, due to particular business strategies. As a result, an efficient way of dealing with those challenges could be, to use the already existing industry practices to accomplish it.

Open innovation processes, which are followed by more and more food companies nowadays, seem to be promising industrial practices, for the development of products that integrate socio-ethical aspects. The fact that the organizational processes of open innovation is in accordance with those of stakeholder engagement as discussed in section 5.2 provides great opportunities for an easier and more efficient responsible innovation adoption in industrial contexts. This kind of relationship is also confirmed in the literature by several studies.

A recent study reveals the relation of open innovation and responsible innovation and how the first can assist the integration of the second in industry's innovation processes. The findings showed that there is an

overlap between the exploratory open innovation activities and the dimensions of responsible innovation. Those activities concerned co-creation, broader engagement of several actors, engagement with peers and industry stakeholders and formalized outsourcing of research and development. They concluded that open innovation activities are very promising in the inclusion of socio-ethical factors without radical changes in innovation practices (Long & Blok, 2017). Furthermore, the fact that open innovation could represent a promising toolkit that can accelerate responsible innovation adoption in industrial contexts, was presented by van de Poel et al. (2017) (van de Poel et al., 2017). This is in line with the paper of Dreyer et al. (2017). In this study, it was also highlighted, the importance of coordinated efforts of academia, industry and public bodies, which could guide industrial innovation towards better social outcomes (Dreyer et al., 2017). Moreover, Gurzawska et al. (2017) commented on the broader stakeholder inclusion in the innovation process and generally the openness of those processes, as important features, when it comes to practice responsible innovation in industrial contexts (Gurzawska, Mäkinen, & Brey, 2017).

Linking to the exploratory nature of this thesis, its objective follows the same rationale as it is aimed to figure out how can open innovation enhance or limit responsible innovation integration for the development of healthier food products. Subsequently, regarding the opportunities that open innovation has as an already existing industry model; it will be presented how it can help to tackle the difficulties that arise, when it comes to adopt responsible innovation in industry practices. As the unit of analysis is the innovation process in the food industry, VSD is selected to approach responsible innovation. This framework, as it was discussed in the previous sections comes in great alignment with the innovation processes of the food industry, so it is believed to be a really promising means to transform the world of social values into the world of technicalities with a less disruptive way. Furthermore, this framework will assist in the analysis of the voluntary standards in the form of FOP labels in food industry's contexts as they represent a mechanism of responsible innovation adoption, which becomes more and more popular over the years and companies use those systems a lot. It will also be argued the importance of stakeholder involvement in those systems in the contexts of open innovation processes that are followed by the companies.

The next section comments the conceptual framework of the study. There is a schematic representation of the concepts that are used in order to reach the general objective of this thesis.

6. Conceptual framework

The following figure shows the conceptual framework of this study. It is created after reviewing the literature in the major concepts in which this thesis will focus. The aim of this framework is to highlight the critical concepts that need to be applied for the operationalization of this empirical study in order to answer the main research question. As the main source of information will be the conducted interviews among product development and innovation managers or directors of selected food companies, the presented

framework will be the baseline for this, in terms of constructing the interview questions and further analyzing and discussing the results.

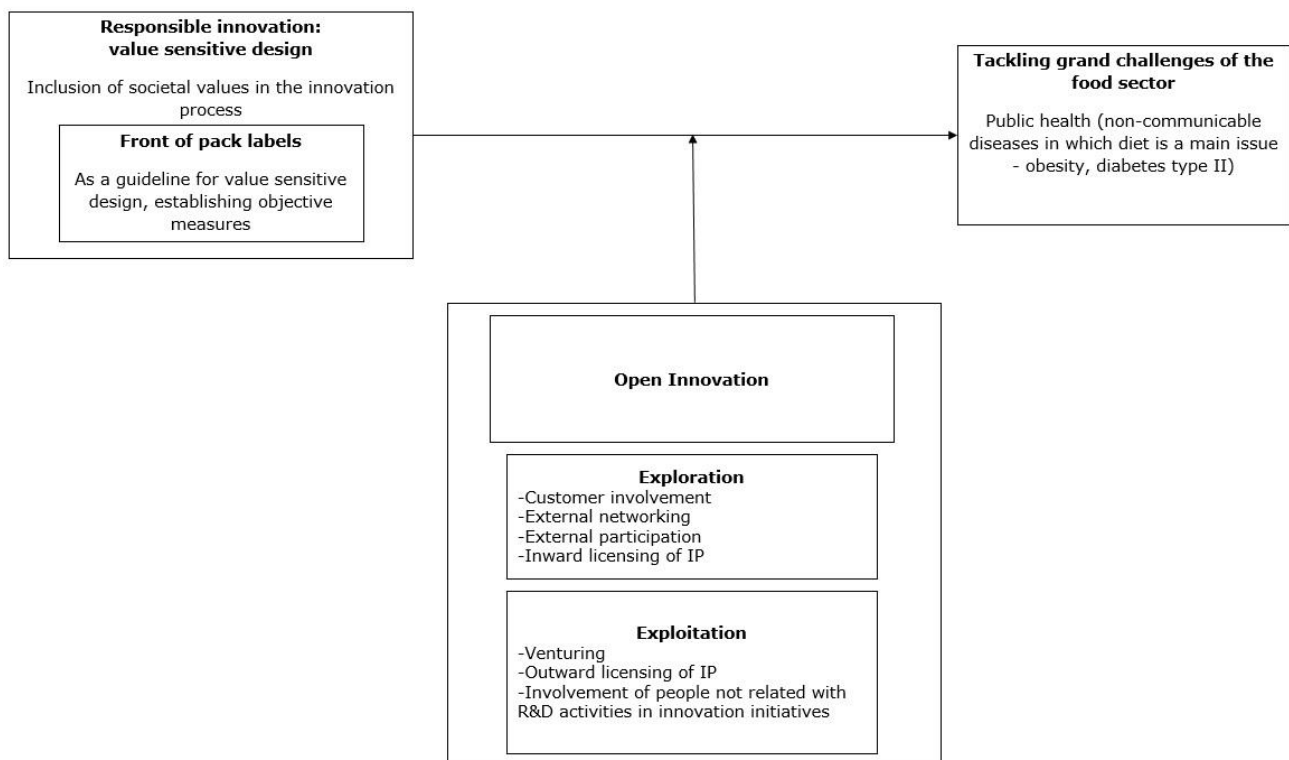


Figure 3: The conceptual framework of the study

The rationale behind is that the grand challenges that the food sector has to deal with nowadays, could be tackled by responsible innovation processes as those phenomena represent a form of input for them (B. Koops et al., 2015; Von Schomberg, 2013). The concept of responsible innovation will be operationalized through value sensitive design as it permits values to be a part of the technical design and in this case of the innovation design. The main values that this thesis concerns are human health and well-being. FOP labels represent the objective standards that can easily introduce these societal values in the design. Nonetheless, responsible innovation practice in industrial contexts is not explored so it is still ambiguous, despite that firms want to implement such processes. The disruptiveness that it creates among business strategies makes its integration inevitable most of the times.

It is argued that open innovation as an industry practice which is adopted by more and more food firms these days provide great opportunities through knowledge and idea exchange throughout the innovation process. This is done by the proactive involvement of stakeholders in their processes. Linking to this, it could be indicated that such an industry model could tackle RI integration implications and extending this FOP labels shortcomings. Open innovation will be operationalized looking at the activities that it entails, which are divided in two categories: technology exploration and technology exploitation. As a result, this study

aims to explore how open innovation contributes to responsible innovation integration in the food industry for the development of healthier products.

7. Research design

In this part, it will be presented the way that this research was executed. In other words, the strategies and methods that were followed in order to answer the research questions in a reasonable life-span, are explained (Verschuren & Doorewaard, 2010).

A qualitative research was executed to accomplish this thesis project as the main objective was to explore and discover how open innovation enhances/limits responsible innovation for the development of healthier food products in the European food sector. An inductive approach characterized this study. This is because the findings led to identifying some patterns among the concepts that were used, and it was possible to draw some generalizations over them (Kothari, Kumar, & Uusitalo, 2014).

7.1 Research strategies

7.1.1 Desk research

Desk research strategy was selected for this study, as in the initial steps the use of empirical data like articles, books and scientific articles coming from different authors helped to create the basis for this research's future (Verschuren & Doorewaard, 2010). Those were particularly provided by searching the literature using world's largest databases like Scopus and Web of Science. As desk research contains two variants' literature survey and secondary research, literature survey conducted in a qualitative way was thought to be the ideal for this project. The literature review that was conducted concerned the major concepts of the study, ' which are responsible innovation and value sensitive design, open innovation and stakeholder's engagement; those also guided the construction of the conceptual framework.

7.1.2 Case studies

As the main objective of this study was to analyze how open innovation enhances or limits responsible innovation for the development of healthier food products in the European food sector, a case study design was thought to be the ideal research strategy. After an extensive desk research and literature review in the concepts of open innovation and responsible innovation, the aim was to gain a full insight and proceed to an in-depth exploration of those in the food industry. Even though responsible innovation is an emerging concept, which becomes more and more popular among food firms, it still remains quite unexplored how those can implement such concepts in their current practices. As a result, further knowledge is required and a case study design helped to form a basis for an inductive theory development approach (Eisenhardt, 2007; Kothari et al., 2014; Verschuren & Doorewaard, 2010).

A multiple case study approach was selected. This led to a more robust and compelling research (Yin, 2003). The several units of analysis are represented by the food companies that were used. The target number of cases was eight. However, seven cases constituted the sample of this research. The cases from the food firms aimed to provide replications, contrasts and extensions to the emerging theory that concerned this study (Eisenhardt, 2007). Figure 4 shows the research design of this study in four sections including the selected research strategies represented by the first two sections. The final section depicts the main objective of this thesis.

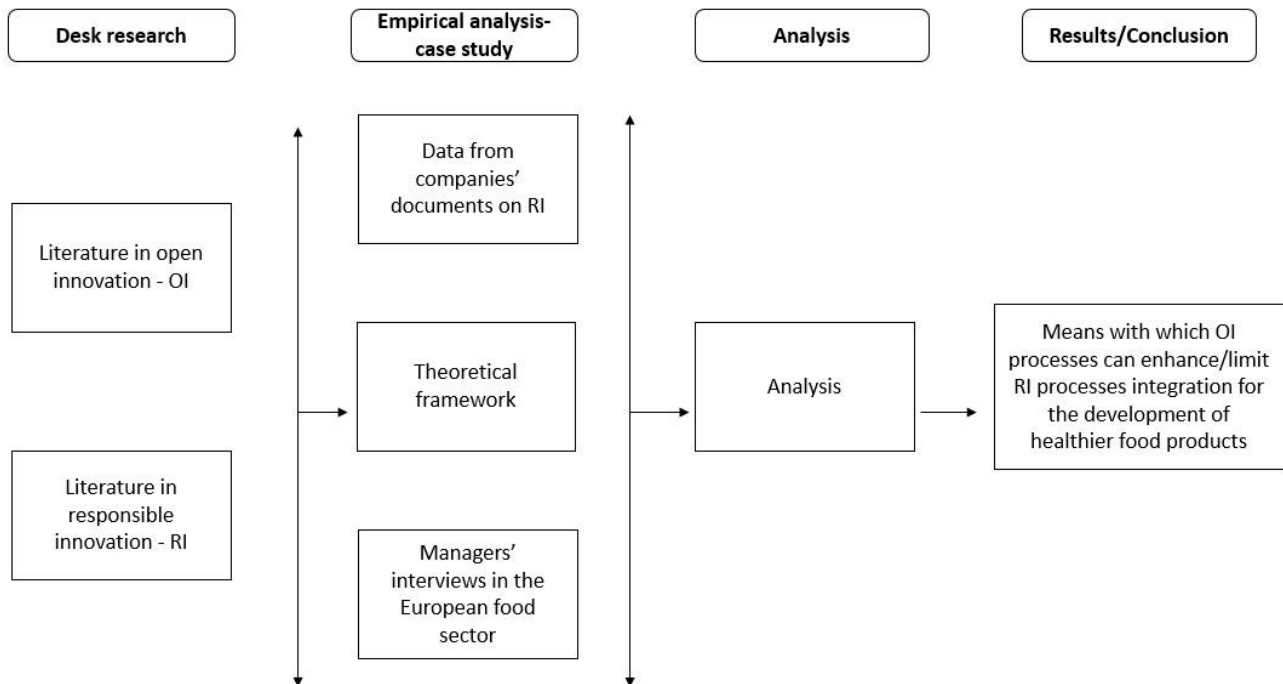


Figure 4: Research design of the study

7.2 Sample selection

A non-probabilistic judgmental/purposive sampling method was used in this study. Non-probability sampling designs are selected when the number of elements in a study population cannot be identified or it is unknown. There are five non-probability sample designs, but for this research the ideal was thought to be the judgmental/purposive. Researcher's judgement was believed to give the most relevant information to achieve the study's objective (Kothari et al., 2014).

As the main objective was to explore how open innovation processes can enhance/limit responsible innovation integration in the European food industry, a non-probabilistic judgmental/purposive sampling method was the most useful. The sample cases had to be relevant to the research questions posed and familiar with the concepts of open innovation and responsible innovation (Bryman, Bell, Mills, & Yue, 2011). Consequently, some criteria were established before selecting the candidate food companies that

contributed to this research. The criteria that were used as guidelines concerned companies that: belong in the European food and beverage sector, shift to healthier product development looking at their focus in product innovations from the information that they have in their websites and have adopted FOP labels in their product portfolio related with the nutritional aspect of their products. Furthermore, companies that follow open innovation processes were an important criterion, which was identified by looking at the information in their websites and some key words in their policies that are related to the concept of open innovation according to the literature. However, companies do not clearly state that they follow open innovation processes so the focus was on companies that state the inclusion of external stakeholders in their processes as it is presented in the following table. Finally, companies which have a CSR policy, which also has specific parts that focus on human health and well-being through their product innovations and concerns specific achievements related to more nutritious and healthy food. In this context, RI was operationalized in the form of utilization of FOP labels which represent voluntary standards and concern product innovations that are in line with the values of human health and well-being.

The firms that met the criteria were approached via e-mail with a short description of the research project and then they were approached via phone.

7.2.1 Data sources

The food and beverage industry (F&B) includes companies that are aware of preparing, processing, preserving and marketing food and beverage products (Enzing, 2009). It is linked with three important sectors: the agricultural sector, the food and beverage processing and manufacturing sector and the distribution sector (Lü, Lü Jinghui Supervisor Ahokangas, & Lehtinen, 2013). This study focused on the processing sector and manufacturing sector which includes companies that prepare, alter, preserve and package a food product and they are located in Europe.

At each company, an interview was conducted with people who hold a manager or a director position in the fields of innovation or product development. All companies met the criteria that were posed for the cases selection. The total number of contacted companies was seven, even though the number of the companies that were approached was twenty one. It should be stated that all companies that participated belong to the European food production sector. There is a diversity in the products that they launch and the great majority of them are small to medium sized firms. However, there are two cases, companies D and G that are large enterprises, which operate worldwide.

Because of confidentiality issues all companies will remain anonymous. A description of each company- case follows in table. All the information is derived from each company's website.

Table 3: Sample companies description

Case	Year of foundation/ location of operation	Product range	Strategy on product innovations, CSR, FOP labelling	Strategy on OI	Interviewee
Company A	1925/ North-Western Europe	freshly preserved vegetables and fruits	<ul style="list-style-type: none"> -Long- term objective is to facilitate healthy eating and living by its products -Commitment on high quality of its products and continuous innovation in order to meet consumer needs -Awareness of sustainability issues regarding their raw materials and packaging methods -Awareness of FOP labelling systems and use them in its products 	<ul style="list-style-type: none"> - collaborates with external stakeholders in case of specific product innovations or for exchanging ideas and feedbacks 	Product development manager
Company B	1893/ Europe- U.S.A- Middle East	production, development and packaging of meat substitutes	<ul style="list-style-type: none"> -Objective is to produce in a fair and transparent way respecting not only human health and well-being but also the animals and the environment -Commitment on sustainable operation as far as it concerns its raw materials, production, packaging and transportation -use of FOP labels 	<ul style="list-style-type: none"> - collaborates with suppliers, other organizations and clients in several aspects of its operations like the product development 	R&D manager
Company C	1897/ Netherlands	bakery products	<ul style="list-style-type: none"> -Objective is to find new opportunities both from a consumer point of view and from a retailer point of view. It follows the consumer trends and try to make new products that fulfil the whole market -Main goal of its product introductions is to develop healthier 	<ul style="list-style-type: none"> -collaborates with retailers, suppliers, consumers, universities regarding its innovation processes 	Product manager

			<p>products</p> <ul style="list-style-type: none"> -Awareness of sustainability issues, especially in the field of resourcing its raw materials -Uses FOP labels 		
Company D	1962/ Operates in 111 countries around the globe	fresh, frozen and dried potato products	<ul style="list-style-type: none"> -Its objectives are continuous inspiration, improvement and innovation which serve the consumers' needs -uses FOP labels -Awareness of sustainability issues, acquisition of extensive reports , focus on environmental factors, trends, human well-being 	-collaborates with different kind of partners	Product development manager
Company E	1979/ the Netherlands	chilled soups, sauces and meal components	<ul style="list-style-type: none"> - Creating products with cleaner label is one of its priorities -Awareness of sustainability, acquisition of relevant documentation 	-collaborates with customers/retailers, suppliers	Product developer
Company F	1957/ Europe	preserved fruits, vegetables and pulses	<ul style="list-style-type: none"> - Its objective is to develop healthy, tasty and convenient food of high quality. It invests on R&D and cooperates with several stakeholders in product development procedures -Awareness of sustainability issues regarding the whole supply chain -limited use of FOP labels 	-long-term relationships with its stakeholders	Director of quality and innovation
Company G	1877/ Worldwide	pasta, ready-to-use sauces and bakery products	<ul style="list-style-type: none"> - Its objective is to develop products that are good for the consumers, the planet and the communities in which it operates. -Acquires an extensive corporate social responsibility plan and they are very aware on these issues 	-highly values the relationships with external organizations as they believe that these kind of collaborations will lead in their continuous progress	Product development manager of a particular product group

			-Uses many types of FOP labels		
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7.3 Data collection

The data were collected by both primary and secondary sources. Semi structured interviews were conducted as a form of primary sources. Secondary sources included scientific articles, books, newspaper and magazine articles, industry reports, websites and documents.

7.3.1 Interview

Generally, interviewing is one of the most popular methods for collecting information from people. As the aim of this study was to gain in-depth information in a quite ambiguous environment that of responsible innovation in a food industry context, interviews provided great advantages, from this perspective. In this research the interviewing part was semi structured because it provided a framework that examined specific topics, while providing the interviewee with freedom to diverge from the topic (Bryman & Bell, 2007). This is useful because of the inductive / exploratory approach of the study. In other words, a standard set of open-questions was created, although a sense of freedom was given to extent their content, in order to gain as much information as possible. Innovation managers/directors/supervisors were approached. When this was not possible, managers or directors of R&D departments were approached.

To create the interview protocol/guide focus was given on the concepts of the existing research framework of this study. The interview questions were self-developed, and they were in alignment with the research questions, but also in an understandable way for the interviewees. This protocol/guide aimed to cover all the topic areas of the study in a reasonable flow, so the concepts from the theoretical framework were translated into variables and questions. According to several studies, for an efficient interview procedure four types of questions could lead to the information that is needed to be extracted (Bryman et al., 2011; Castillo-Montoya, 2016). Consequently, this research followed a similar guideline and structure introductory, transition, key and closing questions. The use of introductory questions was to prepare the interviewees with easy and non-threatening questions and it contained questions about the person's background in general and their occupation in the selected company. Transition questions set the light for the upcoming key questions of the interview which were the most important. Finally, closing questions aimed to give the opportunity to the interviewed person to discuss any relevant but not addressed issues.

The initial aim was to conduct the interviews face-to-face, when that was possible. However, five companies □ Companies A, B, C, E, and G were interviewed via Skype. The seven interviews that represented the sample of this research were recorded and transcribed. All interviews were held in English and lasted

approximately 40 minutes. Appendix I shows the interview protocol and the related information in more detail.

Appendix II depicts the operationalization matrix of the interview protocol which contained approximately 15 questions. Each interview started with an introduction to the topic as a reminder. The order of questions was adapted each time to the interviewee's flow of sayings.

7.4 Data analysis

Unlike quantitative research where data analysis is a clear-cut procedure, in qualitative research this is not the case. The researcher has to deal with great amounts of unstructured information coming from primary and secondary sources without clear guidelines to follow. However, coding is presented as an efficient process to follow in qualitative data analysis and it belongs to grounded theory approach of data analysis.

The present study followed a combined technique of inductive and deductive thematic analysis. Despite the fact that this is a qualitative study of exploratory nature when it comes to data analysis, an alternating procedure of inductive/deductive processes is followed in practice (Hyde, 2000; D. R. Thomas, 2006). A data-driven inductive approach was first used and then a deductive approach was used for the higher levels of the coding procedure which was based on the conceptual framework of the study. First, the interviews were recorded and transcribed with the assistance of oTranscribe, a web based application (Bentley, 2017). Then, the transcriptions were coded with the program Atlas.ti which was provided by the Wageningen University in order to compare all the provided interviews. The coding process started with open coding and in vivo coding to segment all the transcripts and it was characterized by three levels. The open coding step was based on the theoretical framework of the study and the results from the interviews. Then, selective coding in two levels was executed in order to summarize the data and facilitate the answering of the research questions. In total 96 codes were created to analyze the results. Six code families were also created for an easier handling of the results. An overview of the codes and the code families can be found in Appendix III

7.5 Validity and reliability

The quality of any empirical social research like the present, can be judged by using four tests which include: construct validity, internal validity, external validity and reliability (Yin, 2003).

Construct validity concerns the identification of the appropriate operational measures for the concepts being studied. *Internal validity* aims to establish a causal relationship meaning that certain conditions are believed to lead to other conditions. It concerns explanatory or causal studies and not descriptive or exploratory as this study is. *External validity* concerns whether the findings of a study are generalizable or not. *Reliability* has to do with the possibility of repetition of the operations executed in a study, such as data collection

procedures in order to obtain the same results. The main objective of reliability is the minimization of errors and biases in a study (Yin, 2003).

In this research, construct validity was tried to be enriched by data triangulation. This was accomplished by comparing the results of the interviews from the companies with the related documentation that they hold. However, this kind of documentation does not clearly concern issues of responsible innovation or open innovation. The majority of this documentation has to do with CSR policies, but subsections are referred to RI. Furthermore, some of them also hold archives that are related to their innovation processes so information concerning the involvement of stakeholders tried to be extracted. It has to be noted that this documentation was found on the websites of the companies. Moreover, maintaining a chain of evidence in the whole research, so that an external observer can easily follow the flow from research questions to the ultimate conclusions, was another way to increase the construct validity of this study. In addition, complementary phone-calls were made or e-mails were sent when it was needed in order to validate the interview findings or let the interviewees further comment on those.

As this is an exploratory research, internal validity which concerns a causal situation, meaning how and why can a certain event lead to certain situation, is not an issue for this study (Yin, 2003).

External validity was tried to be fortified so that the initial research questions can lead to generalizations. The form of research questions which were all structured with a “how” approach helped in the increase of the external validity of the study.

As far as it concerns reliability, making as many steps of the study as operational as possible, helped to enforce it. The interview protocol, the related documentation, the record and transcription of the interviews are clearly presented in the study. Furthermore, while conducting the interviews, it was tried to follow the same flow of discussion concerning the wording of questions. However, as all interviews were semi-structured, and the flow of saying was not always the same, that might have affected the reliability of the study. In addition, in one case that bad internet connection was experienced, the interview was written so that affects the reliability as well.

8. Results and Discussion

This chapter shows how the data responds to the main research question - how open innovation helps/limits the integration of responsible innovation for the development of healthier food products in the European food sector – as well as the related sub-questions.

The first sub-section will provide an overview on how companies understand the values of human health and well-being and how they integrate those in their innovation processes. The second sub-section will provide insights on the integration of values of human health and well-being through voluntary standards and in this

case through FOP labelling systems. Issues regarding their transparency and trustworthiness will also be discussed in the scope of the general mechanism of RI integration in food industry's contexts. In the third sub-section, a closer look into the innovation processes of the sample companies will be given and it will be discussed if those facilitate the integration of this kind of socio-ethical norms, for the development of healthier products. The final sub-section will further comment on the different types of stakeholders that are involved in the innovation processes and particularly their role and contribution in the different stages of the innovation processes.

8.1 Responsible innovation

This section studies how responsible innovation is understood by the companies, focusing on the values of human health and well-being in value-sensitive design. In other words, it will be shown how companies understand their importance in terms of tackling the grand challenges of nowadays, obesity and diabetes type 2, and how they integrate those socio-ethical norms in the design of their innovation processes.

8.1.1 Understanding and integration of values

As stated in section 5 of the literature review, the inclusion of socio-ethical norms provides a new approach to innovation in general, meaning that in such a notion there is a balance among socio-cultural, economic and environmental aspects. (B. J. Koops et al., 2015). The sample companies are aware of the values of human health and well-being in which this study focuses on. According to the interviewees' statements that could be found in greater detail in the Appendix IV, there were identified five main areas of focus on expressing their understanding of those values which are: a) the willingness to create pure and simple recipes, b) the willingness to help people follow a healthier diet, c) the willingness to develop healthier products, d) the increased feeling of responsibility towards the grand challenges of nowadays, e) efforts to include those values as much as possible in their innovation processes.

Human health and well-being are very important drivers for their product innovations:

"We always have in mind human health and well-being when developing a healthier concept of a product. So for example we have the product and we want to reduce the amount of sugar in it, [...] there is always somebody from our quality department in this project doing the calculations and making sure it is feasible in every step." [Company C]

However, there are also barriers that limit the introduction of these values in their innovation processes. Those barriers have been summarized in five categories and they are shown in the following table.

Table 4: Barriers in values integration in the innovation processes of the cases

Case	Barriers

	<i>Flavor and taste as priorities</i>	<i>Commercially risky</i>	<i>Type of product</i>	<i>Changes needed in the production process</i>	<i>Need for different kind of investments</i>
Company A	✓				
Company B	✓				✓
Company C	✓		✓	✓	
Company D	✓		✓		
Company E	✓	✓			
Company F	✓	✓			
Company G	✓				

All companies underlined the importance of flavor and taste in their final products. So, their priorities when developing a product, even if it is a healthier option are the good taste and flavor in order to be a successful product among consumers which will also ensure their continuity in the market.

“...on the one hand, of course we would like to lower the salt levels but if that means that the consumer will not buy the product, then, it does not make any sense in the end...” [Company B]

The commercial risk of launching a healthier product was also another important barrier. In spite of the fact that all companies are aware of the grand challenges that the food sector faces nowadays, they also want to minimize as much as possible the risks that the launching of a new product might have. They want their product innovations to be profitable.

“...so all our new innovations are no sugar or salt added, clean label, very shortly cooked so basically all our innovation efforts are in the area of maintaining the health of fruits and vegetables as our own material... it is risky to put resources in a progressive project which will not make a good commercial case. So those limitations actually block the start of a new project”. [Company F]

Furthermore, some of the types of products that companies have in their portfolio, they do not allow many changes in the way that they can be reformulated or developed in order to be healthier, partly because of the consumption patterns for that product:

“Some of our products are in a difficult position because they are not perceived as healthy, as they might even be, because in a way they are not unhealthy but they are at least perceived as unhealthy so people eat them when they are snacking...” [Company D]

Moreover, the changes that are needed in the production processes and the need for different kind of investments for the companies' continuity and general progress, act also as barriers in the integration of socio-ethical norms in their innovation processes.

“...but also there are limits on what we can do on the production process because we make baked goods and a lot of times you need sugar for the baking process for example...”. [Company C].

Overall, all companies are motivated to innovate for society and integrate the notions of human health and well-being in their product development processes in order to tackle the current grand challenges. However, the limitations that were identified due to commercial and continuity reasons’ are in alignment with the findings of the existing literature, which supports that the integration of socio-ethical norms for the development of healthier and more responsible, for the public products, it is most of the times inevitable due to particular business strategies. It is apparent that the food industry is in a transitional phase at this moment and still tries to find ways to tackle the grand challenges of our days, like the non-communicable diseases, through their product innovations. However, as it was illustrated, they still find several impediments to that aim.

8.1.2 Practices for integration of values in the innovation process

Linking to the literature section 5, it was stated that value sensitive design is the means of transport of responsible innovation in industry’s practices. So, the considerations of responsible innovation could be used as requirements for exploring how can the design and development of food products better serve the needs of human health and well-being (van den Hoven, 2015). In this section, there is a brief presentation on how the participating food companies try to integrate the values of human health and well-being in the design of their innovation processes. Thus, how they transform these values into design requirements.

All companies follow certain practices for the inclusion of these values in their product development, but these practices vary according to the type of products that each company produces. Practices like following governments’ guidelines and FOP labelling are not shown in this table. It was clear from the interviews that all companies follow governments’ guidelines related to the nutritional aspect of each product. FOP labelling was also a common practice and a requirement for the cases selection, so it is going to be analyzed in greater detail in a following sub-section.

Table 5: Practices/actions of participating companies to deal with the grand challenges and integrate the values in their innovation processes

Cases	Practices				
	<i>Ingredient related</i>	<i>Stakeholder inclusion</i>	<i>Process related</i>	<i>Projects related to well-being and employees’ or consumers’ satisfaction</i>	<i>Nutrition related</i>
Company A	✓	✓			
Company B	✓	✓			✓
Company C	✓	✓			
Company D	✓	✓	✓	✓	

Company E	✓	✓	✓	✓	
Company F	✓	✓	✓		
Company G	✓	✓	✓	✓	✓

As shown in table 4 the type of actions for the integration of values of human health and well-being in the design of the innovation process for the development of healthier products lies on five domains. The ingredient related domain and the stakeholder inclusion domain represent the practices that are used by all companies. The ingredient related domain has to do with reductions in the content of sugar, salt, fat and e-numbers, replacements of ingredients like sugar with plant derivatives, reinforcement of their products with ingredients like fibers and vitamins. The domain of stakeholder inclusion concerns all the stakeholders that are related to the innovation processes of each company, when it comes to develop a healthier product. This particular domain will be further analyzed in the next sub-sections. The third most important practice is the process related actions that are taken by the companies, which have to do with changes in companies' production processes, as their objective is to preserve the naturalness of their raw materials as much as possible. For instance, companies D, E, F and G focus on particular techniques and machines' replacements in order to have a healthier final product. The fourth most popular practice is the creation of projects that are related to human health and well-being which do not only focus on product innovations but also on the general social responsibility spirit that companies attempt to acquire. For example, company E talked about projects that were related with elderly's people health, companies D and G pointed out projects that are related with people's well-being. Last but not least, it is the practice that concerns nutritional related projects that run inside the companies. For company B, that includes in-house nutritional analyses, while for company G concerns a nutritional advisory board of external scientists with which they develop their own nutritional guidelines and nutritional objectives for their products.

Those five categories could represent the way that sample companies transform the values that this study focuses on into design requirements for the development of healthier/ more responsible food products. The consideration of notions of human health and well-being is translated into technicalities regarding the practices that are depicted in table 5 in the companies' product development processes.

Five mechanisms have been identified for the implementation of responsible innovation, according to Von Schomberg (2013). Those are: technology assessment and foresight, application of the precautionary principle, normative/ethical principles to design technology like the creation and adoption of voluntary standards such as FOP labels in food industry's contexts, innovation governance and stakeholder involvement and public engagement (Von Schomberg, 2013). The interest of this study focused on multistakeholder involvement and the adoption of voluntary standards. At this point, it should be stated that

the selected cases contain those kinds of mechanisms in order to integrate the values of human health and well-being in their innovation processes.

The next section comments of the FOP labelling systems that the selected companies acquire. An overview will be presented on how those systems are applied in practice on an industrial level.

8.2 Front of Pack Labels as voluntary standards

As it was already stated in previous section FOP labels could represent a kind of innovation governance for responsible innovation in the form of voluntary standards that was discussed in section 5.1.5. Sharma et al. (2010) argued that self-regulation tactics like food labeling, have a voluntary character and they are supposed to be socially responsible practices in the context of consumer's welfare (Sharma et al., 2010). This section comments on the FOP labelling practice that the researched companies follow. Firstly, there will be given an overview of the types of FOP labelling systems that they use. Then, companies' perceptions towards them as well as the role that they hold in the sample companies' innovation processes will be discussed. In addition, the contribution of open innovation in the improvement of transparency and trustworthiness issues that these systems have will be argued, from an industrial perspective. In the end of this section the following sub-research question will be answered: *"How are responsible innovation processes implemented in the food sector through voluntary standards, « FOP labels »?"*.

8.2.1 Types of Front of Pack Labels

The categories of FOP labels that were identified to be used by the researched companies concern not only nutrition claims, but also other type of claims. The nutrition claims were supported by labels that are in the categories of nutrient-specific systems, summary indicator systems and food group information systems.

The rest FOP labels that are used, concern claims that are related to:

- i. certain intolerances like the gluten-free, lactose-free and allergen-free logos,
- ii. composition and quality like the vegan, vegetarian, 100% sunflower, cocoa certified logos,
- iii. method of production like the biological logo.

Table 6: Types of FOP labels used by the participating companies.

Case	Type of label									
	Nutritional value related	Vegetarian	Vegan	Biological	Gluten-free	Lactose-free	Allergen free	Cocoa certified	100% sunflower	Wholegrain
Company A	✓	✓	✓							
Company B	✓	✓								

Company C	✓		Thinking to use it in the future					✓		
Company D	✓				✓	✓	✓		✓	
Company F	Used to have but not anymore			✓						
Company G	✓		Self-developed	✓	✓					✓

It is clear from the table 6 that almost all companies use a nutritional value related logo on the front of the pack. Company D and F used to have a summary indicator system which indicated the healthier option on their products but they do not own it any more. Company D after internal discussions decided that it is not ethically acceptable to have such a claim in its products due to their type. Company F has become more reluctant with all those claims so it was decided to limit them, while company G still has such a logo. Furthermore, company G has also developed a label that states that its products are appropriate for vegans, with the assistance of an internal nutritional advisory board that it has.

8.2.2 FOP labeling system in practice

Almost all nutritional related logos that companies use are self-developed by following governments' guidelines. Companies A, B, C, D try to follow the guidelines of the Voedingscentrum as well, in order to formulate their nutritional labels. In case of Company G, it also follows the guidelines of a specific governmental agency as it uses a specific summary indicator FOP labelling system, regarding health claims. Companies that acquire a FOP label from an external organization, like the vegetarian (Company A, B), vegan (Company A, B), or cocoa certified (Company C) logos, they only involve those organizations in the validation phase of the product, where it needs to be audited by them in order to acquire the label. Those organizations are not involved in other stages of their innovation processes. However, in case of companies F and G which acquire the biological logo and the summary indicator logo respectively, they choose to include them from the beginning of the innovation process, from the ideation phase, as they want their products to be suitable for that particular label from the first stages. Although, in the case of company F the role of the organization responsible for the certification of the logo is limited to auditing. Furthermore, company G has a self-developed claim for vegan products. This logo has been developed with the assistance of a nutritional advisory board that this company owns and it involves several external scientists from academic institutions.

Table 7 shows the role of stakeholders and the stage of their involvement in the innovation process.

Table 7: The role of stakeholders and the stage of their involvement in the innovation process regarding the FOP labels

Case	Role of stakeholder	Stage in the innovation process
Company A,B,C,D,E,F,G	Regulatory (in terms of validation and auditing)	Final stage-validation phase
Company G	Consultation (in the innovation process)	All stages

It can be concluded that stakeholder involvement in FOP labelling practice is limited, which enhances what the literature states regarding the transparency and trustworthiness of those labels. Overall, what was observed is that the researched companies are not that interested in adopting FOP labelling systems of any kind despite the fact that they are still quite popular. During the data analysis several reasons for this were identified. Table 8 summarizes some benefits/reasons of FOP labeling adoption and shortcomings/reasons why companies are reluctant to adopt FOP labelling systems.

Table 8: Benefits and shortcomings of FOP labelling practice as experienced by the researched companies

Benefits	Shortcomings
<ul style="list-style-type: none"> • Easy choice for consumers [Companies A,B,C,D] • Facilitate innovation process/ time saving [Companies A,B] 	<ul style="list-style-type: none"> • Confusing consumers/ create misunderstandings [Companies A,C,D,F,G] • Lack of transparency/trustworthiness [Companies A,B,C,D,F] • Disrupting innovation processes [Companies A,C,F] • Making products less attractive [Company A] • Questionable if they lead to healthier food products [Companies A,B,C,F,G]

One of the most common reason why they adopt them is that they help consumers to make an easy choice which is subsequently profitable for them.

“... if those labels help us and they also help the consumers why not?...we hope that it is positive and easier for people to select products...” [Company A]

Moreover, another point was the fact that following some standards facilitates the innovation process and it is also time-saving.

“It is good to have criteria which state the health claim and then follow those on the development phase. If there is always discussion of what is healthy then it is much more difficult as one person can say that something is healthy and another one no.” [Company B]

However, several shortcomings that concern the whole practice of FOP labels were detected. Apart from the fact that there are issues of transparency and trustworthiness which will be further discussed in the next

paragraph, as companies insisted on those phenomena during the interviews, all companies agreed that those systems bring confusion among consumers and create misunderstandings in general.

“We know also that there are many FOP labels or nutritional communication systems used across Europe...in this moment the reality is very much fragmented between countries and as a company...we want to avoid increasing the complexity of reading all those FOPs from consumers' side...” [Company G]

Furthermore, the fact that those labels can possibly disrupt companies' innovation processes was argued. The main point was that the existence of certain standards which must be followed, put limitations in their product recipes and control them in such a way that in the end can also become a limit to the general concept of product innovation.

“...I believe, that even a trustworthy labelling system, would lead to less innovation because it limits always...” [Company F]

Another argument that was stated is that sometimes putting a particular FOP label on the packaging can make the product less attractive not only in terms of packaging aesthetics, but also among consumers who just want to buy a product to indulge themselves without having in mind nutritional or any other kind of claims. As a result the product becomes less appealing for a certain type of consumer because of a label.

“...so putting such labels on the products can be negative for people who just want to have a nice product...Personally I do not like the logos because they are very ugly on the packaging ...” [Company A]

An interesting finding was that companies have contradicting opinions on whether those labels can lead to healthier or more responsible food products. Some of them supported that they can help in achieving healthier product options for consumers, while others remained neutral by stating either that they already do the right things so a FOP label do not alter their innovation processes, or by confessing that what is needed is a more coordinated way to approach those labels in order to minimize the shortcomings that they have.

“...so FOP labels are of course in the path of improving healthiness, healthy consumer profile of products, we agree ,of course with this approach, but in this moment the reality is very much fragmented between countries...” [Company G]

Concerning the contribution of those labels, as objective standards, regarding the integration of values like human health and well-being in the design of the innovation process, companies develop them or acquire them by external organizations. In case of self- development nearly all of them do not include any stakeholders because they just follow government/governmental agencies' guidelines. Only company G involves an advisory board of external scientists with whom they have also created their nutritional guidelines. This might be due to the profile and the scale of the company in relation to the other companies. In case of label acquisition from an external organization, they only involve them in the final stage of the innovation process when it comes for the validation of that particular label. Company G, on the other hand, includes the organizations during the whole innovation process in terms of consultation.

Thus, it is shown that the stakeholders' involvement in FOP labelling systems that the companies choose to follow is quite limited to a regulatory role. Furthermore, there is an increased feeling of reluctance among companies regarding the use of those labels as it was described due to transparency issues, the disruptiveness that they can create in the innovation processes, the confusion they create among consumers and the fact that they can lead to less attractive products. Finally, the researched companies do not have a clear opinion on whether these logos can lead to healthier products, as there is a lot of discussion around those issues and they believe that a common road must be found to follow.

8.2.3 Transparency and FOP labels

This section comments on the transparency and trustworthiness issues that FOP labels have, an issue that emerged from the interviews with the participating companies as an important shortcoming that make companies reluctant on adopting those kind of systems.

As it was stated in a previous section, regarding companies' perceptions and practice of FOP labelling systems, they lack transparency and trustworthiness. This is often the reason why they do not choose to implement them in their product lines. The fact that there is not a coordinated opinion on issues of human health and well-being concerning food products brings great disruptiveness and confusion in companies' innovation processes.

The current situation as far as it concerns the sample of this study is that there is not great stakeholder involvement in FOP labelling practice and the role of those that are involved is limited in the validation and auditing of certain standards and criteria in the final stage of the innovation process, in almost all cases. However, researched companies argued that the engagement of different types of stakeholders in FOP labelling systems can increase their transparency and trustworthiness of FOP labelling systems. They all supported that discussions and dialogue in order to create a coordinated labelling system towards health claims and other claims as well, it is of great importance. Nevertheless, none of the companies does that in practice, even if they develop a label by themselves. Only company G includes an advisory board of external scientists and they have created their nutritional guidelines.

Furthermore, what it is also interesting as a finding was that even if they supported that such an engagement can solve many transparency and trustworthiness issues among FOP labelling, it might limit innovation. They argued that it can lead in a very controlled food system and it can even create great obstacles in product innovations in the long term, as everything should be controlled and checked by a group of stakeholders. In addition, it was pointed out that putting such a project in practice it can be very difficult.

"...yes the trust of the people will increase, I think it will help. On the short term that would give a good effect , on the long term it would lead to less innovation because it limits. A very controlled food system could lead to less innovation and a lot bureaucratic." [Company F]

Concluding this section, it was found from the data analysis that despite the fact that the researched companies have a limited interaction with other types of stakeholders in the FOP labelling practices that they follow, they keep a positive stance towards the fact that broader engagement can increase the transparency of those systems. An effective and coordinated FOP labelling system which needs to be created from the collaboration of different types of stakeholders would lead to more trustful labels in general. Dialogue and discussion among those different groups would be the key in order to create a common objective and goal regarding health and well-being issues. However, companies stated several shortcomings that this kind of engagement could cause to their innovation processes. It was admitted that such a controlled food system from the one hand it is very difficult to be put into industrial practice and it could create great limitations in the general concept of innovation and maybe it could lead to the extinction of innovation in a long term.

The next section will give insights on the innovation processes of the researched companies by focusing on the involved stakeholders and the benefits or limits that they can cause to responsible innovation implementation.

8.3 Open innovation process and responsible innovation process

This section will comment on how the current open innovation processes that the selected companies follow, facilitate (or not) the integration of norms that serve the human health and well-being in their innovation processes for the development of healthier products. In the end, a conclusion and an answer will be given on the sub-research question: “How does openness of innovation processes facilitate the integration of responsible innovation for the development of healthier products?” from an industrial perspective.

8.3.1 Factors that enhance the integration of values of human health and well-being in an open innovation model

In the theoretical framework of this study, the three-stages open innovation process described by Chesbrough (2015) and Gassmann and Enkel (2004) was selected. These three stages are: idea generation/research, product development and launch/commercialization of the final product. However, as interviews went through, it was found that companies divided those stages into sub-stages. So the first stage was divided into the discovery and the concept refining phases, the middle stage was divided into the business case phase and the product development phase while the third stage was divided into the validation and the commercialization phases. From the findings, it should be stated that the idea exchange in the product development phase of the innovation process in every company was very limited. Only two companies, as it is shown in table 9, involve stakeholders in this phase and when they do so, they are very careful in what they share. For one company, those stakeholders belong in the category of retailers/customers and their inclusion is more of a consultation type and a feedback exchange, in order to deliver an acceptable product

for commercial reasons mainly. That means that this company does not reveal the complete recipes or create the product with its stakeholders. For another company, universities/knowledge institutions constitute the involved stakeholders in terms of consultation, in case that a change in the ingredients or in the production process is needed.

After data collection and analysis, it was shown that the open innovation activities which the companies acquire are related to technology exploration rather than technology exploitation as it was posed in the theoretical framework of the study. Those activities that concerned the contribution of external inputs for the development of healthier food products are summarized in three categories: feedback and idea exchanging with customers and consumers, involvement of stakeholders that belong to the food industry and broader involvement of stakeholders.

Feedback and idea exchanging - Co-creation

This category includes stakeholders' involvement in the enhancement of idea generation, and feedback exchange among companies in different stages of the innovation process for the development of products that serve the notions of human health and well-being. Personal dialogue among customers/retailers, suppliers and surveys or focus groups among consumers are the most popular ways of interaction. The relationship with customers/retailers and suppliers are formal by the means of signing contracts while the collaborations with consumers are informal by presenting them the pilot product each time and getting feedback of whether it will be appealing for them or not.

"...we have talks with the retailers and we share our plans, so most of the times those are really rough ideas and then we also get feedbacks and new ideas and we change things and then we go into the development phase..." [Company C]

It was shown that the interaction with stakeholders assists in the development of healthier food products that integrate the notions of human well-being, that this thesis studies. All the researched companies argued that sharing their opinions and knowledge it is beneficiary for different reasons. First of all, it decreases the risk of creating a product that will not be acceptable by consumers. Moreover, it helps them in better understanding the public concerns for healthy and nutritious food and also reconsidering their product projects in order to be in alignment with these concerns. So, as it was underlined by many cases, they are not working on their own, they need support in several issues which mainly comes from their stakeholders. Consequently, it could be stated that they create their products in cooperation with the actors that they choose to include in their innovation processes. However, companies' priority in their interactions with stakeholders is to reduce the commercial risk that the launching of a healthier product could have. This is because they want to ensure their existence in the market. Commercial-driven innovations is a priority, regarding the researched companies.

“...if you do not involve them then you might develop a product that does not meet the needs. So it is very important to involve them otherwise you end up with a problem that cannot be solved...” [Company B]

Involvement of stakeholders that belong to the food industry

This activity concerns the interaction of companies with competing companies through special projects that concern the development of healthier food products. Those coordinated efforts help companies to better understand notions of human health and well-being at first sight, and then better practice the proper actions that will lead to a beneficial result for all. These kinds of relationships are formal and when a project is on progress, the meetings could be few times a month. During these project meetings with competing companies, there are discussions on how to create the product having a same goal and vision for it, as well as how to market this product in order to be acceptable by the consumers.

“...we all have the same focus , the same goal... we work together looking at more healthy foods and lower down the amount of salt and sugar, slowly, for the consumer to get used to the new product. That works very well.” [Company A]

These activities assist companies to learn and design their processes in such a way to have a successful final product, commercially speaking, but also in a sense of integration of human well-being values, at least in a primary stage. The most important, as it was also stated by the company A, is that the participating companies in these kind of projects have the same goals, and work together to reach their objectives - in this case, the development of healthier products. However, this does not happen in every company that participated in this study. Only two companies take part in this kind of activities, the main reason for not participating is the risk of information leakage and the fact that they want to keep their best innovations for themselves. So, competition among companies and their willingness to gain greater market share restrict their collaborations.

“...we would like to have our best innovations for ourselves, of course, for our own brand...” [Company C]

Broader stakeholder involvement

This category refers to the interaction of companies with organizations that are not solely involved in the food industry. Those organizations include universities/knowledge institutions, NGO's like the vegetarian union, or government/ governmental agencies. Those collaborations are mostly formal, with the exception of the universities/knowledge institutions, which can be informal sometimes. Some companies have a frequent interaction, once per week, others more rarely when they want to launch a new product. These kinds of collaborations facilitate the whole innovation process. It was stated that sometimes when there are certain guidelines to follow coming from either the government/governmental agencies or NGO's, it can help the development of a healthier product, as there is a specific path to follow. This concerns more the way that they develop their product recipes in order to meet certain criteria that are related to health or

nutrition. So, this interaction facilitates the innovation processes when there is the willingness to develop a healthier or more responsible product for the consumers.

“...it is good to have guidelines which state the health claim and then follow those on the development phase...” [Company B]

Nevertheless, those guidelines are quite challenging sometimes, as the companies have to find ways to follow them, regarding their innovation processes. It was stated that they provoke companies for further investigations regarding the ingredients and the production processes that they usually use, in terms of finding more natural approaches that have a beneficial effect on the consumers after consumption. These could be the replacements of their current ingredients with more natural ones, the use of raw materials with better quality and the application of more-friendly production methods to sensitive ingredients. Moreover, the contribution of each stakeholder is really useful for the development of healthier products, as everyone can add with his experience and expertise in particular phases of the innovation process. That was also identified by Gurzawska et al. (2017) who stated that it is crucial to include as many stakeholders as possible in the innovation process in order to broaden and diversify the sources of knowledge and expertise (Gurzawska et al., 2017). Although, this will be further discussed in the next sub-section.

“So everybody has his role and everybody should go in depth with his own expertise and get connected, to be collective in order to facilitate the whole process...” [Company F]

In addition, project meetings and dialogue with universities/knowledge institutions are quite popular among companies when it comes to product innovations, as they do not only assist them in terms of idea generation, but also in the whole concept refining phase and sometimes in the development phase. Companies gain insights on how to anticipate better the arising problems in the production processes and later in the launching phase of the product, when universities are responsible for quantitative/qualitative research regarding consumers' acceptance of the final product. They provide them with many opportunities as they are sources of information and inspiration for the companies. As it was stated by the majority of the cases, they need the pluralism of opinions that exists among actors that are not directly related with the food industry. This leads to opening their minds in several issues like the one that concerns this study□ the integration of socio-ethical norms in their innovation processes.

However, most of the times the collaborations with the government/ governmental agencies and the NGO's like the vegetarian union are limited. The only way of interaction with them is the validation of certain criteria so the dialogue on issues of developing healthier products is not the main point of their interactions.

Overall, while the researched companies prioritize the commercially-driven innovations, they also seem to be alert on the societal demands of nowadays by involving more actors in their processes. Despite the extent to which they let those stakeholders to be involved, they gain from their knowledge, experience and

expertise. The important thing that needs to be mentioned is that, at least those actors make the sample cases rethink many of their product projects in order to develop a more responsible product for the consumers.

An attempt to summarize the ways of interaction with the different types of stakeholders in the different stages of the innovation process is presented by the following table as a response on how the openness in innovation processes facilitates the integration of socio-ethical norms in them, when developing a healthier product. Furthermore table 14 that follows in the next section gives an overview on the interaction with stakeholders in the different stages of the innovation process for each company.

Table 9: Interaction with each type of stakeholder

Stakeholder	Interaction			
	<i>Personal dialogue</i>	<i>Project meetings</i>	<i>Qualitative/ quantitative research</i>	<i>Criteria evaluation/Logo evaluation</i>
Government /Governmental agencies	G	B		G
Voedingscentrum	A,F			A,B,C,D,F
Retailers/Customers	A,B,C,D,E,F			
Suppliers	A,C,E,F,G			
Consumers			B,C	
Companies in the same industry	B	A,F		
NGO's				A,B,F
Universities/ Knowledge Institutions	F,G	B,D,F	C	

8.3.2 Factors that limit the integration of values of human health and well-being in an open innovation model

Two theme categories emerged from the data analysis regarding the factors in an open innovation model that limit the integration of socio-ethical norms like those that this study focuses on □ human health and well-being. Those are the conflicting values among the different types of stakeholders and the companies and the time load that increases the complexity of the innovation process.

Conflicting values

Almost all companies agreed that conflicting values between them and their stakeholders is an important barrier when they include them or want to include them in their innovation processes. Those values concern issues of health and their general goals missions and visions. Companies, besides their awareness on health and human well-being issues, prioritize their commercial success. Although stakeholders, depending on their type, might focus on profits – as in case of retailers/customers, suppliers and companies from the same industry- ; they might have as a vision a healthier and more transparent food industry in case of the other types of stakeholders.

On the other hand, strict guidelines and different perceptions that the stakeholders hold among those issues of health and nutrition, obstacle their discussions and collaborations. The fact that there is not a coordinated way to define the healthiness or the nutritional value of the products leads to greater problems in the collaborations between the sample companies and their stakeholders. Consequently, the researched companies choose to limit their interactions with them, as the fast-moving environment that they work on does not permit analysis on this kind of issues, even if, the result would be beneficiary for both sides in a long term.

“So in general I think they help, but sometimes it is a limitation because of the very strict sight of what is healthiness. If you just state no added ingredients, no E-numbers, that is very limited view.” [Company A]

Time load/increased complexity of the innovation process

The researched cases commented also on the increased complexity that stakeholders can bring in their current innovation processes and the time load that is needed in order to reach a conclusion. Companies stated that the whole innovation process becomes less speedy when they have to negotiate on different kind of issues that arise due to a product innovation. So, that makes the interactions with their stakeholders of no-added value for them, due to the importance of time-to-market. The sample companies are more interested in being competitive in the fast pace environment rather than discussing extensively on societal issues and demands. Consequently, when they cannot balance this, they are not willing to retard a product innovation which they believe it will be a commercial success. Furthermore, company F underlined that even if there was a coordinated group of stakeholders and companies could take decisions in a more transparent way for healthier product innovations, this might lead to the extinction of product innovations, in a long term. That was also declared by company C which supported that a very controlled food system always brings complexities in real practice.

The following table summarizes the identified factors with some illustrative quotes from the company cases.

Table 10: Barriers of stakeholder involvement in the innovation process as identified by the participating companies

Identified barriers	Quotes
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Conflicting values/ Differences in mission , vision, values	"...so the different angles to look at healthiness of a product makes it more complex...So, what we are focusing on is telling people what it is, and we try to add as less salt as possible but it needs to be tasty because otherwise people don't eat it so you can make a very healthy product but if nobody eats it is no sense..." [Company A]
	"...I think that if the customer is really critical on health we also put a lot of energy in making healthier products of course... but in the end of the day there are a lot of other issues that need to be solved..." [Company B]
	"...when you have a supplier, you construct an idea with him but he cannot make a living only by selling the outcome to you, he has to sell it to your competitors as well, so this is not good for you..." [Company F]
Time load/ increasing complexity of the innovation process	"...So we try to make clear to them, that the amount of vegetables is much more important than the very small amount of salt they kept from our products, those discussions of course takes us time..." [Company A]
	"...what we see is that when there are no limits it is a lot easier to develop a nicer product and a well-accepted product..." [Company A]
	"so I think that involving more stakeholders helps...but you should then review every single product in this group and then of course there are a lot of product innovations so a couple of weeks later it has a new recipe you should look over it again and I think it is way too complicated to do it like this." [Company C]

However, only company G from the researched companies did not mention any limitations that open innovation and more specifically stakeholders' involvement can cause in its innovation processes. The reason for this might be that it is a global player and it has a very well-organized strategy, not only as far as it concerns its stakeholders, but also its social responsibility issues. As it was stated, they always go for long term relationships that can bring benefits to both sides.

In the following table, the barriers of stakeholder involvement in the innovation processes for the development of a healthier product are collected, and consequently the limitations that open innovation can bring to the integration of socio-ethical norms in the design of the innovation process, with the barriers of integration of socio-ethical norms in the innovation process, as they were identified in sub-section 8.1.1.

Table 11: Identified barriers in the innovation process regarding stakeholder involvement and their applicability towards open innovation and responsible innovation

Identified barriers in the innovation process	Cases	OI	RI
Conflicting values	A,B,C,D,E,F	✓	✓
Time load/ increasing complexity of innovation processes	A,C	✓	✓
No added value	A,C	✓	N.A
Changes in production processes	C	N.A	✓
Flavor and taste priorities	All	✓	✓
Type of product	C,D	N.A	✓
Different kind of investments needed	B	N.A	✓
Commercially risky	E,F	N.A	✓

Following table 11, it can be argued that conflicting values and time load/ increased complexity of the innovation processes, are not the only barriers of the open-type innovation model that the sample companies have, but they are also limitations for the integration of socio-ethical norms in the design process. However, according to the sample companies, none of the barriers of the integration of socio-ethical norms in the design of the innovation process is also a barrier for an open innovation model, apart from the flavor and taste priorities which can be included in the conflicting values. That comes in alignment with what the literature states about the diverging goals, motives and values among stakeholders and companies, which are barriers not only for responsible innovation integration but they also limit the general collaboration between them (Holmes & Smart, 2009; B. J. Koops et al., 2015; Pedersen R & Andersen, 2006). Consequently, the fact that companies focus on economic value creation and the acquisition of competitive advantage restricts the possibilities of discussions and dialogues on social value creation, which is supported by certain types of stakeholders that they already have in their innovation processes.

As far as it concerns the barriers of RI, the fact that they are not perceived as potential barriers of OI processes, it could be argued that this finding increases the possibilities of overcoming them with the assistance of the open innovation model. However, that concerns a greater stakeholder involvement and the enhancement of open dialogues on those issues which again leads to the main barriers that were referred and analyzed before. Therefore, a balance should be found, as well as a mutual understanding should be created, among the different kind of goals that each actor in the food industry has.

Concluding this section and answering to the sub-research question on □ how does openness of the innovation processes facilitates/limits the integration of responsible innovation, meaning the integration of values of human health and well-being in the innovation process for the development of healthier food products, the following table gives an overview of the findings.

Table 12: Activities/factors of open innovation that facilitate or limit the integration of responsible innovation

Activities/factors of facilitation	Activities/factors of inhibition
<ul style="list-style-type: none"> • Ideas and feedbacks exchange • Involvement of stakeholders that belong to the food industry • Broader involvement of stakeholders 	<ul style="list-style-type: none"> • Conflicting values • Time load/ increased complexity of the innovation process

So, it was found that open innovation activities, as described by the companies and depicted in table 12, facilitate the integration of those values in the innovation processes. Stakeholder involvement assists not only in the idea generation and the reception of feedbacks during the innovation process but also in the way

that companies perceive and put into practice the notions of human health and well-being. However, there are also several limitations when it comes to this kind of collaborations. The most important was thought to be the differences in goals, missions and visions among between stakeholders and companies. Another limitation concerns the time load and the increased complexity that those interactions can cause to the innovation processes of the companies. This is because, nowadays companies seek innovation strategies that not only can tackle the current grand challenges, but also minimize as much as possible the time that is needed for a product to reach the market.

8.4 Stakeholder involvement in the innovation process

This section will further discuss on the roles of the different types of stakeholders in the stages of the innovation process as they were extracted by the researched cases. In the beginning, an overview will be given on the types of stakeholders that were identified among the cases, who are related to the innovation process for the development of healthier products. Then, an attempt to summarize their role in the different stages of the innovation process will be presented. In the end of this section, an answer will be given to the sub-research question: *“How can different types of stakeholders contribute at each of the stages of (responsible) innovation processes for the development of healthier products?”*.

8.4.1 Types of stakeholders

After data analysis, there were identified certain types of stakeholders who assist companies in their innovation processes for the development of healthier products. Table 13 depicts the different types of stakeholders that contribute in the innovation process according to each company.

Table 13: Types of involved stakeholders in innovation processes of each participating company

Case	Involved stakeholder						
	<i>Government / Governmental agencies</i>	<i>Retailers/ Customers</i>	<i>Suppliers</i>	<i>Consumers</i>	<i>Companies in the same industry</i>	<i>NGO's</i>	<i>Universities/ Knowledge Institutions</i>
Company A	✓	✓	✓		✓	✓	
Company B	✓	✓		✓	✓	✓	✓
Company C	✓	✓	✓	✓			✓
Company D	✓	✓					✓
Company E	✓	✓	✓				
Company F	✓	✓	✓		✓	✓	✓

Company G	✓		✓				✓
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Government/governmental agencies customers/retailers were found to be the most popular types of stakeholders that are involved in the innovation processes. Then, suppliers interact a lot among companies during the development of a healthier product. Universities/ knowledge institutions are quite famous as well and companies showed increased willingness to include them in their innovation processes. Consumers, companies that belong to the same industry and NGO's like the vegetarian union, which are responsible for a particular FOP label, add value as well in the procedures of product development.

The next table presents the involvement of each type of stakeholder in the stages of the innovation process and the case of each company.

Table 14: Stakeholder types and their involvement in the stages of the innovation process for each participating company

Stakeholder	First stage		Middle stage		Final stage	
	<i>Discovery phase</i>	<i>Concept refining phase</i>	<i>Business case phase</i>	<i>Development phase</i>	<i>Validation phase</i>	<i>Launching phase</i>
Government /Governmental agencies	B	B,G	B,G		B,G	
Voedingscentrum		A,B,C,D,F			A,F	
Retailers/Customers	B,D,E,F	A,B,C,D,E	A,B,C	B	A,B,C,D,E,F	
Suppliers	A,C,E,F,G	A,C,E,F,G			G	
Consumers	B	B	B		B,C	
Companies in the same industry	A,B,F	A,F	A		A,F	
NGO's		F			A,B,F	
Universities/ Knowledge Institutions	B,D,F,G	B,D,F,G	B,F,G	F	B,C,F,G	

Greater involvement happens in the first stage and in the final stage of the innovation process. Companies B and F involve retailers/customers and universities/ knowledge institutions respectively, in the development phase but this is more in the form of feedbacks and consultation rather than in developing the product

together. In the launching phase of the final stage, there is no involvement of stakeholders for all participating companies.

The next paragraph further discusses how each type of stakeholder contributes to the innovation process for the development of healthier food products.

8.4.2 Stakeholders' role

In this part, the role of different types of stakeholders in the different stages of the innovation process for the development of a healthier product, will be discussed, as they were described and identified by the participating companies. Table 15 summarizes the findings from the interviews.

Table 15: Stakeholders' role in the different stages of the innovation process according to their type

Stakeholder type	Role	Stage in innovation process
Government /Governmental agencies	-funding offers -educating public on social issues concerning firms' innovations -promoting healthier eating -enabling discussions to make products healthier -validating criteria and auditing standards	First stage Middle stage Final stage
Retailers/ Customers	-contribute to idea generation and inspiration -providing feedbacks to make the final product more acceptable	First stage Middle stage Final stage
Suppliers	-contribute to idea generation and inspiration -providing feedbacks to make the final product more acceptable	First stage Final stage
Consumers	-contribute to idea generation -providing feedbacks to make final products more acceptable	First stage Final stage
Companies in the same industry	-contribute to idea generation and inspiration -providing feedbacks to make the final product more acceptable	First stage Middle stage Final stage
NGO's	-educating public on social issues concerning firms' innovations -promoting healthier eating -auditing standards	First stage Final stage
Universities/ Knowledge Institutions	-contribute to idea generation and inspiration -providing feedbacks and technical knowledge to make the final product more acceptable -provide trust and credibility among firms' innovations	First stage Middle stage Final stage

Government/ governmental agencies

Government/governmental agencies have different roles in the innovation processes. For companies to be eligible to launch a product, they have to follow certain guidelines which are created by the government of the country where they want to launch a product. Thus, most of the times, the role of this stakeholder is to validate those criteria. Furthermore, some governments as well as governmental agencies try to educate the public on healthier eating and related issues that concern the human well-being. Moreover, they have specific projects in which companies can take part and get funded, in order to launch healthier product options for consumers. Sometimes they also promote discussions among companies that are related to the grand challenges that the food sector faces nowadays, and they can be tackled through product innovations. All researched companies referred to the guidelines of the governments' that they have to follow. However, companies B and G (Table 10) include them more actively in their innovation processes through discussions on health issues when they develop products with certain health claims. Although, this kind of involvement has to do with governmental agencies which can provide a particular FOP label to the companies and not the government by itself.

"...we also have now a project, it is business innovation research related, it is a EU program for improving the development of vegetarian products . At the moment they (government) refund some development of vegetarian products." [Company B]

Retailers/Customers

Apart from their usual role in companies' procedures, retailers and customers act also as a source of inspiration, they enable idea generation and in some companies, they also give their feedback on new product concepts. Most of the times, they are involved in the first and in the final stages of the innovation process. However, company B includes them in the development phase also, in terms of feedback and not in terms of developing the product together with them.

"...we have talks with the retailers and we share our plans so most of the times those are really rough ideas and then we also get feedbacks and new ideas and we change things and then we go into the development phase..." [Company C]

Suppliers

Their role is the same as the role of retailers/customers. However, their inclusion is more usual in the first stage of the innovation process by providing assistance with their ideas and feedback. They are not involved in the middle phase, while company G involves them in the validation phase, in order to gain information on how their product will be perceived by the market.

"...we are close with our suppliers, because they are always connected with many companies and they are big source of information and feedback..." [Company F]

Consumers

Consumers' role in the innovation process is not that active for all the companies, despite the fact that they have to accept the new product that companies aim to launch. However, for some researched companies their role is really important, as they are a source of idea generation and feedback which are useful for the companies during the innovation process. As it was stated, including them can prevent several risks that a new product can have upon launching.

"...we have samples which we use for consumer tests for surveys or focus groups, it depends it can be quantitative or qualitative research, most of the times ..." [Company C]

Companies in the same industry

Companies that belong in the same industry, meaning competing companies, contribute usually when there are specific projects that concern all the participating companies which are related to the objectives that they want to achieve through a coordinated effort, in order to launch products that are healthier. So, their role is contributing to idea generation and providing feedbacks through the whole innovation process, according to their expertise and knowledge. It should be noted at this point that the involvement of competing companies happens only under the circumstances of a particular project when they want to solve an industry's problem.

"...we (companies in the same industry) all have the same focus , the same goal... we work together looking at more healthy foods and lower down the amount of salt and sugar , slowly , for the consumer to get used to the new product. That works very well...They help us in a way to develop healthy products..." [Company A]

NGO's

The Non-Governmental Organizations (NGO's) which are involved in companies innovation processes are related to specific FOP labels that are acquired by them. Their role is to promote healthier eating and educating the public on issues of human health and well-being by trying to communicate those tactics with the labels that they provide. Most of the times, they are involved in the final stage of the innovation processes having a regulatory role and auditing standards of particular labels. However, company F chooses to include them also in the first stage, as they want to control the development of the product that will have a certain claim, from the beginning. It should be underlined that those organizations have a limited role in the innovation processes of the companies and in their interactions with them.

"Whether we will involve those organizations in the innovation process, it really depends on the project. But generally we include them from start on, it is not that we find out that only in a particular stage this claim is suitable, it has to be defined in the ideation or in the development phase, so yes we involve them in that."

[Company F]

Universities/Knowledge Institutions

Universities/knowledge institutions are highly valued by the companies when they are involved in their innovation processes. They do not only provide assistance in the idea generation and the concept

refinement phases, but they also give insights to the companies regarding technical issues and nutritional impacts that concern their product innovations. Another very important role that they have is enriching the profile of the company with trust and credibility. Highly academic institutions are always respected by the public. They are involved in all the stages of the innovation process. However, their involvement in the middle phase is only experienced by one researched company.

“...the university is part of the ideation phase, because it gives us an idea, it opens a lot of opportunities...”
[Company F]

8.4.3 Stakeholders and co-responsibility

None of the participating companies referred to co-responsibility with their stakeholders no matter what their type is, in the post launching phase of a product innovation. All of them have the sole responsibility, as they want to have the complete control in that particular phase of the innovation process as their brand name is the one that comes in front. So, they want to protect themselves from any risks that may arise because none of their stakeholders takes the responsibility in such situations. The only case that particular stakeholders are fully responsible, it is the case of private label products, when companies produce for retailers or other kind of customers and they do not put their brand name on the product. However, companies involve them in the stage of validation before the launching of the end product, in order to get feedbacks for further improvements which will lead to a successful product later.

“So we try to understand what their horizon is but it is never co-operational like sharing, we share insights but we do not deliver results together.” [Company F]

Concluding this section, and answering to the sub-research question: “How can different types of stakeholders contribute at each of the stages of (responsible) innovation processes for the development of healthier products”, it was found that the involvement of each type of stakeholder in the different stages of the innovation process, depends more or less on the companies’ internal strategies regarding the extent of stakeholder involvement in their innovation processes. The roles that they hold vary according to their type, as well. They can assist in the idea generation and the concept refinement phases, they can provide feedbacks throughout the whole innovation process, and they can promote and educate in a general way the public on healthy eating and in adopting a healthier lifestyle. Sometimes, they can also fund projects that lead to healthier product innovations, they enable discussions among companies regarding health issues and they are responsible, according to their type, for validating and auditing specific criteria or standards. that concern nutritional or other type of claims. Those companies that choose to involve in a greater extent their stakeholders in their innovation processes, meaning in the three stages of the innovation process, they do it for those whose role is to assist in feedbacks provision throughout the whole innovation process. The sample companies that choose to involve their stakeholders either in the first or in the final stages of the innovation

processes, so those who have a more limited involvement, hold all the other roles that were referred. However, even if they assist with all those roles, none of them, at any case, is co-responsible in the post-launching phase of the product. Companies have the sole responsibility of their product innovations.

9. Conclusion

This chapter will discuss the findings of this study in relation to previous findings in the literature. The main research question as well as the sub-researched questions which were answered from an industrial perspective will also be discussed. Then a conclusion will be given regarding the conceptual framework of this thesis.

9.1. Answering the research questions

This research studied how can open innovation enhance/limit responsible innovation for the development of healthier food products in the European food sector. This was executed by answering the sub-research questions : *“How does openness of innovation processes facilitate the integration of responsible innovation for healthier food products?”*, *“How can different types of stakeholders contribute at each of the stages of responsible innovation processes for the development of healthier food?”*, *“How are responsible innovation processes implemented in the food sector through voluntary standards, « FOP labels »?”*, looking at the European food sector.

The main objective of this thesis was to explore how food companies that belong to the European food sector confront the grand challenges of our days that are related to non-communicable diseases like obesity and diabetes type 2, looking at the emerging concept of responsible innovation. That was approached through value sensitive design as it permits values to be a part of the technical design and in this case, of the innovation design and because such a framework, it is argued to be in great alignment with the innovation process which is the unit of analysis for the present study. A particular emphasis was given on the implementation of responsible innovation in food industry’s contexts, through stakeholder involvement and the adoption of voluntary standards in the form of FOP labels. FOP labels represent the objective standards that can easily introduce societal values in the design. Furthermore, as this thesis concerned companies that adopt an open innovation process model, another aim was to explore its potential to facilitate responsible innovation integration in the food sector. Open innovation in the contexts of this thesis was operationalized looking at the activities that it entails which are divided in two categories: technology exploration and technology exploitation.

SRQ1 “How are responsible innovation processes implemented in the food sector through voluntary standards, « FOP labels »?”

Von Schomberg (2013) argues that the adoption of standards, definitions, certifications and other self-regulation measures are compulsory requirements for responsible development. They represent a new form of governance. Even though, they need to be further developed, they have a great potential for the future when the massive production of new products will make the situation unmanageable, for governments and related agencies (Von Schomberg, 2013). In an industrial context, FOP labels become more and more popular among food companies and their main objective is to help consumers in selecting healthier food products. However, little is known on how food firms practice this and if it corresponds to the notion of responsible innovation.

According to researched companies, they either develop FOP labels or adopt them by external organizations. Those labels do not only concern health claims but also nutritional and other kind of claims. In case they develop them, they do not involve or interact with their stakeholders with the exception of one company that involves an advisory board of external scientists with whom they have also created nutritional guidelines for their product portfolio. The only action that they practice is following governments' guidelines as inputs in their innovation processes, which is inside the legal boundaries when developing a new product. They also try to negotiate with governmental agencies sometimes, but due to their strict criteria, this becomes inevitable and creates disruptiveness in their innovation processes, so they choose to work alone on this. When they adopt a specific FOP label from an external organization, they choose to involve the related with this label stakeholder, on a regulatory basis, in terms of validating and auditing certain standards in the final stage of the innovation process. Furthermore, in this case, no other stakeholder is involved in the decision making process of whether they will adopt or not a specific label. In addition, most of the times with the exception of two companies, they decide to adopt a certain logo in the final stage of the innovation process when they have already developed the product. Consequently, the role of FOP labelling systems in companies' innovation processes, is very limited. Most of the times, if companies' experience difficulties they decide not to adopt a certain logo or claim as an input which could lead to the development of healthier food products as an output.

It is interesting to point out that companies' perceptions towards FOP labelling systems and their potential to serve notions of human health and well-being are divergent. Most of them, agreed that they confuse and create misunderstandings among consumers due to their number and diversity. However, companies use them in the form of a marketing strategy rather than because those labels maybe serve socio-ethical norms.

Some of them agreed that those systems could lead to healthier or more responsible products but others stated that there are a lot of transparency and trustworthiness issues concerning those labels, so they are quite reluctant in using them. It was also found that the stakeholder involvement in those systems is very limited, even if companies follow an open innovation, as the researched companies do. They also stated that

an open dialogue with groups of different types of stakeholders of the food industry, direct and indirect, would be really helpful for the creation of a common guideline concerning those labels. Those interactions would also assist to create a coordinated belief and stance towards the definitions of healthy and nutritious products. Those perceptions come in great alignment with what was stated in the literature in section 5.2. For a voluntary standard to succeed, it requires the coordinated effort of production, organization, marketing, certification, finance and institutions, as it is impossible for those systems to be independent (Meybeck & Redfern, 2014). This is not what is happening in industrial practice, though.

Moreover, some firms expressed their concerns in the idea of a uniform FOP labeling system which would be the result of a coordinated effort from several actors in the food industry, which was also argued in the literature review by Feunekes et al. (2008) (Feunekes et al., 2008). At first sight, they agreed that it could bring great advantages in a short term, but it could also put great limitations to the innovation process, in a long term. Every product innovation would be exposed to speculations from those groups of stakeholders, something that could cause great disruptiveness in companies' innovation processes. Furthermore, a very controlled food system could limit innovation as a concept and even make it extinct in a long run. Thus, what looks very easy and rational in terms of a theory, it can be detrimental for companies in terms of practice.

Concluding, it should be stated that the role of FOP labels in the form of voluntary standards that could lead in more responsible innovations is not the case from an industrial perspective. Researched companies' stance towards those systems is restrained due to their transparency implications, the disruptiveness that they could bring in their innovation processes and the fact that they could lead to less attractive final products. Furthermore, stakeholders' involvement is very limited to a regulatory form, while practicing in those systems. So, it becomes questionable whether those systems actually assist the industrial practice of responsible innovation and if they could represent useful inputs in order to develop healthier or more responsible products in the end. What it could be argued is that theory that presents the adoption of voluntary standards as a mechanism of responsible innovation implementation does not come in alignment with practice. Consequently, FOP labels, looking at the sample companies of this study, do not represent a means of responsible innovation implementation in the food industry. In this case, what should be done at first sight is the formation of a uniform definition on what could be a healthy or nutritious product. This could be achieved by the coordinated effort of different types of stakeholders as it was also proposed by the companies. The objectives, visions and goals of every party should be taken into account without causing further problems in the innovation processes of the companies. Maybe the solution would not be creating a uniform FOP labelling system but uniform guidelines which would respect the values of all the involved parties.

SRQ2: “How does openness of innovation processes facilitate the integration of responsible innovation for healthier food products?”

As it was mentioned in the literature section, an efficient and less disruptive approach to integrate responsible innovation in industry’s contexts could be through its current innovation processes. Open innovation is the main approach that companies follow nowadays. So, the answer to this question aimed to figure out how the existing practice of open innovation can facilitate or limit the implementation of socio-ethical norms for the development of healthier products in the food industry.

First of all, the results from the researched companies showed that technology exploration activities are used instead of technology exploitation activities in the context of open innovation, which comes in alignment with what the literature states about more traditional industries like the food and beverage industry, that they generally encompass the outside-in dimension in their processes (H. W. Chesbrough & Crowther, 2006; Chiaroni et al., 2011). That was also the finding in the research of Long and Blok (2017) in their research which concerned the integration of socio-ethical factors into industry innovation (Long & Blok, 2017).

The activities that were identified they were related to customer involvement and external networking. It was found that those activities facilitate the integration of values of human health and well-being in the design of the innovation processes, for the development of healthier food products. The factors that were identified to assist are: the idea generation and the exchange of feedbacks with the direct stakeholders, the involvement of stakeholders that belong to the same industry and the broader stakeholder involvement. Companies admitted that they understand better the notions of human health and well-being when more actors are involved in the innovation processes and they help them to translate those into technical practices in their innovation processes, for the development of healthier products. Dialogue and project meetings with those actors have the potential to represent useful inputs in companies’ innovation processes in order to develop products that serve the notions of human health and well-being as an output. However, the frequency of those interactions is mainly based on the product project planning of each company. So, that is actually a finding that affirms what the literature states about appropriate relationships among stakeholders, which could lead to better understanding and confrontation of the arisen problems that come from the grand challenges of our days like those of non-communicable diseases that this thesis studied (Busco et al., 2015; Chee Chiu Kwok & Sharp, 2005).

On the other hand, two great themes emerged as limitations for the integration of those values which are caused by the open innovation model. Those are the conflicting values between companies and the different types of stakeholders, as well as the time that is needed in those discussions which, as a result, increases the complexity of the innovation process. The main reason was that the companies, most of the times, are

commercially oriented while some stakeholders and particularly government/governmental agencies hold a very critical and strict stance towards health issues when it comes to a product innovation. A reason for that might be, the fact that there is not a certain claim on what is a healthy / nutritious product and how it is determined. That divides the opinions of all parties in general. However, those are not only barriers for responsible innovation but they are also barriers of including several stakeholders in the innovation processes as it was generally stated by the companies.

In the end, it could be stated that open innovation facilitates with its technology exploration activities the integration of socio-ethical norms in the design of the innovation processes for the development of healthier food products. Although, at the same time, it limits this kind of inclusion, as different types of stakeholders have different objectives and goals from the companies and the direct stakeholders like suppliers, retailers/customers, companies that belong in the food industry. These actors of the innovation process are more into commercially-driven innovations. Furthermore, the fact that nowadays companies seek for minimization of their innovation cycles, is also a reason that they are not willing to spend much time on discussions with other parties that are more into socio-ethical innovations.

SRQ3: “How can different types of stakeholders contribute at each of the stages of responsible innovation processes for the development of healthier food?”

Both open innovation and responsible innovation concern many stakeholders which are more or less active in those processes depending on their contribution. The answer to this question intended to explore how those actors facilitate the development of healthier food products in a responsible way by figuring out their actions in stages of the innovation process.

The types of stakeholders that are involved in the innovation processes of the researched companies are: government/ governmental agencies, retailers/ customers, suppliers, consumers, NGO’s and universities/ institutions. Their involvement in the different stages of the innovation process varied across companies. Generally, they were involved in the first and in the final stages of the innovation processes with some exceptions in which government/governmental agencies, companies that belong in the food industry, retailers/customers and universities/institutions were involved in the middle stage. However, this happens only under specific circumstances like the execution of a project in which all the involved parties want to achieve a certain goal. This kind of goal does not concern a specific product innovation though, but generic guidelines which will lead to healthier product innovations. This comes in alignment with what was stated in the literature that in general, stakeholder engagement occurs in the very initial steps of innovation process and in the final phase as a marketing strategy by the food companies (Blok et al., 2015).

The roles that the involved stakeholders hold in the innovation processes mostly depends on their type rather than on company specific features. So, there are those that contribute in the idea generation and inspiration in the first stage of the innovation processes and then in the later stages, they assist by providing feedbacks and sometimes technical knowledge, in order to make the product more acceptable among consumers. Those roles are represented by retailers/customers, suppliers, consumers, companies that belong in the same industry and universities/institutions. Furthermore, there are those who promote healthier eating, educate public on social issues concerning firms' product innovations, validate and audit standards and health/ nutrition criteria and they enable discussions to make products healthier. These roles are represented by government/governmental agencies, NGO's and universities/institutions. Moreover, government/governmental agencies can also be responsible for funding several projects that are related to healthier and more responsible innovations. Another important role that universities/institutions hold is that they increase the trust and credibility that firms have among the public.

In most of the cases the same type of stakeholders continued to exist in the innovation process but with a different role, which was also found by Goodman et al. (2017). In addition, most of the roles that were identified by the researched companies come in alignment with what several studies have declared in the literature review in section 5.3.2. Nevertheless, none of the stakeholders that are involved in the innovation processes of the researched companies is co-responsible in the post-launching phase of the products. This happens either because they are not willing to take such a responsibility or because companies are not willing to risk their brand name, so they want to have the complete control of the product.

Overall, all companies recognize the importance of stakeholder involvement for the development of products that serve the notions of human health and well-being. They help them to better anticipate and confront several problems that arise during the innovation processes. However, it should be noted that their interactions concern mostly technicalities and marketing strategies rather than analysis of the ethical issues that a product innovation could bring. Furthermore, the role of stakeholders like government/governmental agencies and NGO's is very limited into a regulatory form. The only NGO's that were identified were those that are related to a FOP label. So, that automatically decreases the pluralism of opinions when a product that is intended to serve the notions of human health and well-being, is planned to be launched.

MRQ: "How can open innovation enhance/limit responsible innovation for the development of healthier food products in the European food sector"

Linking to the conceptual framework of this study, it was argued that open innovation has the potential to facilitate the integration of socio-ethical norms in the innovation processes, tackle the implications of responsible innovation integration while extending this in tackling FOP labelling shortcomings.

Looking at the researched companies, it was found that this could be possible looking at the technology exploration activities that the open innovation includes and which are present in the current innovation processes of the companies. The contribution in the idea generation, the exchanging of feedbacks in the different stages of innovation, the involvement of different types of stakeholders, could enhance the integration of socio-ethical norms at a primary stage, as the current discussions on those issues are still very limited. Moreover, this kind of dialogues were found to have the potential of being considerable inputs in the innovation processes of the companies, for the development of healthier food products as an output.

Looking at the different roles that those stakeholders have in the stages of the innovation processes, as well as the particular stages that they are involved, it was shown that they are mostly present in the first and in the final phases. Their roles mostly concern their contribution in idea generation, the feedback and technical knowledge provision, the promotion of healthier eating, the education of the public on social issues concerning firms' product innovations, the validation and the auditing of standards and health/nutrition criteria, the assistance discussions to make products healthier, the funds provision as well as the increase of trust and credibility over the firms that interact with them. Although, none of the involved stakeholders, in any case, shares responsibility for the final product that is planned to be launched. Generally speaking though, it could be argued that the stakeholders could enhance the integration of socio-ethical norms in their design for the development of healthier products.

However, open innovation as it is practiced by the researched companies did not prove to assist the implementation of responsible innovation in terms of voluntary standards adoption. In the present study it is argued that this mechanism could be represented by FOP labels in the food industry. Those labels act like objective standards for the integration of societal values in the innovation process design for the development of healthier food products. As it was emerged from the results this mechanism in industrial practice, faces certain shortcomings. The sample companies do not involve stakeholders while they are developing them or when they decide to adopt them they do not involve the related organization in their innovation processes. The role of any related stakeholder in such cases it is limited in a regulatory form. Furthermore, a reason for that might be that companies are very reluctant regarding all these FOP labelling systems that exist' as there is not a uniform guideline to be followed by every company, on issues that concern healthy and nutritious food. So, that makes the whole mechanism of FOP labelling questionable in terms of industrial practice, something that contradicts the current literature. However, more research is needed in this field.

Nevertheless, this study showed that open innovation cannot only enhance the integration of responsible innovation in a European food industry context, but it can also limit it under certain conditions. The two emerged limitations that were found concern the conflicting values among the different types of stakeholders and the time load that is needed in those interactions which make the innovation processes more complex. The differences in missions, visions, goals and objectives between the companies and the involved stakeholders can create many implications in the different stages of the innovation process. Companies and direct stakeholders like retailers/customer, suppliers and companies that belong in the same industry wish for more commercially driven innovations that can assure them their continuity in the market. Alternatively, government/governmental agencies, NGO's and universities/institutions are more eager to assist in the development of products that serve the notions of human health and well-being. An interesting finding was that, even if all the different actors shared the same missions and objective, that could also create several shortcomings. Companies stated that a uniform goal for all would create the ideal situations for a more responsible food system in a short term, but in a long term there would be many possibilities that they could make innovation extinct. At this point, it should be indicated that those limitations do not only concern responsible innovation but they also represent barriers of the general concept of stakeholder involvement in the innovation processes of the companies.

All in all, it can be concluded that open innovation has the potential to assist in the integration of values like human health and well-being, so to enhance responsible innovation for the development of healthier food products through its technology exploration activities and particularly through customer involvement and external networking. However, the conflicting values and the time load that arise because of those activities could be limits, not only for responsible innovation, but also for stakeholder engagement in general. On the other hand, the way that companies practice open innovation sometimes put limitations, in the potential that this concept has, concerning the tackling of certain shortcomings that for instance, the mechanism of FOP labelling systems. That is because in such a practice the stakeholder involvement is very limited. So, that arises also questions□ if FOP labelling systems act as mechanisms or if they can represent useful inputs of responsible innovation integration in industrial contexts.

9.2. The relationship between RI and OI: adjusting the conceptual framework

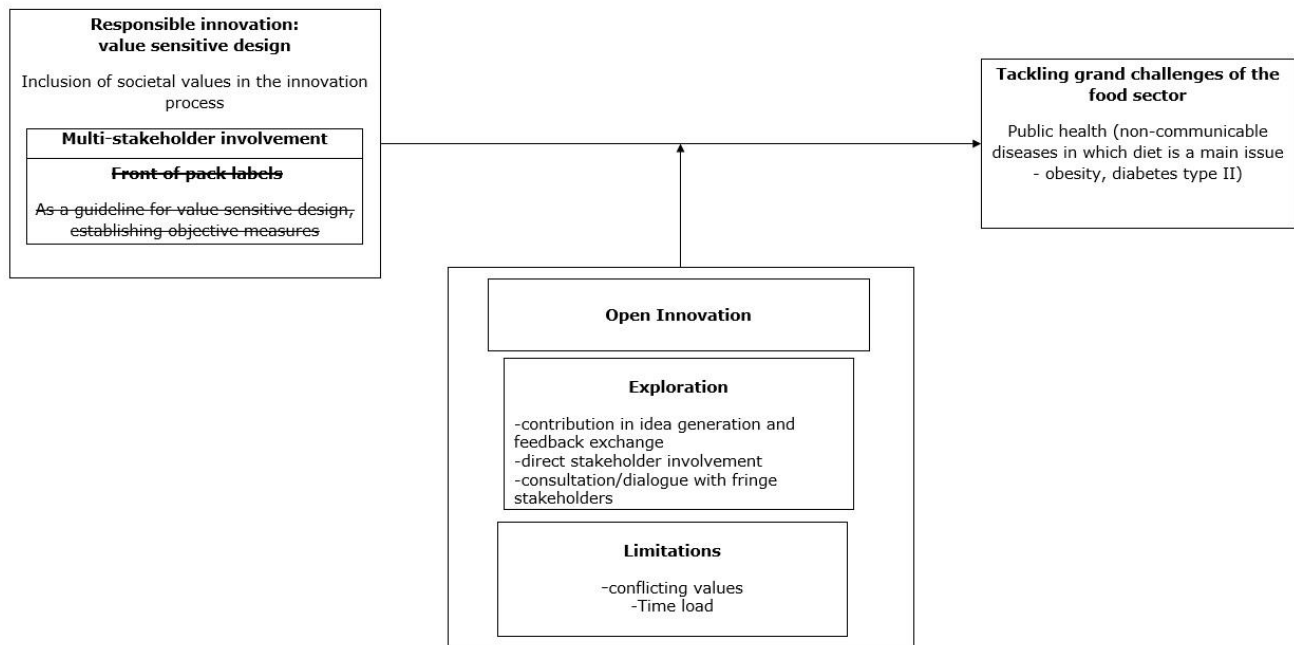
Looking at the conceptual framework of this study some adjustments have to be done after the empirical analysis. It was found that open innovation as an industry practice, has the potential to facilitate the integration of socio-ethical norms, in other words, to facilitate the integration of responsible innovation, through its technology exploration activities, as no technology exploitation activities were identified. The features that contribute to that belong mostly to the categories of customer involvement and external networking. More specifically, assistance in idea generation and feedback exchange, stakeholder involvement concerning actors that belong not only in the same industry, but also a broader engagement,

are the factors that enhance such an integration. Furthermore, the fact that stakeholders hold different kind of roles in the innovation process like contribution in idea generation, feedback and technical knowledge provision, promotion of healthier eating, education of the public on social issues concerning firms' product innovations, validation and auditing of standards and health/nutrition criteria, enabling discussions to make products healthier, funds provision as well as trust and credibility increase over the firms that interact with them, strengthens the potential of open innovation. Consequently, dialogue and project meetings with different types of actors could represent useful inputs in the innovation processes for the development of healthier food products.

As far as it concerns FOP labels which were used in this study as a mechanism of responsible innovation implementation, it was figured out that in industrial practice their role concerning the integration of socio-ethical norms is very limited and companies' opinions towards them are divergent. The fact that there are not any specific claims on how to define if a product is healthy or nutritious make them very reluctant on using them as inputs or guidelines for the development of healthier food products. The researched cases mostly use them as a marketing strategy and not that much because they represent objective standards that can easily introduce the societal values of human health and well-being in the design of their innovation processes. Furthermore, the open innovation model that they follow in their innovation processes, in general, is not applied in the FOP labelling systems that they use, either when they develop a label by themselves, or when they decide to adopt it from external organisations. They do not involve any stakeholder and when they do, it is more in a regulatory form of auditing and validating certain standards, with the exception of one case. However, they all agreed that a group of stakeholders of different types could assist in solving the transparency and trustworthiness that those systems have in terms of creating a uniform and coordinated objective and guideline for all companies, to follow. Nevertheless, none of the researched cases practice that, so the potential of open innovation to confront those kind of shortcomings is very limited in the current industrial practice and it still remains a theory.

Concluding, open innovation does not only enhance the integration of responsible innovation on an industrial practice, but it also limits it, according to the researched companies. The main reasons for that are the conflicting values among the different types of stakeholders that are involved in the innovation process and the time load that is needed in the interactions with them. Commercially driven innovations are more preferred by companies and direct stakeholders like retailers/customers, suppliers and companies that belong in the same industry, as they want to ensure their continuity in the market. As a result, despite the fact that they share the same concerns about the grand challenges of nowadays – like obesity and diabetes type 2 and they want to tackle them through their product innovations, they have to confront stakeholders' goals and missions that are strict and sometimes inevitable to translate them into industrial practices. Furthermore, it was supported that even in the case of a united stakeholder group for those issues, that

could lead to great disruptiveness in the innovation processes in a long term and even make innovation extinct. However, those are not only limitations for responsible innovation integration, but also for stakeholder engagement and open innovation in general.



10. Theoretical contributions

The present study has a general contribution to the literature of responsible innovation as far as it concerns its industrial practice in the European food production industry. The first contribution is related to the method that was selected for the operationalization of the concept of responsible innovation – value sensitive design. There are not many findings in the literature exploring value sensitive design in the food sector, so this study's conceptual framework construction was based on that concept, as it was thought to be more useful in industrial contexts.

The second contribution concerns the mechanisms of responsible innovation integration that exist in the current literature and their applicability in food industry. More specifically, this thesis complements on multi-stakeholder involvement and the adoption of voluntary standards which were the focus area. Regarding to the mechanism of multistakeholder involvement, this study adds value in the literature regarding their involvement in the innovation processes of the food sector and their particular roles in the different stages in order to develop a healthier/ more responsible food product. Furthermore, the literature findings for the relation of FOP labels in the form of voluntary standards and responsible innovation is still very limited when it comes to real practices, so this research contributed to this, regarding its explorative nature.

The third contribution is related to the main objective of the study □ how can open innovation enhance/limit responsible innovation integration. At first sight, it was shown how activities of a current innovation process model facilitate the integration of socio-ethical norms in the development of healthier/more responsible products. Then, the limitations that open innovation can cause on those issues were presented. So this thesis explored how can a current innovation process model that is practiced by more and more food companies nowadays, can contribute in tackling the grand challenges that the food sector phases like obesity and diabetes type 2.

11. Practical implications

This study contributes also as a practitioner-oriented material to the current business practices as far as it concerns their innovation processes.

First of all, it provides an overview of the practices that the European food production companies adopt, in order to respond to the grand challenges that the food sector faces nowadays' non-communicable diseases. Linking to this, it provides companies' stance regarding those issues and their extent of willingness to respond to them. Furthermore, it gives insights on their innovation processes for the production of a healthier/ more responsible product looking at the different stages' idea generation, product development and launching, of the innovation process. The focus of the study is on the open innovation processes of the companies and how those enhance or limit the integration of socio-ethical norms. It provides not only ways with which the current industry innovation model could assist in such integration, but it also presents the limitations that could be experienced regarding the results of the sample cases.

Moreover, it goes through the relationships and the interactions that companies have with their stakeholders. It presents the different types of stakeholders that companies acquire, their involvement and the different roles that they hold in firms' innovation processes. However, it also comments on the different barriers that companies' identified due to this interaction.

In addition, this research includes information regarding an urgent issue among food companies nowadays, FOP labels. The stance and the perceptions of the sample cases are presented, as well as a description on how they practice them. It gives insights on the role of those systems towards the development of healthier/ more responsible products, as it was identified by the researched companies. Finally, it comments on how issues of transparency and trustworthiness could be confronted.

12. Limitations and recommendations for future research

As a first limitation to this research, it could be argued that the results may not be generalized to the whole European food production sector. The cases that this study concerned were seven despite the fact that the number of companies that were reached twenty one. Most of the companies that did not have the

willingness to participate were large enterprises which either they did not have time to devote to this research, or they never responded, even though, there were many attempts to get informed about the project. So, small and medium sized firms represented the sample of this research which are mainly located in the Netherlands but they also export in the European Union. Another issue that does not permit the generalization of the results is the sampling method that was selected for this thesis, which was the non-probabilistic/judgmental. Consequently, only specific companies that met the criteria that were mentioned in section 7 could take part in the research.

Furthermore, one of the main concepts that this study explored, responsible innovation, is still under-research and most of the times unknown among the companies. Many food companies in this study's sample handle responsible innovation as part of their corporate social responsibility programs, so there is not a clear picture of what this notion means for a company and how it is performed. During the interviews there were several times that it was needed to explain further what responsible innovation is, so that automatically causes many limitations regarding the result analysis in the end.

Researcher bias is always a problem in qualitative research as this can be depicted in the formation of interviews questions as well as in the interpretation of responses. However, as far as it concerns the interview questions, the literature and similar studies assisted in creating a guideline for the formation of the interview questions. Moreover, continuous feedbacks from the experienced supervisors of this study, as well as from other researchers from Wageningen University who are acquainted with these methods, led to an efficient interview protocol. Although, in case of the results interpretation, it was attempted to prevent the research bias as much as possible, regarding that this was executed by only one researcher and the continuous feedbacks from the related supervisors.

The fact that all researched companies were chosen because of the open innovation process model that they acquire also puts some limitations, as not all companies follow a similar innovation process. Different companies perceive and practice differently what it is called in theory open innovation. Furthermore, regarding this, the way that they practice FOP labelling, it did not correspond to the notion of open innovation. In fact, most of the researched companies seemed to follow a different direction towards these systems which does not represent the open innovation model as a notion.

This research has explored the potential of a current innovation process model, that of open innovation, in the integration of responsible innovation for the development of healthier food products in the European food production sector. First and foremost, more research is needed to be done regarding the approach of operationalization of responsible innovation that this study selected, value sensitive design, in the food industry. Furthermore, responsible innovation is a concept that needs further exploration anyways, on a food industrial context. Literature is not very specific on the mechanisms of responsible innovation

integration and how those should be practiced. This study focused on multi-stakeholder involvement and the adoption of voluntary standards. Both mechanisms need further research and especially the mechanism of the adoption of voluntary standards which is mostly present as theory and little is known in practice. Moreover, FOP labeling systems need to be studied in greater extent looking at the perspective of food industry as from the perspective of consumers there are many information. Their development, practice and the related with them actors require further exploration.

13. Bibliography

- Aad Correljé, Eefje Cuppen, Marloes Dignum, U. P. & B. T. (2014). Responsible Innovation in Energy Projects: Values in the Design of Technologies, Institutions and Stakeholder Interactions 1 (Draft version for forthcoming book) Aad Correljé, Eefje Cuppen, Marloes Dignum, Udo Pesch & Behnam Taebi, 1(313), 1–15.
- Aarikka-Stenroos, L., Sandberg, B., & Lehtimäki, T. (2014). Networks for the commercialization of innovations: A review of how divergent network actors contribute. *Industrial Marketing Management*, 43(3), 365–381. <https://doi.org/10.1016/j.indmarman.2013.12.005>
- Agogue, M., Ystrom, A., & Le Masson, P. (2013). Rethinking the Role of Intermediaries As an Architect of Collective Exploration and Creation of Knowledge in Open Innovation. *International Journal of Innovation Management*, 17(2), 1350007. <https://doi.org/10.1142/S1363919613500072>
- Ainger, K., & Klein, K. (2016). *How the food lobby fights sugar regulation in the EU*. Retrieved from <http://archpublichealth.biomedcentral.com/articles/10.1186/s13690-016-0162-8>
- Ayuso, S., Ángel Rodríguez, M., & Enric Ricart, J. (2006). Using stakeholder dialogue as a source for new ideas: a dynamic capability underlying sustainable innovation. *Corporate Governance: The International Journal of Business in Society*, 6(4), 475–490. <https://doi.org/10.1108/14720700610689586>
- Bentley, E. (2017). oTranscribe. Retrieved from <http://otranscribe.com/>
- Berg, J. Van Den. (2017). What it Takes to Innovate Responsible An exploratory study based on the performance data of Dutch private food companies.
- Bigliardi, B., & Galati, F. (2013). Models of adoption of open innovation within the food industry. *Trends in Food Science and Technology*, 30(1), 16–26. <https://doi.org/10.1016/j.tifs.2012.11.001>
- Blok, V., Hoffmans, L., & Wubben, E. F. M. (2015). Stakeholder engagement for responsible innovation in the private sector: critical issues and management practices. *Journal on Chain and Network Science*, 15(2), 147–164. <https://doi.org/10.3920/JCNS2015.x003>
- Brem, A. (2008). *The boundaries of innovation and entrepreneurship: Conceptual background and essays on selected theoretical and empirical aspects*. *The Boundaries of Innovation and Entrepreneurship: Conceptual Background and Essays on Selected Theoretical and Empirical Aspects*. <https://doi.org/10.1007/978-3-8349-9679-4>
- Bremmers, H., Omta, O., Kemp, R., & Haverkamp, D. J. (2007). Do stakeholder groups influence environmental management system development in the Dutch agri-food sector? *Business Strategy and the Environment*, 16(3), 214–231. <https://doi.org/10.1002/bse.480>
- Bryman, A., Bell, E., Mills, A. J., & Yue, A. R. (2011). *Business Research Methods*. *Business Research Methods*. <https://doi.org/0195430298>
- Burdick, J. M. (2014). *Encyclopedia of Food and Agricultural Ethics*. <https://doi.org/10.1007/978-94-007-0929-4>
- Busco, C., Frigo, L. M., Riccaboni, A., & Quattrone, P. (2015). *Integrated Reporting Concepts and Cases that Redefine Corporate Accountability*. Springer. <https://doi.org/10.1057/978-1-137-55149-8>
- Castillo-Montoya, M. (2016). Preparing for Interview Research : The Interview Protocol Refinement Framework. *The Qualitative Report*, 21(5), 811–831. <https://doi.org/Retrieved from: http://nsuworks.nova.edu/cgi/viewcontent.cgi?article=2337&context=tqr>
- Chee Chiu Kwok, W., & Sharp, D. (2005). Power and international accounting standard setting. *Accounting, Auditing & Accountability Journal*, 18(1), 74–99. <https://doi.org/10.1108/09513570510584665>

- Chen, J., Chen, Y., & Vanhaverbeke, W. (2011). The influence of scope, depth, and orientation of external technology sources on the innovative performance of Chinese firms. *Technovation*, 31(8), 362–373. <https://doi.org/10.1016/j.technovation.2011.03.002>
- Chesbrough, H. (2015). Open Innovation: Striving for Innovation Success in the 21st Century. *Open Mind*. Retrieved from <https://www.bbvaopenmind.com/en/article/open-innovation-striving-for-innovation-success-in-the-21st-century/?fullscreen=true>
- Chesbrough, H. W., & Crowther, A. K. (2006). Beyond high-tech: early adopters of Open Innovation in other industries. *R&D Management*, 36(3), 229–236. <https://doi.org/10.1111/j.1467-9310.2006.00428.x>
- Chiaroni, D., Chiesa, V., & Frattini, F. (2011). The Open Innovation Journey: How firms dynamically implement the emerging innovation management paradigm. *Technovation*, 31(1), 34–43. <https://doi.org/10.1016/j.technovation.2009.08.007>
- Dörner, N., Gurtner, S., & Schefczyk, M. (2009). Overcoming resistance to innovations : an approach for the use of communication tools within the innovation process. *International Journal of Technology Marketing*, 4(2/3), 199–216. <https://doi.org/10.1504/IJTMKT.2009.026870>
- Dreyer, M., Chefneux, L., Goldberg, A., von Heimburg, J., Patrignani, N., Schofield, M., & Shilling, C. (2017). Responsible innovation: A complementary view from industry with proposals for bridging different perspectives. *Sustainability (Switzerland)*, 9(10), 1–25. <https://doi.org/10.3390/su9101719>
- Dries, L., Pascucci, S., Török, Á., & Tóth, J. (2014). Keeping your secrets public? Open versus closed innovation processes in the hungarian wine sector. *International Food and Agribusiness Management Review*, 17(1), 147–162.
- Eisenhardt, K. M. (2007). THEORY BUILDING FROM CASES : OPPORTUNITIES AND CHALLENGES, 50(1), 25–32.
- Enzing, C. (2009). *Product innovation in the Dutch food and beverage industry* (5th ed., Vol. 5). Wageningen Academic Publishers.
- Feunekes, G. I. J., Gortemaker, I. A., Willems, A. A., Lion, R., & van den Kommer, M. (2008). Front-of-pack nutrition labelling: Testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. *Appetite*, 50(1), 57–70. <https://doi.org/10.1016/j.appet.2007.05.009>
- FoodDrinkEurope. (2017). FoodDrinkEurope. Retrieved from <http://www.fooddrink europe.eu/>
- Ford, C., Sureka, P., & Reid, B. (2012). Realising the Value of Open Innovation. *Big Innovation Centre*, (September), 1–69.
- Freeman, R. E. E., & McVea, J. (2001). A Stakeholder Approach to Strategic Management. *SSRN Electronic Journal*, (January 2015). <https://doi.org/10.2139/ssrn.263511>
- Friedman, B. (1996). Value-sensitive design. *Interactions*, 3(6), 16–23. <https://doi.org/10.1145/242485.242493>
- Friedman, B., Kahn Jr., P. H., & Borning, A. (2006). Value Sensitive Design and Information Systems (PREPRINT). *Human-Computer Interaction and Management Information Systems: Foundations*, 1–27. <https://doi.org/10.1145/242485.242493>
- FSA. (2013). Guide to Creating a Front of Pack (FoP) Nutrition Label for Pre-packed Products Sold through Retail Outlets. *Food Standards Agency*, (June), 27. Retrieved from www.dh.gov.uk
- G. Cooper, R. (2014). Stage-Gate Systems: A New Tool for Managing New Products, (June). <https://doi.org/10.1.1.474.1777>
- Galati, F., Bigliardi, B., & Petroni, A. (2016). Open Innovation in Food Firms: Implementation Strategies, Drivers and Enabling Factors. *International Journal of Innovation Management*, 20(3), 1650042. <https://doi.org/10.1142/S1363919616500420>
- Gassmann, O., & Enkel, E. (2004). Towards a theory of open innovation: three core process archetypes. *R&D Management Conference*, 1–18. <https://doi.org/10.1.1.149.4843>
- Gerybadze, A., Hommel, U., & Thomaschewski, H. W. R. D. (2010). *Innovation and International Corporate Growth*. *Innovation and International Corporate Growth*. https://doi.org/10.1007/978-3-642-10823-5_13
- Goodman, J., Korsunova, A., & Halme, M. (2017). Our Collaborative Future: Activities and Roles of Stakeholders in Sustainability-Oriented Innovation. *Business Strategy and the Environment*, 26(6), 731–753. <https://doi.org/10.1002/bse.1941>
- Gould, R. W. (2012). Open Innovation and Stakeholder Engagement. *Journal of Technology Management & Innovation*, 7(3), 1–11. <https://doi.org/10.4067/S0718-27242012000300001>
- Greenwood, M. (2007). Stakeholder engagement: Beyond the myth of corporate responsibility. *Journal of Business Ethics*, 74(4), 315–327. <https://doi.org/10.1007/s10551-007-9509-y>
- Grönlund, J., Sjödin, D. R., & Frishammar, J. (2010). Open Innovation and the Stage-Gate Process: A Revised Model for New Product Development. *California Management Review*, 52(3), 106–131. <https://doi.org/10.1525/cmr.2010.52.3.106>

- Grunert, K. G., & Wills, J. M. (2007). A review of European research on consumer response to nutrition information on food labels. *Journal of Public Health, 15*(5), 385–399. <https://doi.org/10.1007/s10389-007-0101-9>
- Gurzawska, A., Mäkinen, M., & Brey, P. (2017). Implementation of Responsible Research and Innovation (RRI) practices in industry: Providing the right incentives. *Sustainability (Switzerland), 9*(10). <https://doi.org/10.3390/su9101759>
- Hawkes, C. (2004). Nutrition labels and health claims: the global regulatory environment, 1–88.
- Hawkes, C. (2010). Government and voluntary policies on nutrition labelling: a global overview. In *Innovations in Food Labelling* (pp. 37–58). <https://doi.org/10.1533/9781845697594.37>
- Holmes, S., & Smart, P. (2009). Exploring open innovation practice in firm-nonprofit engagements. *R and D Management, 39*(4), 394–409. <https://doi.org/10.1111/j.1467-9310.2009.00569.x>
- Howells, J. (2006). Intermediation and the role of intermediaries in innovation. *Research Policy, 35*(5), 715–728. <https://doi.org/10.1016/j.respol.2006.03.005>
- Huizingh, E. K. R. E. (2011). Open innovation: State of the art and future perspectives. *Technovation, 31*(1), 2–9. <https://doi.org/10.1016/j.technovation.2010.10.002>
- Hyde, K. F. (2000). Recognising deductive processes in qualitative research. *Qualitative Market Research: An International Journal, 3*(2), 82–90. <https://doi.org/10.1108/13522750010322089>
- Julia, C., & Hercberg, S. (2016). Research and lobbying conflicting on the issue of a front-of-pack nutrition labelling in France. *Archives of Public Health, 74*(1), 51. <https://doi.org/10.1186/s13690-016-0162-8>
- Kleef, E. Van, & Dagevos, H. (2015). The Growing Role of Front-of-Pack Nutrition Profile Labeling: A Consumer Perspective on Key Issues and Controversies. *Critical Reviews in Food Science and Nutrition, 55*(3), 291–303. <https://doi.org/10.1080/10408398.2011.653018>
- Koen, N., Blaauw, R., & Wentzel-Viljoen, E. (2016). Food and nutrition labelling: the past, present and the way forward. *South African Journal of Clinical Nutrition, 29*(1), 13–21. <https://doi.org/10.1080/16070658.2016.1215876>
- Koops, B. J., Oosterlaken, I., Romijn, H., Swierstra, T., & van den Hoven, J. (2015). Responsible innovation 2: Concepts, approaches, and applications. *Responsible Innovation 2: Concepts, Approaches, and Applications, 1–303*. <https://doi.org/10.1007/978-3-319-17308-5>
- Koops, B., Oosterlaken, I., Romijn, H., & Jeroen, T. S. (2015). *Responsible Innovation 2*.
- Kothari, C., Kumar, R., & Uusitalo, O. (2014). *Research Methodology. New Age International*. <https://doi.org/http://196.29.172.66:8080/jspui/bitstream/123456789/2574/1/Research%20Methodology.pdf>
- L'Abbe, M. R., McHenry, E. W., & Emrich, T. (2012). *What is Front-of-Pack Labelling ? Codex Committee on Food Labelling FAO / WHO Information Meeting on Front-of-Pack Nutrition Labelling*. Charlottetown PEI.
- Long, T., & Blok, V. (2017). Integrating the management of socio-ethical factors into industry innovation: Towards a concept of Open Innovation 2.0.
- Lü, J., Lü Jinghui Supervisor Ahokangas, A. P., & Lehtinen, U. (2013). OULU BUSINESS SCHOOL THE ROLE OF EXPORT INTERMEDIARIES IN FACILITATING EXPORT TRADE OF FINNISH SMALL COMPANIES The role of export intermediaries in facilitating export trade of Finnish small companies Case food industry.
- Lubberink, R., Blok, V., Ophem, J. van, & Omta, O. (2017). Lessons for responsible innovation in the business context: A systematic literature review of responsible, social and sustainable innovation practices. *Sustainability (Switzerland), 9*(5). <https://doi.org/10.3390/su9050721>
- Lupton, J. R., Balentine, D. A., Black, R. M., Hildwine, R., Ivens, B. J., Kennedy, E. T., ... Story, M. (2010). The Smart Choices front-of-package nutrition labeling program: Rationale and development of the nutrition criteria. *American Journal of Clinical Nutrition, 91*(4), 1078–1089. <https://doi.org/10.3945/ajcn.2010.28450B>
- Madsen, H., & Ulhøi, J. P. (2001). Integrating environmental and stakeholder management. *Business Strategy and the Environment, 10*(2), 77–88. <https://doi.org/10.1002/bse.279>
- Meybeck, A., & Redfern, S. (2014). *Voluntary Standards for Sustainable Food Systems: Challenges and Opportunities A Workshop of the FAO/UNEP Programme on Sustainable Food Systems*. FAO. Rome. Retrieved from <http://www.fao.org/3/a-i3421e.pdf>
- Nathan, G. (2015). Innovation process and ethics in technology: an approach to ethical (responsible) innovation governance. *Journal on Chain and Network Science, 15*(2), 119–134. <https://doi.org/10.3920/JCNS2014.x018>

- Owen, R. (2014). Responsible Research and Innovation: Options for Research and Innovation Policy in the Eu. Retrieved from http://ec.europa.eu/research/innovation-union/pdf/expert-groups/Responsible_Research_and_Innovation.pdf
- Owen, R., Macnaghten, P., & Stilgoe, J. (2012). Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy*, 39(6), 751–760. <https://doi.org/10.1093/scipol/scs093>
- Pedersen R, E., & Andersen, M. (2006). Safeguarding corporate social responsibility (CSR) in global supply chains: how codes of conduct are managed in buyer-supplier relationships Esben. *Journal of Public Affairs*, 15(1), 14–21. <https://doi.org/10.1002/pa>
- Rodriguez, M. A., Ricart, J. E., & Sanchez, P. (2002). Sustainable Development and the Sustainability of Competitive Advantage: A Dynamic and Sustainable View of the Firm. *Creativity and Innovation Management*, 11(3), 135–146. <https://doi.org/10.1111/1467-8691.00246>
- Sarkar, S., & Costa, A. (2008). Dynamics of open innovation in the food industry. *Trends in Food Science & Technology*, 19(11), 574–580. <https://doi.org/10.1016/j.tifs.2008.09.006>
- Sharma, L. L., Teret, S. P., & Brownell, K. D. (2010). The food industry and self-regulation: Standards to promote success and to avoid public health failures. *American Journal of Public Health*, 100(2), 240–246. <https://doi.org/10.2105/AJPH.2009.160960>
- Simon, J. (2016). Value-Sensitive Design and Responsible Research and Innovation, 219–236.
- Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*, 42(9), 1568–1580. <https://doi.org/10.1016/j.respol.2013.05.008>
- Taebi, B., Correljé, A., Cuppen, E., Dignum, M., & Pesch, U. (2014). Responsible innovation as an endorsement of public values: the need for interdisciplinary research. *Journal of Responsible Innovation*, 1(1), 118–124. <https://doi.org/10.1080/23299460.2014.882072>
- Tempels, T., Verweij, M., & Blok, V. (2017). Big food's ambivalence: Seeking profit and responsibility for health. *American Journal of Public Health*, 107(3), 402–406. <https://doi.org/10.2105/AJPH.2016.303601>
- Thomas, D. R. (2006). A General Inductive Approach for Analyzing Qualitative Evaluation Data. *American Journal of Evaluation*, 27(2), 237–246. <https://doi.org/10.1177/1098214005283748>
- Thomas, E. (2012). The role of intermediaries in collaborative innovation projects. *Globelicsacademy.Net*, 1–16. Retrieved from http://www.globelicsacademy.net/2013_pdf/Full papers/Thomas full paper.pdf
- Traitler, H., Watzke, H. J., & Saguy, I. S. (2011). Reinventing R&D in an Open Innovation Ecosystem. *Journal of Food Science*, 76(2). <https://doi.org/10.1111/j.1750-3841.2010.01998.x>
- van de Poel, I., Asveld, L., Flipse, S., Klaassen, P., Scholten, V., & Yaghmaei, E. (2017). Company Strategies for Responsible Research and Innovation (RRI): A Conceptual Model. *Sustainability*, 9(11), 2045. <https://doi.org/10.3390/su9112045>
- van de Vrande, V., de Jong, J. P. J., Vanhaverbeke, W., & de Rochemont, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation*, 29(6–7), 423–437. <https://doi.org/10.1016/j.technovation.2008.10.001>
- van den Bosch, P. (2017). *Moral Intelligence for IT Production*. UTwente.
- van den Hoven, J. (2015). *ENGINEERING ETHICS : RESPONSIBLE INNOVATION & VALUE*. Delft.
- van der Valk, W., & Wynstra, F. (2005). Supplier involvement in new product development in the food industry. *Industrial Marketing Management*, 34(7 SPEC. ISS.), 681–694. <https://doi.org/10.1016/j.indmarman.2005.05.009>
- Verschuren, P., & Doorewaard, H. (2010). Designing a Research Project: Project Design. *Designing a Research Project*, 1–25. <https://doi.org/10.1007/s13398-014-0173-7.2>
- Von Schomberg, R. (2013). A Vision of Responsible Research and Innovation. *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, 51–74. <https://doi.org/10.1002/9781118551424.ch3>
- Vyth, E. L., Steenhuis, I. H., Roodenburg, A. J., Brug, J., & Seidell, J. C. (2010). Front-of-pack nutrition label stimulates healthier product development: a quantitative analysis. *The International Journal of Behavioral Nutrition and Physical Activity*, 7, 65. <https://doi.org/10.1186/1479-5868-7-65>
- Wartella, A. E., Lichtenstein, H. A., & Boon, S. C. (2010). *Examination of Front-of-Package Nutrition Rating Systems and Symbols*. <https://doi.org/10.17226/12957>
- West, J., Salter, A., Vanhaverbeke, W., & Chesbrough, H. (2014). Open innovation: The next decade. *Research Policy*, 43(5), 805–811. <https://doi.org/10.1016/j.respol.2014.03.001>

WHO. (2009). *Global Strategy on diet, physical activity and health*. (Vol. 2002).

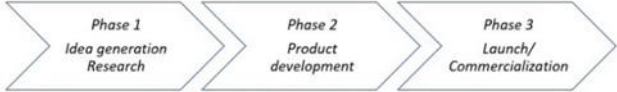
Yin, R. K. (2003). *Case Study Research . Design and Methods*. *SAGE Publications*. <https://doi.org/10.1097/FCH.0b013e31822dda9e>

14. Appendices

Appendix I

Operationalization matrix and interview protocol

The operationalization matrix of the interview protocol is provided in this Appendix. The interview protocol was operationalized in approximately 15 questions. The matrix shows the relation of those questions with the concepts of this study and the variable that were used for forming the interview questions. The column of the pertinent interview questions represents the actual interview questions which in this table are categorised regarding the sub-research questions of the study, so before those questions there is a headline that summarizes somehow which interview questions belong to the sub-research questions.

Concept	Variables	Pertinent interview questions	References
		Responsible Innovation in the food sector	
Innovation process	3-stages model 	- Could you explain the stages/steps of your innovation process when developing a healthier product?	(H. Chesbrough, 2015; Gassmann & Enkel, 2004)
Responsible Innovation/ values integration in innovation processes	Emphasis on Innovation for society	-How is responsible innovation understood by your company regarding the grand challenges of nowadays like obesity and diabetes type2?	

Innovation with society	Value sensitive design Practices like: stakeholder involvement, adoption of voluntary standards, normative/ethical design technology, public engagement, application of precautionary principle, technology assessment and foresight	-How does your company involve/integrate the notion of human health and well-being when developing food products regarding the innovation processes that the company follows? -How does your company integrate those values in practice?	(Blok et al., 2015; Burdick, 2014; van den Hoven, 2015; Von Schomberg, 2013)
	3 stages: ideation product development, commercialization	-How does the integration of those values affect the innovation process?	(Gassmann & Enkel, 2004)
		Responsible innovation and stakeholders' contribution (SRQ-2)	
Stakeholder involvement in innovation process	Types: customers, suppliers, NGO's, academic institutions etc. Interaction: information and knowledge sharing, dialogue Phases of engagement: ideation, product development, commercialization	-How are they involved looking at the innovation process when it comes to develop healthier products? -in which phases? -in what ways? consultation, dialogue? how often?	(Ayuso et al., 2006; Blok et al., 2015; Bremmers et al., 2007; Madsen & Uihøi, 2001)
	Roles: broker mediator, stimulator, concept refiner, legitimator, educator, context enabler, impact extender	-What about stakeholders' responsibilities? (according to their type and the innovation phase)	(Aarikka-Stenroos et al., 2014; Agogue et al., 2013; Goodman et al., 2017; Howells, 2006; E. Thomas, 2012)
	Co-responsibility	- How about their role/responsibility in post launching phase of the product? -Are they co-responsible when they are involved? until the launching phase?	(Blok et al., 2015)
		Responsible innovation and open innovation (SRQ-1/3)	
Open innovation and stakeholder engagement	Technology exploitation and technology exploration activities: customer involvement, external networking, external participation, outsourcing R&D, IP purchasing, outward licensing, venturing, employee involvement	-Concerning the development of healthier products, in what ways does your company collaborate with external actors in the context of its innovation activities?	(H. W. Chesbrough & Crowther, 2006; Chiaroni et al., 2011; van de Vrande et al., 2009)
Open Innovation activities and	Tackling the grand challenges of nowadays like obesity,	- How do you think the collaboration activities that	(Galati et al., 2016; Simon,

responsible innovation	identification of conflicting values	are followed, help/limit the development of more responsible (healthier) products?	2016; Taebi et al., 2014; van den Hoven, 2015)
		Responsible innovation-FOP (SRQ-3)	
Responsible Innovation and FOP/ FOP in the value sensitive design process	Cooperation, transparency, credibility, trust Role: close monitoring, evaluation, consultation	- How do you think the involved stakeholders contribute to FOP labels' transparency and trustworthiness issues that every company in food industry has to deal with? -How do they enhance those? -How about their particular role in this?	(Feunekes et al., 2008; Grunert & Wills, 2007; Kleef & Dagevos, 2015; Meybeck & Redfern, 2014)
	Stakeholders' involvement/co-creation	- Do the FOP labels used are developed by the company or by an external organization? -if they don't develop: how are those standards integrated in the innovation process, hoe do they choose which FOP to use?	(Wartella et al., 2010)
	Self-promotion strategy, reformulation/ development of healthier products as they want to confront human health and well-being, mechanism of RI	- Do you think that the implementation of those labels lead to more socially responsible products?	(Kleef and Dagevos 2015; Meybeck and Redfern 2014; Von Schomberg 2013; Sharma, Teret, and Brownell 2010)
	Effects regarding 3 stages of innovation process, disruptiveness, implications Guideline provision for product reformulation	-How about the role that FOP labels hold in the innovation process?	(Wartella et al., 2010)

Appendix II

Tree of codes

This appendix presents the codes that were extracted in three levels regarding the interviews of this study. In the first column there are the first level codes and in the second and third columns the codes that were resulted after the selective coding process.

<ul style="list-style-type: none"> -feeling of responsibility towards health issues -willingness to develop healthier/more responsible products -willingness to help people follow a healthy diet -willingness to create pure and simple recipes -efforts for values inclusion in innovation processes 	companies' understanding of values	Values integration in the innovation process
<ul style="list-style-type: none"> -changes in the production process -does not make good commercial case -flavor and taste priorities -type of product -need for different kind of investments 	Limitations in values integration	

<ul style="list-style-type: none"> -avoiding preservatives -careful ingredient selection -fat reduction -sugar reduction -salt reduction -ingredient replacement -higher content in fibers 	ingredient related	practices/actions for values integration
<ul style="list-style-type: none"> -changes in production processes -give information on preparation methods 	process related	
<ul style="list-style-type: none"> -stakeholder inclusion 	stakeholder inclusion	
<ul style="list-style-type: none"> -projects related to well-being of consumers and employees 	projects related to well-being of consumers and employees	
<ul style="list-style-type: none"> -nutritional analyses in house -nutritional projects and guidelines formation 	nutritional related	

<ul style="list-style-type: none"> -government/governmental - agencies -retailers/customers -suppliers -consumers -companies in the same industry -NGO's -Universities/Institutions 	stakeholder types in innovation process	Stakeholder involvement in innovation processes
<ul style="list-style-type: none"> -first stage -product development stage -final stage -fully engaged in all stages 	stage of involvement in innovation process	
<ul style="list-style-type: none"> -dialogue -consultation -focus groups -universities' students -- involvement in projects -qualitative/quantitative research -surveys -formal -informal 	Ways of stakeholder engagement	
<ul style="list-style-type: none"> -very frequent -few times a month -few times a year -continuously -rarely 	frequency of relationship	
<ul style="list-style-type: none"> -better understanding of values -facilitates the whole innovation - process -receiving feedbacks -new ideas -getting larger scale -refunds for special projects 	Benefits of stakeholder involvement	
<ul style="list-style-type: none"> -conflicting values -strict guidelines -time load -no added value 	Barriers of stakeholder involvement	
<ul style="list-style-type: none"> -sole responsibility -partial responsibility -no responsibility 	Co-responsibility	

<ul style="list-style-type: none"> -nutritional value -choices label -green keyhole -vegetarian -vegan -biological -cocoa certified -whole-grain -gluten-free -lactose-free -allergen-free -100% sunflower 	Types of used FOP labels	FOP labels in industrial context
<ul style="list-style-type: none"> -arbitrary opinions for products -challenging work under strict guidelines -easier innovation process when following guidelines -easy choice for consumers -healthier products with FOP labels -FOP labels quality is claims depending -no added value for consumers -no added value in certain product types -no helpful in leading to -time saving when following standards 	FOP labels and companies perceptions	
<ul style="list-style-type: none"> -confusing consumers/create misunderstandings -disrupting innovation processes -making products less attractive -transparency/trustworthiness issues 	FOP labelling shortcomings	
<ul style="list-style-type: none"> -applying for a FOP label -self-developed labels 	FOP labelling strategy	
<ul style="list-style-type: none"> -no involvement of FOP label in the innovation process -involvement of FOP label in the final stage -involvement of FOP label in the first phase -involvement of the FOP label in the product development phase 	FOP labelling practice in innovation process	

<ul style="list-style-type: none"> -auditing the claims of a label -no inclusion of stakeholders in FOP labelling -transparency enhancement -understandable labels 	stakeholders' inclusion in FOP labelling	stakeholders' inclusion in FOP labelling
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Appendix III

Table 16: Companies' perceptions on values of human health and well-being and barriers in their integration in the innovation process

Case	Quote	Barriers
Company A	<p>"Yeah, of our main responsibility is that people need to eat more vegetables and pulses and we do that by developing nice recipes...So our main goal is to develop products which are nice to eat but in the end give you the benefits of all vegetables and the fibers etc."</p> <p>"So regarding to obesity we are very aware of the problem and I think that we take the right responsibility for people to make it easy to eat enough vegetables and pulses which is very helpful for the right diet and the right way to follow"</p> <p>"...people need to eat more vegetables..."</p> <p>"...within our portfolio all the recipes are very pure, very simple..."</p>	Flavor and taste as priorities
Company B	<p>"...developing products that are healthy, it is one of our main drivers for innovation...Our customer group is very health conscious and it is buying our products because they are healthy alternatives to meat or to other products, so in our case is one of the main drivers for development and also if we do not meet the healthy criteria the product might not sell so it is the most easiest driver for us. It is more like business commercial driver to put energy into this."</p>	Need for different kind of investments
Company C	<p>"Most of the products we develop nowadays are either healthier concepts or improvements of existing products in which we reduce salt or sugar or fats. So that is the main goal of our product innovations. We are trying to make healthier products but we are also a brand really down to earth, so our products are not that niche or over healthy but just sensible products and we try to make them a little bit healthier than other bakery brands...We just try to make existing products a little bit healthier."</p> <p>"We always have in mind human health and well-being when developing a healthier concept of a product. So for example we have the product and we want to reduce the amount of sugar in it, we follow the same process when developing it and there is always somebody from our quality department in this project doing the calculations and make sure it is feasible in every step."</p> <p>"...we still try to have our products in self as healthy as possible..."</p>	<p>Flavor and taste as priorities</p> <p>Changes in the production process</p>
Company D	<p>"For us social responsibility is important but on the other side is not the main part we focus on the product development."</p> <p>"...we look for the healthier options among our product range..."</p> <p>"...we always choose for the best option considering consumers' health..."</p> <p>"So we take those values of human health and well-being into account, but they are not our main focus."</p>	<p>Flavor and taste priorities</p> <p>Type of the product</p>
Company E	<p>"...we really do feel responsible for good and healthy food..."</p> <p>"...we try to follow notions of human health and well-being throughout our innovation process..."</p> <p>"We try to develop more products with more vegetables, low in salt, preferably with no added sugars"</p>	<p>Flavor and taste as priorities</p> <p>Commercially risky</p>
Company F	<p>"We believe very strongly in human health and well-being but our products are very</p>	Flavor and

	<p>basic because all of our raw materials are very healthy..."</p> <p>"...so basically our innovation approaches respect the healthy nature of the product and maintain it during the process , so , all our new innovations are no sugar or salt added, clean label, very shortly cooked so basically all our innovation efforts are in the area of maintaining the health of fruits and vegetables as our own material."</p> <p>"...it is our mission to help people to get their portion of fruit and vegetables on a daily basis, so always take the consumer as guide..."</p>	<p>taste as priorities</p> <p>Commercially risky</p>
Company G	<p>"...so when developing a product it has to be good for you...in the sense of good from a nutritional standpoint. The product has to be also good for the planet which means , responsible sourcing or improving as much as possible our production processes and also has to be good for the communities , so whenever, wherever possible the company, tries to help the local communities."</p> <p>"Better for you is an area we try to push a lot because we really believe that the healthier approach is an important part of our job, so our responsibility as a company."</p>	<p>Flavor and taste as priorities</p>