UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Master Degree Project in Knowledgebased Entrepreneurship

Innovation Ecosystems in the Food Industry

Creating Innovative Food by Sharing Knowledge –
A Qualitative Study of the Swedish and Danish Food Industry

Andreas Trägårdh

Supervisor: Olof Zaring
Master degree project no:
Graduate School

Innovation Ecosystems in the Food Industry
Creating Innovative Food by Sharing Knowledge –
A Qualitative Study of the Swedish and Danish Food Industry

By
Andreas Trägårdh

Graduate School – School of Business, Economics and Law, University of Gothenburg
Vasagatan 1, P.O. Box 695, SE-40530, Gothenburg
andreas_tragardh@hotmail.com

Supervised by:
Olof Zaring
Head of Department
Department of Economy and Society
University of Gothenburg, School of Business, Economics and Law
Olof.zaring@gu.se

Abstract

The purpose of this thesis is to address the, by scholars and managers alike, expressed need of attention towards innovation in the food industry. Sprung from the critique of the existing food innovation system, the concept of an innovation ecosystem is studied. The research at hand aims to present a definition of what an innovation ecosystem in the food industry is, and to display the role such innovation ecosystem has in the creation of innovative food. The thesis employs a qualitative approach by a multiple case study of four ecosystems in the Danish and Swedish food industry. The data has been collected through semi-structured interviews with management at the researched organisations. The results suggest that the presented definition holds value. The role of an innovation ecosystem in the food industry is to facilitate knowledge sharing by organising activities at their local centre point and to connect actors to each other in order to enable development of innovative food. The type of knowledge shared was concluded to be Scientific, Technological, Market and Business knowledge. Furthermore, the role is to aid initiatives originating; top-down, bottom-up or internally, as well as provide such initiatives with the appropriate financing in the creation of innovative food. Implications for the Swedish food industry shows that actively searching for collaborations and sharing knowledge, favours the development of innovative food.

Keywords: *Innovation Ecosystem, Ecosystem, Food Industry, Innovative Food, Knowledge Sharing, Food Innovation*

Acknowledgements

Few things in the world are both vital to our survival, and possesses the power to spread joy, excitement and pleasure. I consider food to be of such characteristics, necessary to eat, but at the same time providing countless of exciting mixtures, textures and flavours. Thanks to my grandmothers Hjördis and Birgit, I inherited my passion for food. The passion and profound interest in food, led me to early on pursue a career in the restaurant industry, equipping me with a deep insight in food and the art of cooking. When the opportunity was given to combine this interest with my academic career, the motivation of this thesis came naturally.

I would foremost like to thank my supervisor Olof Zaring and my mentor, professor Maureen McKelvey. Thank you for all your valued insights and interesting discussions, always pushing me forward in my research. I would also like to pay a special gratitude towards the respondents from the researched innovation ecosystems. My research has furthermore benefitted greatly from useful discussions and interactions with researchers, lectors, PhD students, and the members of Riksbankens Jubileumsfond, in which I have had the honour to be employed as a guest researcher. Thank you: Sven Lindmark, Evangelos Bourelos, Charlie Karlsson, Ethan Gifford, Daniel Ljungberg, Daniel Hemberg, Snöfrid Börjesson Herou, Johan Brink, Guido, Buenstorf, Astrid Heidemann Lassen, Karin Berg, Linus Brunnström, Erik Gustafsson, and Ryan Rumble.

In addition, I would like to extend my thank you to Josefine Berggren for your much-valued insights and discussions. Finally, I would like to thank my class of the knowledge-based entrepreneurship program and my discussant Niels-Malte Thorn for their earnest support and appreciated discussions.

Andreas Trägårdh
Göteborg, May, 2018

Definitions

Food innovation:
Food innovation can be described as a collective name for innovation within the food industry. It spans a wide area from food-tech, transgenesis, and biochemistry in food, to agricultural machines and production processes. The concept of food innovation can therefore be said to bridge the entirety of innovation in the food industry.

Innovative food:
Innovative food is a part of food innovation, but relates to the innovative aspect of the actual food product. This thesis employs the following definition of innovative food:

> *Innovative food can be considered innovative due to the addition of, or replacement with, unusual ingredients; the recombination of products into new blends or products; being processed and/or cooked in a way novel to the product; successfully penetrating a new market coming from a different origin or culture.* (the author).

For further explanaition and previous literature of innovative food; see chapter *2.6.1, Innovative Food – A Definition*.

Innovation system
The concept of an innovation system as the framework of innovation processes, was developed by Freeman (1987). The concept was based on a nations networks between institutions in the private and public sector and was denoted a "national system of innovation". For a definition of an innovation system; see chapter *2.1, Innovation System.*

Sectoral system of innovation
Out of the national system of innovation sprung the sectoral approach (Edquist, 2005). The sectoral approach accounts for the differences among sectors in innovation, often between industries. The main distinctions between sectors refers to high R&D-intensive and low R&D-intensive. The sectoral system of innovation approach allows for detailed analyses of the knowledge and learning processes, structure and institutions of innovation. For a definition; see chapter *2.2, Sectoral System of Innovation.*

Open innovation:
Sharing, diffusing and absorbing knowledge in the process of innovation, can be regarded to depend on some level of openness. As innovation processes are systemic and interactive in nature, firms co-create in collaboration with external agents (Bayona-Saez et al., 2017).

> *"Open Innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively"* (Chesbrough, Vanhaverbeke & West, 2006, p.14-4).

For further definitions on open innovation, see chapter *2.4, Open Innovation*.

Entrepreneurship ecosystem
The literature suggests that entrepreneurship ecosystems consists of; social, local, institutional, cultural and most importantly dynamic processes, managed by actors that promote new firm formation and growth. Simatupang, Schwab & Lantu (2015) withholds that entrepreneurship ecosystems are a highly complex multi-level construct. Furthermore, it is suggested that entrepreneurship ecosystems are geographically locally bound. For definitions; see chapter *2.5.2, From Entrepreneurship to Innovation*.

Innovation ecosystem:
Innovation ecosystems are considered nonlinear and highly complex systems that adapts to the benefit of its actors. The adaptability and complexity leads to that the same input in the ecosystem, don't always produce the same output. By unexpected changes and synergy-effects, and the behaviour of the system, it cannot be considered the sum of its individual parts.

> *An innovation ecosystem in the food industry consists of actively participating actors and their relations, sharing purposive inflows and outflows of knowledge to enable the creation of innovative food, where knowledge sharing is facilitated by a local geographical centre-point with unbound environmental limitations.* (the author).

For previous literature and further definitions on innovation ecosystem; see chapters *2.5, Innovation Ecosystem; 2.6, Ecosystems, Innovative Food and the Food Industry, and; 2.6.2, Innovation Ecosystems in the Food Industry – A Definition*.

Table of content

List of Models

List of Tables

1. Settings

The following chapter gives the reader an overview of the field of research. The chapter starts by presenting the background settings for the problem discussion where the research area and research question are motivated, leading to the aim of the thesis.

1.1 Background

In the 1930s, the global depression hit Sweden, affecting the food industry with a price collapse. Demand fell both within and outside the country. A solution to these problems came in the form of market regulations. Three key objectives of the regulations were to keep up prices. The *Income target* meant that prices would be kept up for farmers to achieve an economic standard, equivalent to other groups in society. The *Efficiency Objective* meant that, by means of external rationalization, small farms and food producers would be pooled into more sustainable production units, whilst internal rationalization focused on improving production technology and operations. The *Production Objective* was aimed at aiding domestic supply, to achieve almost self-sufficiency in Sweden. To achieve these goals, border protection and price controls in the food industry were introduced. These regulations caused market equilibrium disruption, which meant that further regulations were implemented (Lindberg, 2008)

Tellström (2015) explains how the food and meals previous to the depression had been an expression of tradition and community between people, but how it changed to become a means for the citizen to be useful in society. The nutritional content of the food became very important, with lobby-groups proclaiming that cooking in a longer perspective should be taken over by industry, the only way to guarantee a full diet. This lead to that, mid second world war, the Swedish government appointed an agriculture committee, dominated by farmers and agricultural bureaucrats, acting in the interest of the food industry. The committee working together with independent associations gained significant power. Jönsson (2005) argues that in the period 1932 to 1970 the Swedish state can be denoted as a corporative, as the committee and associations cooperated and influenced the state. The corporative accelerated the closure of small farms and small producers, favouring large-scale industry in the 1960s when the food industry cried for labour (Lindberg 2008). The change in the perception of food led to a major change in the link between tradition, culture and food. When the power of food changed from local to industrial, the committee of agriculture emphasised the nutritional content of food by changing the language around food. “Food” became “diet and nutrition”, “good” turned into “need” and to “eat” was transformed into “individual public health” (Tellström, 2015). By transforming the language, the Swedish population became reluctant to question the ongoing change in the food industry.

The changes in the food industry culminated, and the great food battle was fought in the years 1966-1967, when the 1960s governmental agricultural investigation was to be dealt with. It was done in the shadow of the 1960s record years and rapid growth in the Swedish economy. Food prices had fallen steadily on the world market and were expected to remain low. In addition, a Swedish approach to the western European market was seen. The investigation therefore emphasized that Sweden should adapt production to these conditions and that the costly surpluses should decrease. The investigation would also speed up the rationalization rate, that is, move towards large-scale operations and large units of utilization through state loans, grants and a modernized land acquisition scheme (Lindberg, 2008)

This move towards industrialization during the 1960s led to an increase of innovation in production equipment and process innovation. Swedish companies such as Tetra Pak, Arla,

Abba and Pågen, amongst others, made way for this new industrialism innovation, conquering new markets due to new products, processes and packages while the local farmer was forced to shut down to see traditions traded for nutrients. But as the post 1930s "farm to fork" tradition was once re-written to "industry to fork", the time has come where there is need for a new re-writing. During the last decade, a strong trend of small-scale, locally produced, environmentally friendly and life-style specific products have been produced and favoured by consumers, putting the small scale and medium-sized companies in the centre of attention (Winger & Gavin, 2006). The industry shift entails a rather different type of innovation framework, creating incentives to research the innovative landscape in the food industry, in order to find new ways of facilitating innovation in the modern food scene.

1.2 Problem Discussion

In spite of the food industry's attempts to develop a more interesting and exciting food culture and new food experiences, Winger & Gavin (2006) claims that the periods between great food innovations seems to become lengthier. They find the answer to lie in the fact that the food industry is low-tech in which distinguishing between products are difficult. Being a low-tech industry has further implications. There are very few barriers to market entry within the food industry and it is considered hard (however, not impossible) to use patents or similar types of intellectual property rights to protect innovative food products. The low rate of radical innovation and change within the industry, in combination with the high failure rate of food products following market launch (Winger & Gavin, 2006), implies that the methodology, framework and conditions for new food product development urgently needs to be investigated and further developed. Such need of investigation and development are confirmed by the newly released Swedish long-term national food strategy (2017) as well as by a report by the Swedish food industry's member organisation; Livsmedelsföretagen (2017).

Hirsch-Kreinsen, Jacobson & Robertson (2006) points out that the main source of incremental innovation in a low-tech industry is located at the stock of existing knowledge, where development is being predominated by the existing knowledge base. Bayona-Saez et al. (2017), confirms, in their study of the food and beverage industry, that the food industry is no exception. The development of innovative food[1] therefore tends to depend on the interaction between actors, and the employment of knowledge, distributed through exchange in formal and informal networks. Even if the industry already shows tendencies of breaking up from being a rather closed industry with silo tendency, Bayona-Saez et al. (2017), state that the food industry need to implement an even higher level of open innovation[2] in the development of new products. The literature and the industry alike have however failed to give new frameworks for innovation in the food industry any attention, even after Traitler, Watzke & Saguy (2011) alerted that SMEs are struggling with innovation.

Stemming from the critique of the food industry's current innovation system, as well as the benefits found in knowledge sharing (Pisano and Verganti, 2008) and the concept of open innovation (Chesbrough, Vanhaverbeke & West, 2006), the interest in adopting the framework of an innovation ecosystem[3] emerged. The suggestions of increased openness, knowledge sharing and collaboration within the industry, place the ideation, development and creation of future innovative food, not at the single company, but within systems and networks in the industry (Bayona-Saez et al., 2017; Kühne et al., 2010). A potential innovation framework for

[1] For a definition on innovative food, see chapter 2.6.1
[2] For a definition on open innovation, see chapter 2.4
[3] For a definition on innovation ecosystem, see chapters 2.5 and 2.6.2

the food industry is the adaption of the concept of innovation ecosystems, which has received increased attention in the recent years (Malecki, 2017). The terminology of ecosystems stems from the science of biology and was adapted to the social science when Moore (1996) proposed the analogy between the biological world and business world. According to Mercan & Göktas (2011), innovation ecosystems are dynamic structures by nature, proposing a fit to the dynamic process of innovation. McKelvey & Zaring (2016) thoughts, proposes further linkage by stating that innovation grows when actors, knowledge, technique and institutions interact in systems, denoting such systems of actors as ecosystems

Due to the lack of previous literature, testing the concept of an innovation system in an empirical setting, such research is suggested. Due to the recent shift in the food industry, as well as the expressed need for new frameworks of innovation (Traitler, Watzke & Saguy, 2011), the food industry presents itself as a great setting for conducting such empirical research. The study should focus on investigating the nature of an innovation ecosystem, what it is and its potential fit in the food industry. These findings conclude that the role of an innovation ecosystem in the food industry should be given attention.

1.3 Research Question

In line with the discussion above, the approach of this thesis can be summarized in an overall research question:

- What is the innovation ecosystem's role in creating innovative food?

The research question will be explored by examining the role, based on what type of activities that are arranged, in existing innovation ecosystems in the food industry. Answering the question entails that the following fundamental questions need to be answered.

What is innovative food?
What is an innovation ecosystem in the food industry?
What type of knowledge is relevant in the creation of innovative food?

The underlying questions will be answered by synthesising the relevant literature, empirically testing the definition of an innovation ecosystem, in order to empirically study the innovation ecosystems' role in the creation of innovative food.

1.4 Research Aim

The aim of this thesis is hence to investigate what an innovation ecosystem is, in the context of the food industry. The aim is further to research what role an innovation ecosystem has in the creation of innovative food. Furthermore, indications towards how the Swedish food industry could benefit from such learnings will be discussed and illustrated. The conclusions might therefore operate as a practical indication for the development of innovative food in Sweden while the academic contribution is found in the definition of *innovative food* and *innovation ecosystem*. Simplified; the aim is to find support for innovating in ecosystems, appropriate for creating innovative food and to present how the Swedish industry could benefit from such adaption.

1.5 Research Disposition

Chapter one; introduces the reader to the background settings for the problem discussion. The discussion leads to the motivation of the study, presenting the research question and aim of the thesis.

Chapter two; the theoretical approach and previous research is presented, starting with the theories used for the thesis, followed by a literature review leading to the author's definition of *innovative food* and an *innovation ecosystem in the food industry*.

Chapter three; covers the methods used in the study. The chapter presents the choice of research strategy and design choice, as well as the motivation of the ecosystems used for the empirical study. Thereafter follows data collection methods and the methods for analysing the data collected.

Chapter four; holds the empirical research findings, that is, the data from the semi-structured interviews with respondents from the four selected ecosystems.

Chapter five; presents the analysis of the empirical findings, linking it with the theoretical framework as well as findings from the food industry.

Chapter six; contains the conclusion drawn from the empirical finding and analysis, presenting implications of the study, as well as suggestions for further research.

2. Theoretical approach and previous research

In the following section, the reader is introduced to the core theories regarding innovating in systems, sectoral systems, by open innovation and in ecosystems. The literature review, where previous research is presented and discussed, leads to the author's definitions of innovative food and an innovation ecosystem.

2.1 Innovation System

The concept of an innovation system as the framework of innovation processes was developed by Freeman (1987). The concept was based on a nations networks between institutions in the private and public sector and was denoted a "national system of innovation". Freeman defined the system as: "the network of institutions in the public and private sectors whose activities and interactions initiate, import and diffuse new technologies" (Freeman, 1987, p1). Sprung from Freeman's theories, two of the most influential books regarding national innovation systems are; Lundvall (1992) and Nelson (1993), employing two slightly different approaches. Lundvall (1992), taking the broader approach, defines the system as the network interactions aiming to produce valuable knowledge in a nation. The relative success of innovative activities is dependent on that organisations are embedded in a wide social economic-system, accounting for political and cultural effects as well as economic policies. According to Nelson (1993), an innovation system is consistent of the set of interacting firms, determining a country's innovative performance, emphasising the organizations that promote the creation and diffusion of knowledge as being the key source of innovation.

The two definitions focus on different determinants of innovation, however, using the same terminology. This goes to show that there is a lack of stringency in the definitions. Edquist (2005) therefore suggests a broad definition to innovation systems stating that every important economic, social, political organizational, institutional and additional factor that impact the development, diffusion and the final use of innovations are to be included in the concept. Metcalfe & Ramlogan (2008) develops their own definition of an innovation system, taking a more technological standpoint. They argue that innovation systems are the framework where small and large companies, universities and public organizations can interact, with the aim to develop knowledge and produce new technologies with the limitations of being regional or national bound. Interactions between the actors can consist of; technological, commercial, social, legal and financial aspects.

Critique against the concept has been targeting its lack of boundaries as there are no clear indications of what should be excluded of a system of innovation. Furthermore, the definitions at hand all include institutions. However, the meaning of institution in the different definitions varies, leading to further diffuseness. Lundvall (1992) uses the term institution primarily to describe "the rules of the game" while for Nelson (1993) the use of institution means different kinds of organizations. Edquist (2005) further denotes that the concept of innovation systems is not to be considered formal theories as they do not suggest causal relationship among its components.

The diffuseness that followed the definitions presented a need for further research. The critique at hand led to a want for a better-defined concept where boundaries are applied in a distinct way. As innovation is a complex and multidimensional phenomenon, it was argued that a generic system for all industries and contexts was not favourable. Out of this critique, the concept of sectoral systems of innovation arose.

2.2 Sectoral System of Innovation

Out of the national system of innovation sprung the sectoral approach. Part of the literature argues that the concept of sectors is a part of the national system approach, while the opposition argues for the theories being an extension and development to better understand and facilitate innovation (Edquist, 2005). The sectoral approach accounts for the differences among sectors in innovation. The main distinctions between sectors refer to high R&D-intensive and low R&D-intensive. Furthermore, distinctions are made in market structures and dynamics amongst industries. Other differences are related to technological regimes, discussing the learning and knowledge sharing environment in which actors operate.

The main differences to a national system of innovation are found in that a national system of innovation employs rather unclear national boundaries, the sectoral system, however, applies; local, national and/or global dimensions to its limitations. A sector is symbolised by a set of undefined activities, linked by a given or rising demand, through sharing common knowledge. Firms in a sector share some commonalities whilst also being heterogeneous. Malerba (2006) lists the main dimensions of a sectoral system of innovation being: *Knowledge and technological domain; Actors and networks* and; *Institutions*. The essence of sectoral interactions and informal networks are in line with Neo-Schumpeterian thoughts and Malerba argues that innovation always is endogenous in a sectoral system approach. Over time, the sectoral system will transform and change due to the various actors and elements coevolution.

The sectoral system of innovation approach allows for detailed analyses of the knowledge and learning processes, structure and institutions of innovation. The approach furthermore provides ways to research the dynamism in sectors sprung from innovations. The dynamic specifics and the sectors can therefore be compared to other similar sectors to explain differences in a regional, national or global setting. However, the lack of excluding boundaries leads to the incorporating of "every actor" in a sector, which provides a need for further development of an appropriate innovation framework.

2.3 Triple Helix

Found as an actor in both innovation systems and sectoral systems of innovation, is institutions. Universities can be regarded one type of such institutions, playing part in the process of innovation. The complex relationships in innovation were described by Etzkowitz (2003) who wrote:

> *"Society is more complex than biology. A double helix was sufficient to model DNA. A triple helix is required to model university – industry – government interactions"*
> (Etzkowitz, 2003, p295)

Etzkowitz (2003) used the triple helix concept to define a university's role in the innovation process. According to the triple helix approach, the government plays the role of supporting steady relations and interactions by setting the rules for the industry. The thought of the government's role can therefore be linked to how Lundvall (1992) argued that the institutional role primarily is to describe "the rules of the game" in an innovation system. According to the triple helix approach, it is however within the industry that the productive and direct actions toward innovation happens. The mission of the university in the triple helix concept is therefore to create, improve and diffuse new knowledge and technology (Mercan & Göktas, 2011).

Etzkowitz (2003) is of the opinion, that an increasing part of innovation is based upon the triple helix framework. The augmented importance of knowledge in the innovation process, and the

universities role in the creation and diffusion of such, has given the concept a more recognized place in the literature. Etzkowitz denotes the university as "the entrepreneurial university", taking a relatively proactive role in putting knowledge to use. This is done by universities employing an interactive, rather than a linear model of innovation, leading to firms raising their technological level, and by so, the firms move closer to an academic model of knowledge sharing.

The concept of the triple helix has however been criticized for the failure to devote attention to the "transformation" in government and industry. As the focus is aimed towards the university's role as an entrepreneur or firm; creating, improving and diffusing knowledge needed for innovation, critique is aimed at the overstatement to what extent universities fulfil this role across academic fields (Mowery & Sampat, 2006). It should however be stated that the increasing focus towards the creation and improvement of knowledge, and especially sharing of such, goes in line with some of the latest innovation literature (Simatupang, Schwab & Lantu, 2015; Theodoraki, Messeghem & Rice, 2017; and Bayona-Saez et al., 2017).

2.4 Open Innovation

Sharing, diffusing and absorbing knowledge in the process of innovation, can be regarded to depend on some level of openness. The theories of open innovation are therefore suiting the context of knowledge sharing in different sets of systems. As innovation processes are systemic and interactive in nature, firms, by need or want, should not keep the entire innovation process in-house, but rather co-creates in collaboration with external agents (Bayona-Saez et al., 2017). There are several definitions of open innovation at hand. In this thesis the pioneering concept by Chesbrough will be employed:

> *"Open Innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively"* (Chesbrough, Vanhaverbeke & West, 2006, p.14-4).

According to Laursen & Salter (2014), in order to innovate, companies need to draw from, and cooperate with, a great number of external actors. At the same time, firms must be devoted to capturing the returns from their innovative outputs. Such contradictions give rise to the paradox of openness, hence - the creation of innovations regularly requires openness, but the commercialization of innovations requires protection. This paradox implies that there must be different levels of openness, depending on the context and aim of the sharing of knowledge. Such differences in openness range between what Pisano and Verganti (2008) label as "completely open innovation" and "closed innovation". It is important to state that even though it is denoted as closed innovation, it is still a form of controlled openness. Completely open innovation is described as crowdsourcing, where the firm has no or little control of the contributors and collaborators. Closed innovation on the other hand refer to a form of open innovation where a firm chooses its partner(s) of collaboration or pick the type of input sought. This perspective of closed innovation differs a lot from Chesbrough's (2011a,b) concept of closed innovation, referring to in-house closed R&D and innovation. These two perspectives should not be confused for another. When the term open innovation is used in this thesis, it is the former type of "closed innovation", where actors have some control over (Pisano & Verganti, 2008), their purposive inflows and outflows of knowledge (Chesbrough, Vanhaverbeke & West, 2006).

According to Chesbrough (2011a), an increasing number of firms are looking for knowledge and collaborations outside their organisations. Firms are outwards looking for strategic

approaches to innovation in order to source potential value from the larger environment in which they function. Such knowledge seeking activities and collaborations can further be divided into two different approaches, what Chesbrough (2011a) explains as the "outside in", and the "inside out" perspectives.

2.4.1 Outside In

Openness commonly mean ways of sharing with others what you know, as well as inviting their involvement. Chesbrough (2011a) explains how the "outside-in" perspective refers to when a firm absorbs and utilises external knowledge, technology and persons in the firm. The context of this approach makes the openness in need for overcoming the "not invented here" syndrome. This is a common syndrome of companies as it is connected to pride, market share and status. In order to embrace the outside in perspective, a company needs to stop monopolizing its source of innovations, and in its place welcome external contributions.

2.4.2 Inside Out

The other type of openness is the "inside-out" perspective. In this case, the firm allows for their ideas, processes, technology and know-how to be used and further developed outside the company by other firms. Chesbrough (2011a) states that this type of openness relates to the company overcoming the syndrome of "not sold here", (as opposed to not invented here). By opening the innovation process to external contributors and collaborations, or by outscoring the innovation process, the firm values co-creation.

2.5 Innovation Ecosystem

The innovation system approach and the sectoral system of innovation approach are criticised for not being able to explain and visualise the relationship between the event of innovation and the innovative structure. Mercan & Göktas (2011) accuses the concepts of being static, calling for an appropriate framework for something dynamic as innovation. Thus, the approach of ecosystems in the innovation literature emerged.

2.5.1 The Roots

In order to analyse the innovation ecosystem approach, the roots of its biological terminology need to be brought to light. An ecological system constitutes of a system, where living organisms interact with each other and with their environment. The branch studying such systems and relationships are the science of ecology. The term `ecology' is derived from the Greek "*ecos*", meaning household, and from "*logos*", which mean discourse. Ecology therefore translates to the discourse, or rather, discussion of the household of nature. According to Papaioannou, Wield & Chataway (2009), an ecosystem, in the biological term, flourishes through the adaptation of organisms in its surrounding environment, by having dynamics within the ecosystem that regenerate the relations between organisms and the environment. Miller (1975), stated that an ecosystem implies that;

> *"everything is connected to everything; everything feeds back through the ecosystem on itself. The interconnectedness preserves the overall system"* (Miller, 1975, p77).

Two decades ago, Moore (1996) proposed the analogy between the biological world and business world, by bringing ecosystems into the social science as the term business ecosystem was coined. The concept was adapted to the social world in order to describe the evolutionary nature of interactions between different actors, their innovation activities, and the environment

they operate within (Papaioannou, Wield & Chataway, 2009). Represented in the business ecosystem are; firms, universities and other public and private organizations. These actors accumulate and manage the flow of information, adapted to, within, and diffused from, the ecosystem. Depending on what type of knowledge is being shared, the actors collaborate in different value-creating activities. Papaioannou, Wield & Chataway (2009), do however raise awareness of the risk that biological concepts and terminology, such as ecosystems, potentially can fail to capture the complexity of the socially dynamic environment of knowledge and innovation. They argue that more research is needed in the field in order to avoid simplistic definitions.

2.5.2 From Entrepreneurship to Innovation

In the recent years, the attention towards entrepreneurship ecosystems has increased drastically (Malecki, 2017). The literature suggests such entrepreneurship ecosystems to consist of; social, local, institutional, cultural and most importantly dynamic processes, managed by actors that promote new firm formation and growth. Simatupang, Schwab & Lantu (2015) withholds that entrepreneurship ecosystems are a highly complex multi-level construct. They highlight the actors on a regional level being; political decision makers, government agencies, universities and industry associations. Ács, Szerb, & Autio (2015), and Foster & Shimizu (2013) argues that the concepts have received their increasing attention due to that policymakers, firms, universities, and communities have begun to identify the potential of interacting in the creation, diffusion and utilization of policies, programs, structures and processes. Such creation is thought to foster regional entrepreneurship activities, which in its extension supports innovation. Simatupang, Schwab & Lantu (2015) argues that it is the active participation of the ecosystems actors that has been identified as the key success factor for creating such system. The interrelations and knowledge sharing, both downstream and upstream, are seen as essential for cross-fertilization and synergy effects in the ecosystem. If the notion, expressed by Hekkert et al. (2007, p421), "there is no such thing as an innovation system without entrepreneurs" is true, there is a benefit in highlighting some of the literature' definitions on entrepreneurship ecosystems before moving on to innovation.

Cohen (2006, p3) states that: *"Sustainable entrepreneurial ecosystems are defined as an interconnected group of actors in a local geographic community committed to sustainable development through the support and facilitation of new sustainable ventures"*.

Gauthier, Penzel, and Marmer (2017, p24) writes: *"We defined ecosystems … around the concept of a shared pool of resources generally located within a 60-mile (100-km) radius around a center point"*.

Theodoraki, Messeghem & Rice (2017, p50) argues: *"The entrepreneurial ecosystem includes three dimensions: actors who form it and their interactions (formal and informal network), physical infrastructure, and culture"*.

The definitions might differ a bit in focus, however, a few key pillars can be extracted. There is need of a local or regional geographical centre point. The ecosystem furthermore both consist of and enables, respectively, the interaction and sharing of knowledge (seen as a resource to each actor). These features can be described as a network of relationships, enabling the interactions between a broad range of institutional and individual stakeholders with the aim to support and generate entrepreneurial ventures, innovation, and local or regional economic growth.

Innovation ecosystems stems from entrepreneurship ecosystems and could be considered to be a narrower part of entrepreneurship (or vice versa depending on standpoint), only focusing on the process of innovation. According to Mercan & Göktas (2011), innovation ecosystems are dynamic structures by nature, which evolve due to changing market conditions, incapable of being governed by public policies but rather function by the division of labour between private and public actors. Highlighted by Jackson (2015) is an innovation ecosystem's tendency to be geographically localized, (similar to the definitions on entrepreneurship ecosystems), or being strategically linked between actors.

The Global Innovation Index (2009-2010), created by the World Economic Forum summarizes the elements of an innovation ecosystem as the development of clustering university-industry collaboration and their culture to innovate. Mercan & Göktas (2011) denotes the components of an innovation ecosystem as:

> *"An innovation ecosystem consists of economic agents and economic relations as well as the non-economic parts such as technology, institutions, sociological interactions and the culture" (*Mercan & Göktas, 2011, p102).

The non-economic components in the innovation ecosystem can be linked to what Papaioannou, Wield & Chataway (2009) symbolised as the environment in which the actors operate. This indicates that there is a need for something "more" than actors. A biological ecosystem refers to such components as the interactions amongst its living organisms, the environment in which they live and their interactions with the environment. The environments non-living components such as; H_2O and oxygen, and external conditions, for example, climate and the temperature are essential in the survival of the living organisms (Moore, 1996). In an innovation ecosystem, such components are thought of as enablers of ideation, developing and creating innovations and diffusing them. The innovation ecosystem can therefore be stated to aid the actors in an industry to operate beyond their firm boundaries in order to develop, share and absorb knowledge, which in turn can lead into innovations.

2.6 Ecosystems, Innovative Food and the Food Industry

Winger & Gavin (2006) argues that the food industry's adversity in developing innovative food products lies in the industry being low-tech with low entry barriers, and where the replication of products is frequently occurring. However, even if innovative food products reach the market, only a very small proportion of new products were considered to carry the features of radical changes, meaning that the majority of the products had incremental changes. Even then, Winger and Gavin (2006) found that of all new products, 75% were considered failures. By comparing the food industry to other industries, they found that a very low level of R&D was carried out. According to Bayona-Saez et al.'s (2017), study on the food and beverage industry, evidence is found of development within the food industry being characterized by the interrelationship that actors in different parts of the industry (and outside) have created. They further state that the food industry is shifting towards a higher implementation of open innovation, but in need of new frameworks of collaboration in order to increase the innovative output from the food industry. Proof of that low-tech industries tend to focus on external knowledge by collaborating with competitors, customers and external actors is further strengthened by Grimpe and Sofka (2009).

Hirsch-Kreinsen and Jacobson (2008) state that there is growing interest in analysing how low- and medium-technology industries innovate, in comparison to the previous literature' focus on high-tech firms. Stemming from such increase of interest, Robertson, Smith & von Tunzelmann

(2009) propose that the knowledge sharing activities in low- and medium-tech sectors needs to improve in order to develop the industry. If the sharing of knowledge were to increase by a framework suiting innovation, the food industry could arguably be able to increase its output of innovative food. Before defining such framework, it is important to define what innovative food is.

2.6.1 Innovative Food – A Definition

First of all, it is imperative to distinguish between innovative food and food innovation. *Food innovation* can be described as a collective name for innovation within the food industry. It spans a wide area from food-tech, transgenesis, and biochemistry in food, to agricultural machines and production processes. The concept of food innovation can therefore be said to bridge the entirety of innovation in the food industry. This thesis will however deal with *innovative food* which is a part of food innovation, but narrowed down to the innovation of the actual food as a product. Building on Schumpeter's general definition of innovation;

> *"The introduction of a new good (...), The introduction of a new method of production (...), the opening of a new market (...), the conquest of a new source of supply (...), and the carrying out of the new organisation of any industry"* (Schumpeter, 1934, p66)

Fagerberg (2004) states, that the concept of innovation is highly dependent on its context, therefore requiring an extensive range of diverse definitions. Fagerberg identifies a wide and common theme of all innovation by stating that: innovation is characteristically understood as the successful introduction of something new and useful. Moskowitz et al. (2006) builds on this wide concept and adapts the innovation concept to food by adding the idea of ''recombination of components into new blends''. A more technical definition is presented by Earle and Earle (2000), stating that innovation must be "new to the world", contain "product improvements" and "cost reductions". In the OECD, Oslo manual for measuring innovation (2005), four types of innovation are suggested; product innovation, process innovation, marketing innovation and organisational innovation. In the definition of innovation, the manual reads:

> *"An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations" (*OECD, 2005, p46).

The manual further specifies product innovation by the following definition:

> *"A good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics" (*OECD, 2005, p46).

For further definitions by OECD on the four types of innovation, see appendix 1. Left out in the above definitions are the consumers' perception of a products newness, suggested by Winger & Gavin (2006) to be highly dependent on the geographical and cultural location and context of the consumer. This contradicts the definition by Earle and Earle (2000), suggesting that innovations have to be novel to the world. Applied to innovative food, a product being new to a certain market, targeting a certain type of consumers, can be considered innovative by such consumers. As one example described by Winger & Gavin (2006), Asian food products were

exported to western supermarkets in the early 1990's, considered to be novel and innovative. However, the products were well-established and traditional products in Asia. The product development processes used, the challenge of market penetration and its success, the investments needed and the potential financial impact, were not less crucial simply because Asian food had previously existed in Asia. The fact that a food product is not "new to the world", does not diminish its innovative potential when successfully introduced on a new market, matching Schumpeter's (1934) definition of innovation and the OECD (2005) definition on marketing innovations.

As discussed in the background setting of this thesis, tradition used to carry a strong link with food. Kühne et al. (2010), finds that traditional food products are subject to an increased interest in Europe. Innovations, however controversial in the context of traditional, are likewise of a growing interest. As innovation and tradition can be considered antonyms, innovating traditional food products can be very challenging (Amilien et al., 2005; Gellynck & Kühne, 2008). Gellynck & Kühne (2008) and Kühne et. al. (2010), explores how innovations in traditional food mainly relate to, product size and form, and new ways of using the product or packaging innovations. This thesis will neither deal with package-innovation, nor the usage of a product if related to the package.

Boer, Helms, & Aiking (2006), and Olsen et al. (2007) states in their research, that cross-cultural studies, in general, show important differences in food-related innovation aspects even in relatively homogenous countries such as those belonging to the EU. However, the expressed differences are rather an indication of the diffusion (i.e. spread of innovations) in different geographical and demographical areas. What is rather interesting in these studies is however the attention to the cross-cultural consumer perception of innovative food. Guerrero et al. (2009) summarises and condenses the cross-cultural literature on innovation, highlighting five different areas considered innovative food by consumers, proven to be very similar across cultures.

Novelty and change: relating to something new, such as modifications in the ingredients, in its size, and in the preparation of food. Food was considered to be innovative if it was prepared in a different way, when adding unknown or new ingredients or when adding unusual and foreign ingredients. The concept of novelty in food is similar to that found in the scientific literature (Fagerberg, 2004 or Moskowitz et al., 2006).

Variety: Consumers implied that innovation fulfils an apparent benefit for consumers as it increases the variety of available options such as; variations in taste, in product shapes, and in combinations of ingredients (Guerrero et al., 2009).

Processing and technology: Innovative food was considered to be linked to technological characteristics and industrial food processing. Innovative food could therefore be created by applying novel technologies or further processing the ingredients or the actual product.

Origin and ethnicity: Determining whether food was innovative, were shown to be related to both ethnic food and to imported products. The image of foreign (non-national or nonregional) products tends to play an important role in the determination.

Convenience: Practical advantages was highlighted as innovations as they could make a consumer's life easier. Some examples of innovative food being convenient were presented in the studies; frozen foods, precooked or ready-to-eat foods, and microwavable products.

Guerrero et al. (2009), defines innovation associated with food based on the cross-cultural consumer studies as:

> *"The addition of new or unusual ingredient; new combinations of product; different processing systems or elaboration procedures including packaging; coming from different origin or cultures; being presented and/or supplied in new ways; and always having temporary validity'' (*Guerrero, et. al., 2009, p349*).*

Another approach based on Schumpeter's work is to classify innovations from incremental to radical. From this perspective, continuous improvements of preparations and cooking, exchanging ingredients and the change of size and usability could be characterized as incremental or marginal innovations, and the creation of entirely new products to be radical. Winger & Gavin (2006), states that the vast majority of innovative food during the last 20 years have been developed by incremental changes (in other sectors called "continuous innovation") whilst only 1 to 2 percent was radical.

Previous research and available definitions tend to focus on food innovation in general. Such definitions include several types of innovation, employing a framework without clear limitations, as it deals with technology, chemistry, processes etc. In order to suit the research focus in this thesis, a definition adapted for innovative food i.e. the actual food product, is needed. The following definition aims to provide an understanding of what innovative food is, and how such innovation can be created.

> *Innovative food can be considered innovative due to the addition of, or replacement with, unusual ingredients; the recombination of products into new blends or products; being processed and/or cooked in a way novel to the product; successfully penetrating a new market coming from a different origin or culture*. (the author).

Examples of innovative food according to this definition are described in the following chapters; 4.1.2, 4.2.2, 4.3.2, 4.4.2.

2.6.2 Innovation Ecosystems in the Food Industry – A definition

Although some literature uses the term ecosystem, it is rarely specifying the role of the framework nor the context of the system. Depending on the industry in which an ecosystem is operating, a different set of connotations and implications are existing (Fagerberg, 2004). This aligns with the aim of this thesis to define an innovation ecosystem in the food industry.

According to Gobble (2014), the literature tends to use ecosystem as a synonym to cluster and network. This means that the line of communications is defined according to a hierarchical construct and there are expectations on how activity in one part of the system will affect conditions elsewhere. Such clusters and networks can be complicated as they consist of several different actors and their relationships. However, they are not especially complex. In contrast, an ecosystem is highly complex, employing a dynamic and constantly adapting structure in order for the actors within the system to live from, and by, each other.

A few available definitions of innovation ecosystems are available, suiting to be adapted to the food industry. Mercan and Göktas (2011) write:

> *"Ecosystems and ecologies are the concepts that describe evolutionary features of the interactions between individuals, their relationships with innovative activities and their relations with the environment in which they operate"* (Mercan & Göktas, 2011, p103).

Such definition implies that there needs to be a flow of knowledge between the ecosystems actors, linking it with the theories of open innovation. Durst and Ståhle (2013) suggest such linkage by arguing that like open innovation, innovation ecosystems rely on flows and exchange of knowledge to facilitate collaboration and co-creation. In accordance with Laursen & Salter (2014) who argued that in order to innovate, companies need to draw from, cooperate, and share knowledge, with a great number of actors, this thesis argues that within an ecosystem, a certain degree of openness needs to be sought. This means, that when an actor joins an ecosystem, that actor by choice, will have some control over their purposive inflows and outflows of knowledge, as described by Chesbrough, Vanhaverbeke & West (2006). In regards of Chesbrough's (2011a) distinction between the outside-in and the inside-out perspectives, both types of sharing and openness is applicable in an ecosystem. This means that a firm can absorb and utilises external knowledge, technology, and persons into the firm while at the same time allowing for their ideas, processes, technology, and know-how to be used and further developed outside the company, meaning; by other actors in the ecosystem.

As previously stated, there is evidence of the food industry's tendency to beginning to employ a higher level of openness in its innovative activities (Bayona-Saez et al., 2017; Grimpe and Sofka, 2009). McKelvey and Heidemann Lassen's (2013) builds on such openness in the innovation process by highlighting the importance of what type of knowledge that plays a role in the creation of innovative opportunities. This creates a need to clarify what type of knowledge that is shared within an innovation ecosystem in the food industry, in order to be able to define the ecosystem. This thesis, therefore, employs McKelvey and Heidemann Lassen's (2013) definitions of knowledge types, with one addition. McKelvey & Heidemann Lassen specify three types of knowledge; (1) Scientific & Technological, (2) Market, and (3) Business. In this thesis, the first group of scientific and technological knowledge is broken up in two different types of knowledge, as the food industry has shown to differ between the two. This leads to an employment of four different types of knowledge to be shared within an ecosystem when developing innovative food. Hereunder described per type, originating from McKelvey and Heidemann Lassen (2013) and adapted to the food industry.

Scientific knowledge; is created by years of studies, often originating from universities or research centres, involving chemistry, engineering, microbiology, and nutrition research. Scientific knowledge in the food industry consists of the biological, physical, and chemical makeup of food; the causes of food deterioration; and the causal concepts of food processing. Scientific knowledge can be used to develop innovative food by new ways to recombine, process, preserve, and store ingredients and/or food.

Technological knowledge; is the knowledge of how to take animal-, vegetable-, marine-, or bio-lab materials and convert them into final products through the application of machinery, energy, labour and scientific knowledge. This type of knowledge is generated by firm experience and through universities and research centres.

Market knowledge; is referring to information gathered from past and current customers and markets. The knowledge further entails an understanding of what current and future customers and their markets seek. Hence, it consists of the wants and needs of customers and the

understanding of the market dynamics, diversities and industrial trends and dynamics over time. In the food industry, customers and market specifics differ a lot due to demography and geography. By gaining market information, the development of innovative food can be adapted to and/or by the most favourable market.

Business knowledge; is consisting of how to create, run and develop a business. This type of knowledge is generated by experience and experts and is involves organizational design, financing, management techniques but also the information regarding an industry's laws and regulations. Business knowledge can aid the development of innovative food in ways of facilitating organizational and managerial thresholds, gaining financial opportunities and building a business case around the development of innovative food.

These different types of knowledge can be stated to be the underlying catalyst for the development and creation of innovative food. The knowledge is utilised within a firm or organisation after sharing and absorbing it amongst actors in the ecosystem. Attempts at specifying the different type of actors have previously been done in the literature' definitions of; national innovation systems, sectoral system of innovation and entrepreneurial ecosystems. Suggested actors are, but not limited to; private firms and organisations, public firms and organisations, institutions, universities, and individuals. Drawn from the critique of previous literature, there is importance in defining what institutions are in an innovation ecosystem. Previous literature has suggested that institutions range from universities, organisations, and government (Nelson (1993), to public policy through laws and regulations, culture, and "the rules of the game" Lundvall (1992). In this thesis, institutions primarily employ Nelson's (1993) definitions, meaning that universities, organisations and the government are to be considered institutions.

In order to be considered an actor in an ecosystem, active participation is required (Simatupang, Schwab & Lantu, 2015). If not being an active partaker, effects of an institution can be considered to make up the environment of which an ecosystem operates within. This means that neither, policy or laws, nor culture are considered actors but creates the limitations of the ecosystem by being both the environmental restraints and the enabler to innovation activities.

Previous research on entrepreneurship ecosystems has suggested that such systems all have a geographical centre-point (Cohen, 2006; Theodoraki, Messeghem & Rice, 2017,), some very specific adding a local limitation by kilometres in their definition (Gauthier, Penzel, and Marmer, 2017). Innovation ecosystem are suggested to share such local geographical centre point by Jackson (2015). In regard to the food industry, food often has a local or regional limitation of cultivation and breeding, whilst the final innovative food product can be diffused on a global scale. This makes a local proximity through a centre-point suitable for a definition of innovation ecosystems in the food industry. However, one should not mistake such definition for the environmental limitations of an ecosystem.

Innovation ecosystems are considered nonlinear and highly complex systems that adapt to the benefit of its actors. The adaptability and complexity lead to that the same input in the ecosystem, does not always produce the same output. By unexpected changes and synergy-effects, and the behaviour of the system, it cannot be considered the sum of its individual parts. In a biological ecosystem, such adaptability and dynamism would mean that an actor not contributing to the system would die due to the harshness of the environment or be killed by another actor. In an innovation ecosystem this means that an actor not gaining from, or contributing to, the system would leave the system by choice or by force.

Drawn upon previous research on; innovation systems, sectoral systems of innovation, open innovation, entrepreneurship ecosystems and innovation ecosystems, and the suggested linkage to the food industry, this thesis presents a definition of innovation ecosystem in the food industry.

> *An innovation ecosystem in the food industry consists of actively participating actors and their relations, sharing purposive inflows and outflows of knowledge to enable the creation of innovative food, where knowledge sharing is facilitated by a local geographical centre-point with unbound environmental limitations.* (the author).

2.7 Theoretical Summary

The theories of innovation systems (Freeman, 1987) and the later sectoral innovation systems (Edquist, 2005), originated from the belief that innovation can be planned, and executed according to plan, on a national, and later, sectoral level. Such systems have however been argued to be inflexible with long lead times, giving reasons for the critique aimed at the concepts. Furthermore, open innovation is discussed as an increasingly important concept in the creation of innovation, especially in low-tech industries, as the sharing of knowledge relates to a certain level of openness (Pisano and Verganti, 2008). Stemming from the critique of innovation systems and sectoral innovation systems, as well as the benefits found in the concept of open innovation (Chesbrough, Vanhaverbeke & West, 2006; Laursen & Salter, 2014; Chesbrough, 2011a), the literature has in the recent years turned its focus to ecosystems. An ecosystem is highly complex, employing a dynamic and constantly adapting structure in order for the actors within the system to live from, and by, each other (Mercan and Göktas, 2011). Employing a dynamic and flexible framework for innovation is considered a prerequisite in order to frame the interactions and collaborations in innovation.

Previous research of ecosystems revolves around entrepreneurship- and innovation ecosystems. This thesis argues that some core concepts from previous research is applicable to conducted research, highlighted in the definition of an innovation ecosystem in the food industry, available in chapter *2.6.2*. *Actively participating actors* refers to the origin of the ecosystem terminology where the actors in an ecosystem all live from and by each other, in order to be included in the ecosystem (Miller, 1975). This implies that if an actor is not active, the actor is not part of the ecosystem. S*haring purposive inflows and outflows of knowledge*, describes the inflows, as the absorption of knowledge by an actor and; outflows to the sharing of knowledge by an actor, being purposive (beneficent) to the actors. The concept of knowledge is derived from McKelvey and Heidemann Lassen's (2013) definition, adapted to suit the food industry by employing four types of knowledge, being; scientific knowledge, technological knowledge; market knowledge and business knowledge. Employing the concept of a *geographical centre-point* stem from the literature on entrepreneurship ecosystems. The employed definitions, presented in chapter 2.5.2, expresses the limitations of an ecosystem to be geographically bound. This thesis does not limit the ecosystem to such restrains, but includes the geographical centre point in form of a facility functioning as the knowledge facilitator. Finally, describing the ecosystem's *unbound environmental limitations,* refers to McKelvey's (2016) thoughts on innovation spaces, being geographically unbound. The linkage aims to describe the knowledge sharing, not being limited to the geographical proximity of actors, but unbound in what is referred to as the ecosystems environment.

This chapter has presented how the theoretical literature on innovation ecosystems is growing, however, with a lack of applied research. Therefore, applying the theoretical concept of an

innovation ecosystem in the food industry is of interest. Such interest derives due to the discussed inflexibility in the food innovation system and the high failure rate in food products penetrating the market (Winger & Gavin, 2006). Based on the theoretical framework of an innovation ecosystem, condensed in the above presented definition, the applicability of the terminology will be sought as well as the role of such system in the creation of innovative food.

3. Research methodology and design

The following chapter presents the methods used for the thesis. The section starts by motivating the choice of ecosystems to be examined as well as the methods employed for data collection. Following is the methods for analysing the empirical findings and a discussion of the methods chosen. The section ends by a summary of the methodology

3.1 Research Strategy

In order to create an understanding of the collaborative efforts to create innovative food and the sharing of knowledge within innovation ecosystems, a comprehensive analysis covering the past and present state of the food industry and its fit with the literature of innovation frameworks was desired. An analysis of a number of innovation ecosystems in the food industry was deemed appropriate.

The previous literature in the field of innovative food uses a diverse methodological approach, representing both qualitative and quantitative research, often with a cross-cultural or regional focus. In this thesis, in order to allow for the researcher to perceive the interview situation and context through the interviewees, a qualitative approach is favoured. As an innovation ecosystem is a social construct, analysis of perception is of importance, further favouring a qualitative approach, as have the selected authors chosen to do in their research of food innovation and of ecosystems; Earle (1997), Winger & Gavin (2006), Gellynck & Kühne (2008), Guerrero et al. (2009), Gawer & Cusumano (2014) and Clarysse et al. (2014). As this thesis finds its foundation in the mentioned authors, amongst others, this thesis employs a qualitative approach in order to reach its aim.

The research approach of this thesis can be titled abductive. This is due to the initial test of the theoretical definition of an innovation ecosystem in the food industry, presented in chapter 2.6.2 and explained in the theoretical summary, chapter 2.7. Such approach is deductive in its nature, aiming to find a potential fit between the theoretical definition and the researched ecosystems. Following is the investigation of an innovation ecosystem's role in the creation of innovative food, conducted by an inductive approach. Patterns from the conducted observations where analysed in order to generate conclusions of the data, in order to find a fit for the definition, and to discover the ecosystem's role. The freedom allowed in the abductive approach suited the topic of research as it allowed for flexibility and can be considered exploratory, suitable when researching a novel phenomenon as innovation ecosystems in the food industry.

With the deductive element of this thesis, testing the definition of an innovation ecosystem in the food industry, it could be argued that a quantitative approach could have been incorporated. Such approach could have provided data from a large number of respondents, strengthening the validity of the result. However, as organisations, potentially to be labelled innovation ecosystem, are scarce in the food industry, a quantitative approach with the geographical limitations of this thesis, Sweden and Denmark, would not provide a satisfactory result. Furthermore, as the concept of an innovation ecosystem is novel to the researched organisations, a qualitative approach is favoured as it allows for the possibility to perform in-depth research the selected organisations of this thesis.

3.2 Research Design

The study examines the role of the ecosystem and what type of knowledge that is shared among its actors when collaborating in the creation if innovative food. In order to capture the data needed, the observations were aimed towards the ecosystems geographical centre point,

arguably working as the ecosystems facilitator in the knowledge sharing process. As comparisons between a handful of innovation ecosystems were sought, the research design is labelled a multiple case study. As the topic of research is considered novel, descriptions of unique features are needed, which can be obtained through a multiple case study (Bryman and Bell, 2011). Another benefit of choosing a multiple case study approach is the possibility to compare and contrast the innovation ecosystems to each other, stimulating the analysis and discussion of the data obtained. Besides using different ecosystems, another aspect was taken into account. Namely the one of choosing ecosystems by a geographical regional specification to the south part of Sweden and the west part, and Copenhagen region of Denmark. A similar approach containing multiple case studies and cross-cultural aspects have been favoured by the following researchers in their studies on innovation in the food industry; Amilien et al. (2005), Gellynck, & Kühne (2008), Guerrero et al. (2009), Winger & Gavin (2006), amongst others, strengthening the choice of design for this thesis.

However, the research design at hand does not come without flaws. Choosing a multiple case study increases the risk of paying less attention to specific features and contextual relationships, that a single case study would entail (Bryman & Bell, 2011). This is however not considered a great problem for this thesis, as a clear focus on investigating the ecosystems role, and the knowledge sharing, was the aim. A multiple case study was further thought of as the prominent approach, to illustrate and to provide a deeper discussion of innovation ecosystems in the food industry, due to the novelty of the field.

3.2.1 Selection of Ecosystems and Respondents

As Boer, Helms, & Aiking (2006), as well as Olsen et al. (2007), state in their research, cross-cultural studies in general show important differences in food-related innovation aspects even in relatively homogenous countries such as those belonging to the EU. An important factor to account for was, therefore, to limit the ecosystems for selection to a geographical narrow area in order to, what Winger & Gavin (2006) argues to be highly important, study a similar cultural and contextual perspective on innovative food.

West Denmark and the Copenhagen region, and the south of Sweden was chosen as the regions to study based upon the key informant's information of the regions being world leading in innovative food. Two of the regions are agricultural areas providing a large part of their nations agricultural products, and two of the regions are major cities. The selection of ecosystems started from this geographical limitation and was then carried out by searching on the internet for food innovation activities in the regions. As innovation ecosystems are a new phenomenon, search words used were: Food innovation centre, food innovation, food innovation hub, food innovation Denmark, food innovation Skåne, and innovative food Denmark, Innovative Food Skåne. Out of the few results that could be argued to have the potential of being an innovation ecosystem, the website of each organisation found was analysed in order to see if there was a fit with this thesis definition of an innovation ecosystem in the food industry. Out of the small sample that constituted of innovation ecosystems, the organisations were contacted by email and phone to schedule interviews.

Yin (2011) argues that the chosen respondents in a multiple case study are to be selected based on their unique provision of data in order to answer the research question. As the respondents from each innovation ecosystem were purposely chosen, the sample is described as non-random (Bryman & Bell, 2011). The aim was to interview people on executive management level, with insight and an overview of the entire organisation. As most innovation ecosystems are quite limited in managerial positions, the selection was easier to facilitate, choosing the respondents with positions facilitating innovation.

Abbreviation	Ecosystem	Country	Title of possition	Date of interview	Length in min	Channel
DFC1	Danish Food Cluster	Denmark	Innovation Manager	2018-04-13	55	In house
RAB1	RISE Agrifood and Bioscience	Sweden	Business and Innovation Manager	2018-04-16	65	Phone call
KRI1	Krinova	Sweden	Food Innovation Manager	2018-04-17	70	In house
CPH1	CPH-Food	Denmark	Project Leader	2018-04-24	45	Phone call

Table 1. *Illustrating the interviews held at each respective ecosystem*

3.3 Research Methods

3.3.1 Primary Data Collection

As an initial step, in order to generate an understanding of innovation in the food industry, unstructured phone, and in-person interviews was carried out. The interviews were held with representatives from the industry, referred to by Bryman (2011) as key informants. Five such interviews were conducted in the initial data collection. Rubin & Rubin (1995), favours the employment of unstructured interviews as they provide the possibility to take preliminary steps toward a semi-structured interview as the researcher develops knowledge of the investigated field. However, as the conducted interviews aimed at creating a general understanding of the industry, being unstructured, they are not included in the results of this thesis.

Due to the explorative character of this thesis, the gathering of primary data was carried out by semi-structured interviews in accordance with a semi-structured technique. See appendix two for the interview questionnaire. The following authors have in their research of ecosystems employed a similar technique; Clarysse et al. (2014) and Gawer & Cusumano (2014), strengthening the choice of interview technique. By using semi-structured interviews, follow-up questions, rephrased questions and to ask for clarifications by the respondents, was made possible. This was of great importance for the research as there is ambiguity in the terminology of innovative food, ecosystems and knowledge. To avoid such ambiguity, the respondents were first allowed to share their view and understanding of the mentioned areas. If their view was in line with the thesis definitions of the respective area, they were urged to continue. If not, the definition of respective area was presented to them, in order to align their understanding of the terminology, aiming to receive more accurate and valid data. However, Bryman (2011) highlights the risks connected to a semi-structured interview technique as it increases the difficulties in replicating the study and the potential to affect the reliability and validity of the result. This thesis is subjected to such risks, as the respondents of each ecosystem might quit or change position and the investigated ecosystem might drastically change in focus or organisational setup. However, the methodological framework can be applied to similar ecosystems in the food industry in order to replicate the study. The choice of a semi-structured technique was however seen as the appropriate method of data collection, motivated due to the flexibility and possibility to ask follow-up questions.

3.3.1.1 Rating of Knowledge Sharing

During the primary data collection interviews, each respondent was asked to describe the type of knowledge shared concordant to the four types of identified knowledge; Scientific, technological, business and market. The respondents then got asked to rate the amount of each type of knowledge shared. The rating was consisting of a 1-10 scale, 1 being very low amount shared, and 10 a very high amount shared. The data from this activity can be considered subjective and biased to the respondent and the ecosystem. It will however indicate how the sharing of each knowledge type relates to the amount of the other types. The data was used in order to get an indication of how ecosystems differ in focus on knowledge sharing. An illustration of the comparison of the ecosystems knowledge sharing is presented in chapter *5.2*.

3.3.2 Secondary Data Collection

In order to reach the aim of this thesis, the historical and present concepts of innovation theories had to be discovered and examined, as well as the current innovation process of the food industry. Such secondary data is based upon academic literature in the form of articles, industry reports and books. The academic literature was identified by the use of Google Scholar and Gothenburg University Library's search function. The databases included in the searches are as follows; Business Source premier, ScienceDirect, Emerald, SpringerLink, GUNDA, LIBRIS, and GUPEA. As literature covering innovation ecosystems and innovation ecosystems in the food industry are novel fields of research, scanning of already identified literature references was performed, in order to extend the literature review.

3.3.3 Practicalities

The selected sample of potential innovation ecosystems was contacted by email and phone to schedule interviews. If the organisation failed to answer one week after the initial contact, a follow-up email was sent as a reminder. Six organisations were contacted, leading to four scheduled interviews. The reluctant organisations expressed their decline due to time restraints.

Prior to conducting the semi-structured interviews, an interview guide was constructed, presented in appendix two. The questions in the guide aimed to capture the appropriate data in order to analyse and answer the guiding questions for this thesis. The prepared questions guided the interview, however letting the interviewer and respondents to ask follow-up questions and clarifications due to the semi-structured character of the interview.

Two of the interviews were conducted face to face and two were conducted by phone. The two, face to face, interviews were conducted at the respondent's company site, in an undisturbed meeting-room. The four interviews ranged from 45-70 minutes, providing rich and deep data. The interviews started with the interviewer giving a personal introduction to then present the thesis purpose and aim. The respondents were then presented with the research to be conducted, asked for their agreement, ensured their personal confidentiality and told how the collected data was going to be used. In order to capture the interviews, computer written notes were taken during the interviews. The interviews were furthermore, with the permission of the interviewee, voice recorded. The smartphone application "Wrappup" was used in the recording, providing an automatic initial transcription. The voice recordings and the transcriptions were very helpful when important sections needed to be backtracked and were of great aid in the analysis of the data.

3.4 Analysis of data

The interviews held, were all conducted within a two-week timeframe, enabling the immediate revision of raw material in the form of notes and recordings in order to, later on, transcribe the

interviews. The analysis of the material employed a thematic approach by identifying and analysing patterns, in terms of uncovering major "themes" found in the data.

The interpretations of themes and the comparisons between innovation ecosystems used a constant-comparative method. It entailed the comparison among the empirical findings from each ecosystem and the discovered themes. The findings where furthermore compared with previous research and the theoretical framework of an ecosystem, described in chapter, 2.7. In this study, the collection of data, reviewing the literature and analysing the empirics, have been carried out in an iterative way. This means, that when empirical results pointed at a certain direction, theoretical explanations were sought, post data collection, working in a parallel process.

When analysing the innovation ecosystems facilitation of knowledge sharing, the empirical findings are illustrated in a spider diagram. The types of knowledge analysed are the four types explained in chapter *2.6.2*. The choice of a spider diagram suits the data collected as it provides an illustrative model of data. The diagram provides an overview of the different types of knowledge in relation to each other. The illustration provided ground for further analysis of the types of knowledge shared and indicates any tendencies to share a certain type of knowledge in favour for another. After illustrating and analysing respective ecosystem, an aggregated spider diagram, chapter *5.6*, is presented and analysed by comparing the tendency of knowledge shared amongst the ecosystems, in order to conclude any major differences or similarities. Furthermore, the thematic approach was used in order to discover activities initiated by the innovation ecosystems, not directly linked to the sharing of knowledge. By analysing such activities, the role of an ecosystem in the creation of innovative food was discussed, aiming to discover the activities, collectively forming the role of an ecosystem.

An analysis of the theoretical concept of an innovation ecosystem in the food industry, presented in chapter *2.7*, in relation to the retrieved data, was conducted in order to find applicability of the ecosystem terminology. The discussion stemming from the analysis caters to the industry's (Winger & Gavin, 2006) and scholars' (Avermaete et al., 2004; Bayona-Saez et al.'s, 2017) interest, in finding new frameworks dealing with the inflexibility in the existing food innovation system, and the high failure rate of food products penetrating the market (Winger & Gavin, 2006).

3.4.1 Validity

When evaluating the test methods validity in a qualitative study, Eriksson & Wiedersheim-Paul (2014) states that it is extremely hard to, in most cases, measure such validity. However, it is possible to increase the validity by using multi-perspective data collection and analysis (Patel & Davidson, 2011). If the results are the same, independently of perspective, the validity is regarded to be high enough. In this thesis, the validity is increased by comparison of theories and empirical observations. The data collected from the four researched organisations is furthermore compared to each other, having been collected by the same interview technique, subjected to the same questionnaire. Another threat to the validity is whether the research results can be generalized and in such case, applied to external areas. In order to counteract such threat, measurements are taken against the generalizability of the results, by pointing out that the result should not be generalized to adjacent areas, not included in this study. Such areas are innovation ecosystems, innovation centres and hubs, as well as the generic concept of product innovation, in other industries than the food industry. This implies that the studied ecosystems and organizations can be compared to each other, and to similar ecosystems and organizations, only, within the food industry.

3.4.2 Reliability

Qualitative studies do in general provide difficulties in their replication due to the hardship in reproducing the interview environment, how questions are asked, and the context (Bryman & Bell, 2011). The data collection methods, as well as the methods of analysis, have in this study been defined in advance with the purpose to increase the reliability through avoidance of uncertainty in the measurements. The data has been collected from several respondents at different geographical locations, holding different positions of management, and under different settings, strengthening the reliability as respondent bias is levelled out in the data comparisons. A structured interview technique would have been the optimal choice in regard to reliability. However, with respect to the aim of this thesis, a semi-structured technique was favoured. This is argued to have been the optimal choice for the thesis as it provided the researcher and the respondent to create a mutual understanding of the questions and answers. Furthermore, this thesis chooses to employ high transparency in its methods and in the selections of ecosystems and respondents in order to support the replication of the data collection.

3.5 Methodological reflections

The role of being an interviewer was not without challenges. Even though possessing previous experience in interviewing and having studied available literature in the art of interviewing; bias, knowledge gaps, and taking notes while asking questions were put to the test. The knowledge of the food industry, and the theories behind innovation ecosystems, improved for the author, due to the initial key informant's unstructured interviews, and while analysing the available literature. This is argued to have improved the quality of the primary data interviews, as they could be held in a professional and scientific way, in line with Kvale and Brinkmann's (2009) thoughts on learning by doing. The questions asked during the interviews, provided in appendix 2, aimed only to capture data in relation to the aim of the research, providing data to answer the guiding research questions. The respondents provided sufficient data in order to compare and analyse the theories with the data.

The selection of innovation ecosystems could further have been geographically expanded to a greater number of nations. This would, in turn, generate the possibility to analyse a cross-cultural context of innovative food and ecosystems, adding the possibility to analyse cross-cultural conditions in the form of; policies, regulations, public financing methods and the culture to innovate. However, such expansion would then suffer from cultural and contextual differences, which according to Boer, Helms, & Aiking (2006) and Olsen et al. (2007) are very high in the food industry. The researched innovation ecosystems are considered to have been a very good fit with the aim of the thesis. The data provided was sufficient in order to answer the research questions and to provide implications of the research, as well as present suggestions for further research.

The thought of graphically illustrating an innovation ecosystem in the food industry was disfavoured. If such attempt were to be made, it would only capture a snapshot of the current environment of the ecosystem, failing to account for the dynamism and flexibility, as actors frequently join and leave the ecosystem.

Furthermore, employing a qualitative design led to that no quantitative measures were generated. Nor can the results from this thesis be applied in other contexts i.e. in innovation ecosystems operating outside the food industry. A supplementing approach could have been to include a survey in the study, in order to collect data from the actors within an innovation ecosystem. By statistically testing the questions and answers, a greater level of objectiveness

could have been reached. However, the aim of this thesis is neither to provide a generalizable result, nor provide an overview of all types of innovation ecosystems, but rather empirically test the suggested definition of an innovation system, and to investigate its role in the creation of innovative food.

3.6 Methodology summary

This thesis motivates its research strategy and design and chosen methods due to its exploratory and novel research. Choosing a qualitative approach give the research the possibility to collect deep insights from the researched organisations as well as providing an interesting analysis. Furthermore, as the majority of the relevant research in innovation ecosystems and innovation in the food industry takes a qualitative approach, this thesis finds value in employing a similar strategy. Additionally, as the food industry is currently undergoing a transformation with an increase of SMEs and more openness, discussed in chapter 1.2, weight in with the fact that only a small number of organisations could be potentially labelled innovation ecosystems, the choice of a qualitative approach is further strengthened.

Moreover, by employing an abductive approach, the aim of testing the definition of an innovation ecosystem as well as investigating the role of such innovation ecosystem in the creation of innovative food, was possible.

The method for data collection was carried out in a two-step approach. Initially, unstructured interviews were held with key informants to gain an understanding of the food industry. Following were the semi-structured interview, see appendix two for the interview guideline, to gain in depth knowledge of the role of the innovation ecosystem in the creation of innovative food. The interviews were carried out with four respondents of the studied ecosystems, all working with innovation at managemental positions. The findings are analysed by a thematic approach employing a constant-comparative and iterative method. The study should not be generalised to innovation ecosystems outside the food industry.

The methodological choices in this thesis are argued to allow for the theoretical framework in this thesis, discussed in chapter 2.7, to be used in the collection and analysis of data. When dealing with novel research, applying definitions to empirical studies, the author argues that flexibility and adaptability are of great favour. As this thesis has chosen its strategy and design in order to provide such flexibility, the results presented in this thesis are thought of as valid, providing implications for both the literature and the food industry.

4. Empirical results

In the following chapter, the reader is presented with the results of the empirical research. The findings are derived from the semi-structured interviews motivated in the methodological chapter. Firstly, each ecosystem will be presented and an example of an innovative food product, will be described. Secondly, the knowledge sharing within each ecosystem to be illustrated in a spider diagram before expressed suggestions for improvement are presented.

4.1 Danish Food Cluster

The Danish Food Cluster, hereon DFC, is located in the west of Denmark. The region is considered the agricultural centre of the country, also being located close to the major city of Aarhus. DFC was founded in 2013 and is today employing six people, all working with administrating and facilitating their member companies and actors. The organisation is currently made up of 160 small, medium and large-sized companies, employing a total of 900 people working on-site. The DFC is financed by member fees, 55 % and the rest by EU, regional and national funds, 45%.

The purpose of DFC is to facilitate the means for its members to innovate by organising their activities based on three main pillars: (1) Maximizing innovation. (2) Branding and network. (3) Visibility (nationally and internationally). The DFC organizes several activities and events in order to provide an innovative environment for their members. There is at least one event per month. A few of the activities are; Network meetings, thematic seminars, company visits, conferences, scientific researcher presentations, and innovation support for member companies. Another activity is what DFC calls “round table”. It’s a forum where selected members from the cluster, together with external agents, are invited to discuss a specific topic of interest, in order to find potential benefits by collaborating. Furthermore, DFC has a very good relationship with the Aarhus University, organising multiple activities together. Once every semester, DFC organises an event called Master classes, inviting students to present the latest research that could have potential impact in the food industry. The presentations are done to the member companies in order to create networks and collaborations between students and companies, and amongst companies. Moreover, once a year, a case event is held where large companies present a challenge for master students to solve, with the help of experts of the industry. The case-results have historically been presented at a conference to then go on and be implemented in the industry.

The DFC is expanding, building new facilities. As an effect of this expansion, the Aarhus University has decided to move their food research department to the new facilities, placing it in immediate proximity to the physical centre point of the organisation. In near proximity, the major dairy company Arla has located their headquarter as well as their innovation development facilities. The Aarhus university hospital is also located close by, which has led to a lot of collaboration with the DFC in regards of bridging food innovation and innovation in health and medicine.

4.1.1 The Role in Creating Innovative Food

DFC explains that in the creation of innovative food, they have a clear and defined role as a facilitator.

> “*We put people and companies together. Sometimes by companies asking for collaboration. Sometimes it’s a push from DFC that “you have to meet”, that is, if we have recognized a potential fit”* (DFC1, 2018-04-13).

DFC is facilitating the sharing of knowledge in their cluster by the formentioned activities that they arrange. Furthermore, they diffuse knowledge between companies through initiating, leading and participating in innovation projects.

> *One of the most important parts of our role is to make research available to the food market, and create the link between the universities and knowledge institutions and the industry, to create a higher level of knowledge in the food companies for them to create food innovations.* (DFC1, 2018-04-13)

However, the facilitating mainly intends to initiate contact and collaborations, for the companies to then answer for the innovation process themselves. The DFC provides support if needed and wanted, but does in most cases not have an active role in each innovation project. The DFC can furthermore finance projects between member organisations. They can also partner the collaborations with public and private financers. They do as well charge an administrative fee for the facilitation of the collaboration.

At the DFC facilities, there is an incubator. The role of the incubator is to accelerate the growth, and distribute knowledge, amongst start-ups in the food industry. If successful and when the companies reach a specific state or size, they are offered the possibility to rent office space at the facilities, leaving the incubator and becoming members of DFC. Most production companies however leave the facility as no production plant is offered. The DFC hopes to change this by adding production and upscaling-facilities in the expansion of the clusters facilities.

4.1.2 An Example of Innovative Food – Dansk Supermarked Group

The creation of a platform. This is not an example of a single product, but the case of several innovative food products that by the aid of DFC reached the market. After the products had been developed at member companies, with aid by DFC in form of offering their facilities, achieving contacts with financers and innovation support, they all faced the hardship of reaching the market. Getting accepted by a supermarket and securing a good shelf location in a store is a common struggle for all products in the food industry.

DCF recognised this problem, and together with the Danish market's largest supermarket consortium, Dansk Supermarked Group, aimed at finding a solution. By organising a yearly fair, functioning as a platform for the food products, the Dansk Supermarked Group and its six daughter companies (the supermarkets) were able to see and try the new products, while meeting the people and companies behind the products. The platform has led to a large increase of products being accepted by the market as they have secured shelf space in a recognised supermarket.

DFC1 stresses that in order to become an innovative food product, there is need for acceptance in the market. It is therefore of interest to highlight an initiative that got several products to actually reach the state of innovation as they penetrated the market due to the innovation fair.

4.1.3 Knowledge Sharing

Below is a short description by how the DFC shares knowledge, presented per knowledge type together with the rating (1-10).

Scientific knowledge – This type of knowledge comes from the universities and research centres. Researchers and students bring their knowledge to the university-industry activities

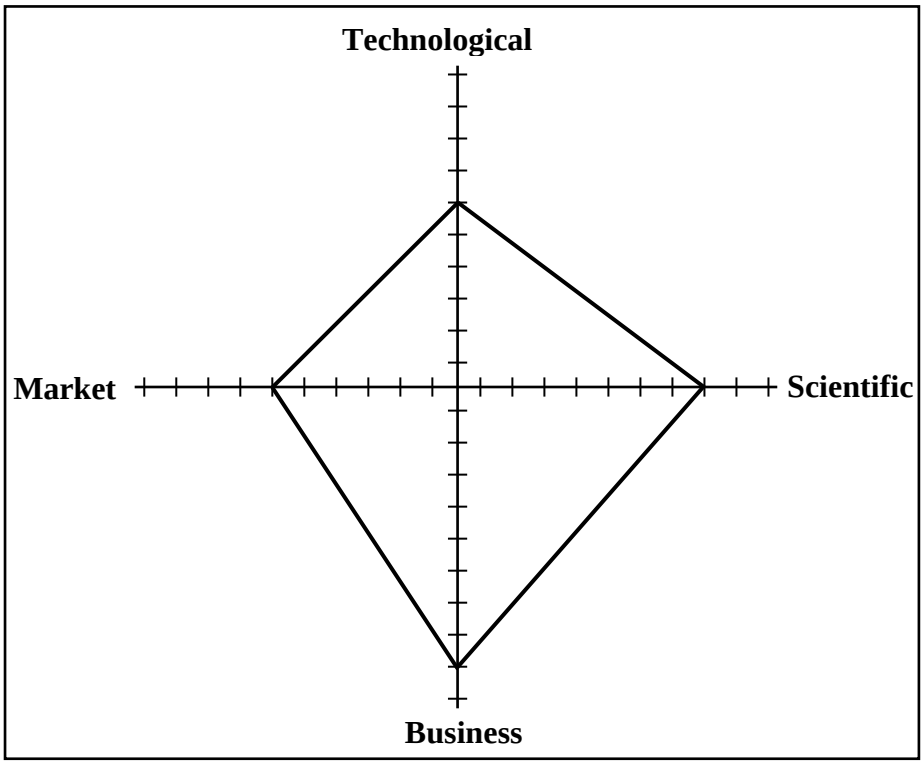
organised by DFC. Furthermore, scientific knowledge is constantly shared thorough DFC's online platforms. For some innovation projects, DFC demands companies to partner with a scientific knowledge provider, in order to achieve financing by DFC. Rate. **8**

Technological – This type of knowledge originates from the DFC core members, being members primarily working with food. There are furthermore non-core members, functioning as technology providers, for instance; IT and steel companies, being able to provide technical knowledge to the cluster. Rate: **6**

Market – This type of knowledge is primarily aimed at towards innovation projects in need of penetrating a market. The DFC admits to lack knowledge of the market as well as activities aimed at achieving such knowledge. However, the market knowledge shared comes from market expert consultants, brought in per specific innovation project. Rate: **5**

Business Knowledge – This type of knowledge stems from the previous and ongoing innovation projects within the cluster. The member companies are made up of 65% SMEs. Their knowledge, experience and aims are shared within the ecosystem through events and round table discussions. Rate: **9**

See model 1, for the illustration of the Danish Food Cluster's knowledge sharing presented.



Model 1. *Model illustrating the amount per types of knowledge, shared within the Danish Food Cluster.*

4.1.4 Expressed Need for Improvements

DFC1 expresses how their 160 members cover approximately 75% of the diversity in the food industry. In order to better facilitate knowledge sharing, it is expressed that the technology and IT sector of the food industry should be incorporated into DFC.

Furthermore, DFC1 explains how today's food production is not big enough to feed the growing population of the world. Therefore, in order to facilitate innovative food with a sustainable aim, more base- and applied research should be aimed at discovering and developing new types of proteins.

4.2 RISE Agrifood and Bioscience

Research Institutes of Sweden[4]. with focus on Agrifood and Bioscience, hereon RISE, is located in the south-west of Sweden. This region has some agricultural actors and is considered the fish and marine hub of the country, RISE being located in the outskirts of the major city Göteborg. This location puts the centre fairly close to the University of Gothenburg and the technical university Chalmers. RISE got its current structure in 2017, after a merger between a few different actors in 2015. The organisation was prior to 2015 consisting of private and governmental initiatives. The research institute employs 130 people working with food and agriculture. The food centre is located in Göteborg whilst the agricultural centre is located in Uppsala, with hubs in Lund, Skara and Umeå. RISE is financed by; 19 % governmental funds, 6% EU funds, 21% from public finances and 54% from the industry (where SMEs stand for 30% of the industry financing).

The purpose of RISE is set by the Swedish government, responsible to drive: Innovation and research leading to competitiveness along the food chain, in order to increase the total food production and provide sustainable development throughout the country. The purpose is segmented into three different target areas, being: (1) Sustainable production in the food chain; (2) demand-driven product innovation; and (3) Innovative techniques and processes.

RISE organises and partakes in several activities and events in order to reach the set goals. Events range from providing innovation support to SMEs, to coordinate the national research on food and connecting universities and master students to companies with a defined case to be solved. The institute also works as a consultant for the industry, offering a wide range of activities. The activities are as follows: Driving research and innovation projects; Research-based expert services and preliminary studies; Providing testbeds, laboratories and demonstration facilities; Design assignments and design processes; Technical assessment and verification; Prototyping; Innovation support for SME companies.

4.2.1 The Role in Creating Innovative Food

RAB1 explains how the organisation is receiving a greater role in the national coordination of innovation by the government. This has led to that the organisation is partnering with several initiatives all over Sweden in order to structure and create an omnichannel for food innovation.

> *"We see a trend in Sweden that a lot of activities are ongoing, but there are very little collaboration and sharing of the information on what is going on. There needs to be better collaboration between the different activities, creating clarity."* (RAB1, 2018-04-16)

By coordinating activities, and displaying ongoing initiatives in a national network, the aim is to provide a landscape that is easier to navigate for companies in the food industry.

[4] RISE is a Swedish research institute made up of six divisions. The Agrifood and Bioscience unit falls under one of these divisions. In this thesis, when the name RISE is used, it is only referring to the unit of Agrifood and Bioscience and their activities in regards of innovative food. The set goals and purpose of formentioned unit might differ from other divisions and units and should not work as an indicium for the entire organisation of RISE.

Furthermore, RISE is looking into building an incubator for food innovation in close proximity to their current research institute. In this way, they argue that their competence and knowledge can be put to use in a better way, as well as themselves getting a better view of the market.

Moreover, RAB1 explains how RISE is a research institute that aims to be a research partner to firms in the food industry. This means that in order to achieve the governmentally set purpose with its three target areas, RISE is offering their services as consultants to companies partaking in food innovation. RISE is facilitating the sharing of knowledge in their network by the formentioned activities that they arrange and by the consultancy role.

> *"We work with open innovation, what we call innovation landscaping. We connect large national and international companies with smaller companies and entrepreneurs to develop better market fitted products."* (RAB1, 2018-04-16)

Due to RISE Agrifood and Bioscience being part of the larger organisation RISE, the sharing of knowledge between different fields of research is also done internally. This process of sharing is under development due to the new organisational structure, but it is aiming at finding potential fit between research in different fields.

4.2.2 An Example of Innovative Food – Oumph!

The creation of Oumph! This product is a protein-based, meat free alternative. It is created by a soy protein concentrate that is mixed with water into a dough. The dough is then put in an extruder, a machine that by heat and pressure creates a fibre-like texture to the product. The final product has a meat-like texture and can be cooked and flavoured in the same way as meat. The name Oumph! Was inspired by the sound one makes when eating something really delicious. The product was created by the Swedish company Food for progress by co-creation.

The company Food for progress, hereon FFP, were after their initial and successful product *Beat*, a paste made out of beans, looking for further developments within the meat-free sector. FFP already had a relation with RISE since the development of Beat, and once again turned to the institute when developing their new product Oumph! RISE's role in the development was to analyse and research the compounds of the product as well as aid the company in building a network of potential partners and to attain financing. RISE invited FFP to an export network meeting in order to find potential partners.

This lead to FFP gaining contact with the production facility, Marimat AB, and a Dutch production facility. The Swedish company Marimat AB later came to rebuild their facility in order to be able to produce Oumph!, and a line of other healthy and sustainable food products. The contact with the Dutch production facility led to the soy protein and dough being produced in the Netherlands and then shipped to Sweden for flavouring and extruding. Through the relationship with RISE, FFP also came to receive financial aid from Vinova, Almi and Västra Götalandsregionen (All public financers). Further actors that was aiding the development of Oumph! were a PR firm, the quality certification organisation KRAV, and actors specialised in technical competence. RISE estimates the number of external actors to have been at least ten, involved in different stages of Oumph!'s journey. The main roles of RISE were explained to have been (1) scientific research in a lab environment, and (2) to facilitate the connection between different actors for the innovation process.

RISE says that the biggest outcome and lesson from this journey is that companies, not being major ones, neither could, nor should try to develop everything themselves, but to co-create by asking for help, and by sharing progress.

4.2.3 Knowledge Sharing

Below is a short description of how RISE shares knowledge, presented per knowledge type together with the rating (1-10).

Scientific knowledge – This type of knowledge originates from in-house researchers that are performing research on a "pull" basis from companies, or by a "push" basis, if RISE has identified a need that is not currently requested by companies, but where the knowledge would benefit the industry. Scientific knowledge is also originating from collaborations with universities, even though such collaborations are not frequently arranged today. Rate: **8**

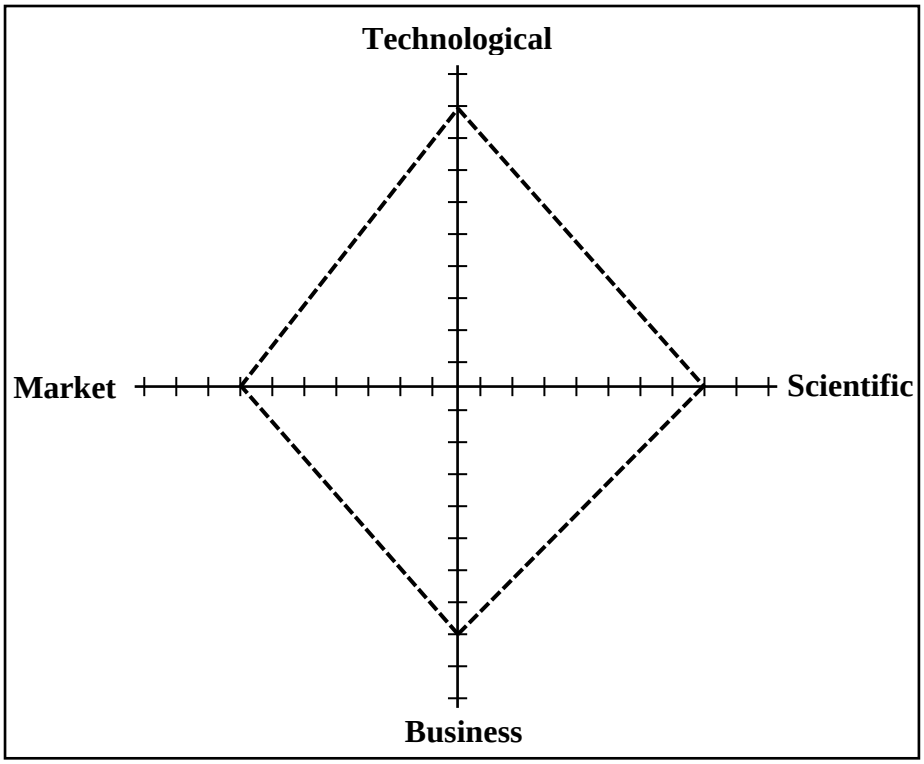
Technological – This type of knowledge stems from RISE's personnel traveling to companies to see how scientific knowledge could be implemented in the companies' technologies[5]. The learnings from the different companies are then spread within the network. RISE do not develop their own technologies but are facilities knowledge and collaboration between different actors. Rate: **9**

Market – This type of knowledge comes from the input from different actors, collaboration partners, and consumers. By this input, RISE gains a picture of ongoing trends, being shared through different events, and by request, to companies. The institute does however not conduct pure market research analysis but instead bring in consultants and initiate contact with market specialists and companies. Rate: **7**

Business – This type of knowledge is spread by promoting collaborations after finding fruitful potential partnerships in the market. Most requests for business knowledge come from SMEs and entrepreneurs wanting to find collaborations and gain knowledge. It is mainly revolving around information regarding regulations and policy in the food industry. Several questions from companies also come in regard to financing. RISE does not finance projects but can connect the company to the right actor. Rate: **7**

See model 2, for the illustration of RISE's knowledge sharing presented.

[5] Technologies meaning machines and production equipment in this context. Clarification added by author.



Model 2. *Model illustrating the amount per types of knowledge shared within RISE Agrifood and Bioscience*

4.2.4 Expressed Need for Improvements

RAB1 explained that there are several ongoing activities in Sweden aiming at creating innovative food. However, there is very little collaboration and knowledge sharing across the industry, of what is going on. There is therefore an expressed need to increase the knowledge sharing and cooperation between different activities. As a reaction, RISE, together with a few other actors, have launched the initiative SAMLA. SAMLA will help Swedish food companies get a more efficient innovation and development process so that they can reach larger markets with sustainable, competitive and innovative products.

RAB1 further explains how RISE needs to be more proactive. As a step in such direction, there are plans of building a physical innovation hub for companies within the food industry to rent office space. This would put the SMEs in close proximity to the expertise of RISE as well as enable collaboration between the companies. Another need for improvement lies in the fact that it is hard to get the large companies to share their methods and knowledge of innovation with external actors. Smaller companies are better at sharing and collaborating when developing products, understanding the benefits of co-creation. RAB1 argues that if large companies were to understand the benefits of collaborating with smaller ventures, the industry would benefit from more innovative products being generated.

4.3 Krinova

Krinova is one of Sweden's 70 incubator and science parks, yet, Krinova is the only one with a special interest in food[6]. It is located in north-east of Skåne, being the most southern region in Sweden, in what is the agricultural centre of the country. The incubator is located in the city of

[6] It should be noted that even though Krinova has a special interest in food companies, they do not exclusively work with such, but allows firms from other industries. In this thesis, it is only the incubators role in working with food companies that is presented.

Kristianstad and at the campus of Kristianstad University. It was founded in 1999 in an old military facility. Krinova employs 16 people working with different areas in the incubation process and food innovation process. The organisation is financed by the municipality by 80% and by the Kristianstad University by 20%.

The original purpose of the incubator was to increase the region of north-east Skåne's growth and attractivity. The purpose has however been broadened so that Krinova since 2007 is running the national food innovation program. The incubator is fulfilling this role by making research and knowledge available to different businesses and society at large, with the aim that it shall generate more innovative companies in the food sector.

Krinova has three lead motives figuring as the main interest of their organisation, these are: (1) Incubation – start-ups. (2) Open innovation – collaboration. (3) Acceleration – growth. In order to provide an innovative environment and the right aid for their start-ups and innovation projects, Krinova organizes several activities and events. A few of the events are: Business design programs, taste panels, network meetings, providing facilities for food conferences and events, running an innovation process training program (TOY-imagine), company visits, providing financial support, and hosting a food hackathon, amongst other.

Krinova is furthermore looking at international expansion, partnering with innovation hubs all over the world. The lead motive is to facilitate a network and, in-market knowledge, to their start-up or partner companies, looking to export their food products.

4.3.1 The Role in Creating Innovative Food

KRI1 explains how Krinova has taken the role of being "on top" their community, looking out over the world. By doing so, they are quick to discover challenges and opportunities in the market. When a company has requested specific aid, it is the role of Krinova to provide three prerequisites for innovation. Those being; (1) A meeting place between ideas, people, and companies. (2) A platform for development and innovation projects. And (3) A catalyst for knowledge intensive companies with growth potential. As the main role of Krinova is being an incubator, KRI1 explains the selection process of admitting a company or idea:

> *"We don't say no to anyone. Every idea and company is accepted in order to try out their concept. The ones that are bad or need more development disappear by themselves. It's a natural selection process."* (KRI1, 2018-04-17).

After a company has been "admitted" and started their process, Krinova facilitates the sharing of knowledge between the existing companies, the university and external actors. The role is based on having a large network and great understanding of the market. Krinova then "sits down on the same side of the table" as the company, in order to; Co-learn, Co-design, and Co-effectuate.

> *What we do, is that we only connect companies based on challenges. If a company is facing a challenge, we know what partner has the right knowledge, and we go on to connect them.* (KRI1, 2018-04-17).

Furthermore, Krinova partakes in the development of areas that could benefit the food industry, if they see that no company has the financial power, the will or understanding of the potential benefit. Krinova then applies for EU funds in order to develop the area, to then share the outcome with the food industry.

Krinova is moreover engaged in a close relationship with Kristianstad University, especially the gastronomy programme. The University brings scientific research as well as students (seen as potential entrepreneurs) to the incubator where further development can be conducted by the aid of the students. Krinova has launched an innovation training process (TOY-imagine) that is being launched at the University, mandatory for all programs, in order to raise the knowledge of innovation while also providing practical moments in the form of a case competition.

Another initiative run by Krinova is their annual food hackathon. The most recent one held in January 2018, attracted 40 actors from 22 different countries. The Food hackathon combines foodies, product developers, large companies, designers, students and entrepreneurs; cross-polling ideas, creating new products and tools to improve and develop the food industry. The hackathon is run as a competition and the final concepts are judged by: The most innovative idea, the most influential idea, the greatest potential idea and the audience's choice.

4.3.2 An Example of Innovative Food - Gårdsfisk

The breeding of Gårdsfisk[7]. The novelty behind this product is based on a revolutionary way of breeding fish. Providing enough fish to satisfy the increasing demand without overfishing the oceans or greater lakes has proven to be a challenge. As a solution, farmed fish has increased in popularity. However, fish breeding in oceans or lakes comes with a lot of downsides in the form of overfertilization, diseases and by the killing of biodiversity in the natural habitat. Providing an alternative approach, two entrepreneurs came with the idea to breed fish at regular farms, that already possesses the facilities, routines and knowledge of cultivating, breeding and harvesting.

Krinova was contacted by the two entrepreneurs in order to help with business design, networks and financing. Through Krinova, the company secured an initial investment of 300 000SEK in order to purchase their own test farm. KRI1 states that without the partnership and aid by Krinova, there would most likely not be a company nor a product. Through open innovation and several iterations based on the market, the farm was rebuilt and a business model was created in order to sell the concept to other farms. The concept is based upon existing farms expanding by installing a closed water-tank system for the farming of fish. The farm harvests the fish four times a year, which is picked up by Gårdsfisk and sold at the fish market. The farmer is therefore not becoming a fish trader, as the company takes cares of distribution and sales, leaving the farmer to focus on the running of the farm. By small scale fish breeding at farms, the overfertilization in the ocean is decreased, as well as letting the farmer take the potent water from the tanks and use it in the farmland, containing a healthy amount of fertilization.

Krinova has been part of the entire process, connecting Gårdsfisk with different actors across several industries in order to access financing, fish breeding knowledge, technical knowledge of closed water systems and distribution solutions, amongst other knowledge. The product has partially been developed as a collaboration with the Kristianstad University. The company recently received investments by venture capital, having attracted the attention of the market due to its great potential. One private investor together with LRF, Lantbrukarnas Riksförbund (Farmers National organisation), both invested a large sum in order for the company to expand both nationally, and internationally. The company is currently in negotiations in Mexico and the south of USA, with the hope of selling their business model.

[7] Gårdsfisk translates to *farm fish*.

4.3.3 Knowledge Sharing

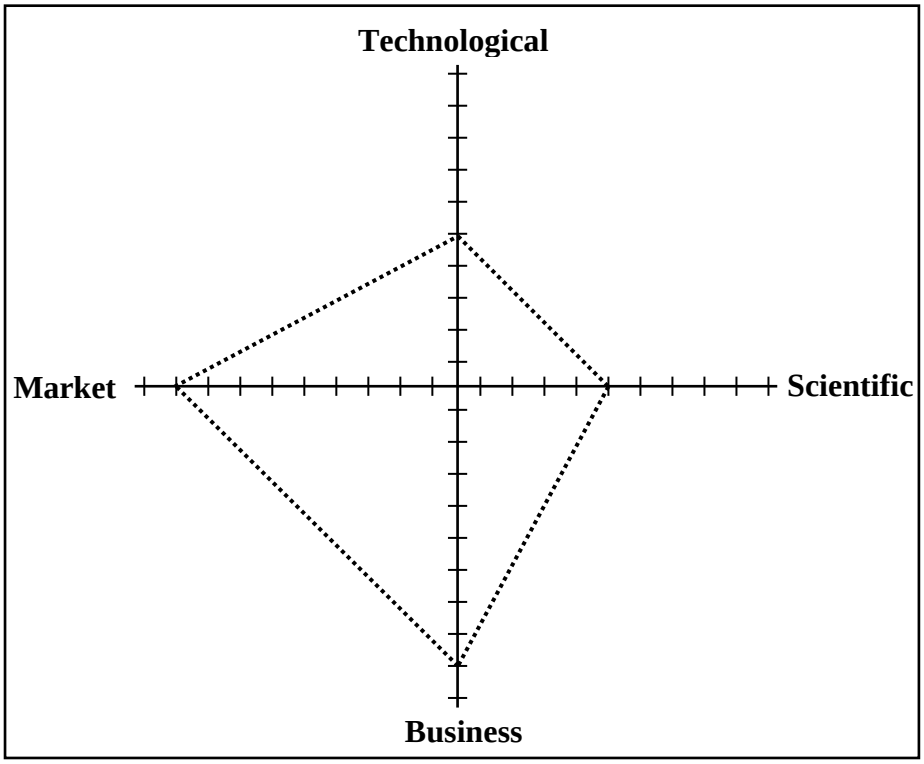
Scientific knowledge – This type of knowledge comes from the collaboration with the university. However, there is little request from companies regarding scientific knowledge. The knowledge is primarily shared through events between university and companies. Rate: **5**

Technological – This type of knowledge stems from the connections between actors and Krinova, where personnel visits different companies. Krinova does not have any technological development but spread this type of knowledge by connecting different actors. Rate: **5**

Market – This type of knowledge originates from Krinova being "on top" of their community, gaining great insight into the market. The connections and events with companies, university, students, consumers and international partners help Krinova to attain knowledge and to diffuse within the community. A lot of question from the companies in the incubator as well as companies asking for help revolve around market knowledge. Rate: **9**

Business – This type of knowledge stems from Krinova being a specialist in business design and aiding companies in accelerating, innovating and penetrating markets. Krinova has a long track-record of companies in their incubator, meaning that they have generated a knowledge base from experience. Several questions Krinova receives from companies revolve around financing. Krinova can in certain cases finance the project, company or idea, and in other cases connect the company with the right actors. Rate: **9**

See model 3, for the illustration of KRINOVA's knowledge sharing presented.



Model 3. *Model illustrating the amount per types of knowledge, shared within KRINOVA.*

4.3.4 Expressed Need for Improvements

KRI1 expresses how it is imperative that the Swedish food industry in general, their incubator included, becomes more proactive. It is argued that the Swedish food innovation scene is extremely reactive, leading to less innovation, especially radical ones, being generated.

Furthermore, there needs to be a better financing system for SMEs in the food industry. The complexity of applying for different grants, as well as the lack of private investors, makes the food industry lag behind in the creation of innovative food.

4.4 CPH-Food

The Greater Copenhagen Food Innovation Project, (CPH-Food), is a project running from 2016 to 2020 at the Technical University of Denmark, DTU. CPH-Food is located at the universities facilities in greater Copenhagen, in proximity of several other universities, SMEs, other actors involved in the food industry, and the south of Sweden. The project employs one person on fulltime basis, functioning as the project leader. However, most students and researchers of the DTU food institution function as "potential project members", working on an hourly basis in different projects. The project is financed by the Danish region of Sjaelland and by EU grants.

The project collaborates with a few different partners; KU, Capnova, Agro Business Park, Future Food Innovation and Danish Food Cluster with the aim to increase the degree of innovation and develop concrete solutions for SMEs in the food industry. The companies can be supported in developing innovative products, processes, and concepts that are considered to have a strong commercial future. The project aims to ensure that innovation and the sharing of knowledge become a fundamental part of the company's everyday life and strategy in the future. The goal of the project is to initiate 42 projects with SMEs during its existence.

4.4.1 The Role in Creating Innovative Food

In order to reach the goal and aim of the project, CPH-Food utilizes their partners' united competencies in individually-tailored and targeted development processes for innovation. This is done in order to create value for SMEs and for the food sector in general. CPH1 explains how most companies come to CPH-Food themselves, asking for help with a specific problem. The project then allocates students and researchers to find suitable research and solutions to the problem, without partaking in base research. However, it is commonly held that many of the smaller companies are of the belief that a collaboration with the university is out of their reach. Therefore, the project leader of CPF-Food targets potential SMEs, calling them and explaining the benefits they can get by collaborating with the project.

The promise of increased innovation at the SMEs is achieved through targeted collaboration between knowledge providers, companies, being shared in a creative environment. Development of innovative food in food occurs after matchmaking between actors in one of three different ways: (1) Development in collaboration between business and students. (2) Development in collaboration between company and researcher. Or (3) Development in mini consortia consisting of several companies.

> *"We are not allowed to work with, or finance large companies. We only aid SMEs with their expressed needs. In some cases, we can promote partnerships between small companies and large companies. However, the larger company cannot have any direct financial gain by the partnership"* (CPH1, 2018-04-24)

This means, that only small and medium-size companies are allowed to partner with the project and receive expert aid through students and researchers. The companies partaking in a project receive free expert assistance to solve their specific challenges. They must however bear the actual operating costs, such as the cost of materials for laboratory tests.

The project furthermore runs a food hackathon where students are allowed to work on a set problem, attacking it from different angles, in a competitive environment. The solutions are aimed at aiding the food industry at large.

4.4.2 An Example of Innovative Food – Kefir Water

The creation of Kefir Water. Due to the market's increased want for probiotic products, the company Pure Kefir Crystals decided to develop their product, Kafir Water. There were initially several challenges in the process of developing the right kefir water recipe. It was these challenges that led to the company contacting CPH-Food in order to receive help in the innovation process.

The role of CPH-Food was to pair the company with a researching team at the university. The team studied the basic fermentation properties. Furthermore, the team performed a consumer test on the sensory properties of the kefir water, making it possible for the company to scale up production.

The help from CPH-Food is described as having "fast-forwarded" the development for the small company. Based on the research conducted, the team could prove the probiotic properties of the product, aiding the market release. According to the company, neither the products properties nor the scaling up of production could have been possible without the expertise from the CPH-Food project. It was done by providing a unique offer for entrepreneurs, in general, rarely possessing the financial resources for lab-research and product development.

4.4.3 Knowledge Sharing

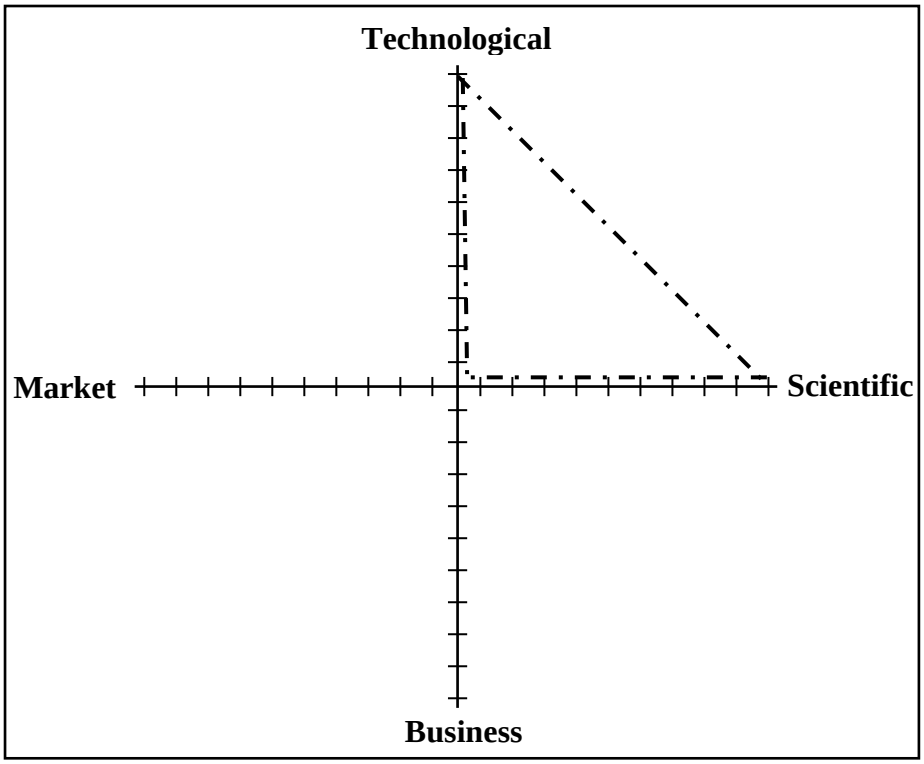
Scientific knowledge – This type of knowledge comes from research at the university, DTU. It is shared with SMEs seeking aid in the development of innovative food products. Rate: **10**

Technological – This type of knowledge stems from research at the university, DTU. It is shared with SMEs seeking aid in the development of innovative food products. Rate: **10**

Market – By the project description and assignation, the CPH-Food project is not allowed to share knowledge regarding the market. They are only allowed to point companies "in the right direction" of where to attain such knowledge. Rate: **0**

Business – By the project description and assignation, the CPH-Food project is not allowed to share business knowledge. They are only allowed to point companies "in the right direction" of where to attain such knowledge. Rate: **0**

See model 4, for the illustration of CPH-Food's knowledge sharing presented.



Model 4. *Model illustrating the amount per types of knowledge, shared within CPH-Food.*

4.4.4 Expressed Need for Improvements

CPH1 expresses the need for more investment activities in the food industry. If innovative food is going to increase, there needs to be much more capital available. The public investors furthermore need to coordinate their applications and investment schemes in order to make it easier for SMEs to apply for and to attain financing.

5. Analysis

In the following chapter, the reader is presented with the analysis of the empirical findings. The findings are analysed by the methods of choice and anchored in the theoretical literature presented in chapter 2. Each topic is derived from employing a thematic approach, where similarities and differences are analysed between the ecosystems.

5.1 Actors Involved

All of the investigated organisations have expressed their cooperation's with several different actors. There are some differences in how the ecosystems facilitate and connects different actors. KRI1 expressed how Krinova includes every entrepreneur with an idea or existing small company in their incubator, it is a very liberal and open system of collaboration. The philosophy behind the openness is that by allowing everyone, there will be gains in network effects even if the company fails with their original idea. For external partnerships outside the incubator, KRI1 expressed:

> *"We work with everyone that wants to work with us*" (KRI1, 2018-04-17)

This openness and way of screening, or rather not screening, differs from how DFC selects companies to collaborate with. To join the DFC incubator, a rigorous screening process is employed in order to analyse the maturity and growth potential of the idea, product or process. Furthermore, as DFC1 expressed, the organisation is specifically looking to partner with firms in the IT sector as well as the metal sector, due to the lack of current collaborations, in order to incorporate a greater diversity and knowledge base within their system. In regards of CHP-Food, the selection of partnerships is determined by the official directives stipulating that the project may only work with SMEs. Their partnerships are mainly made up of university connections and other public organisations, and when partnerships or knowledge in other fields than scientific or technological are sought, the project aids the SME by connecting them with the right partners, without further involvement.

These ways of partnering with actors or connecting actors with each other can be linked to the dynamic character of an ecosystem, described by Mercan & Göktas (2011). They reason that innovation ecosystems by nature are dynamic, where collaborations evolve due to changing market conditions, uncappable of being governed by public policies and limiting frameworks. However, operating within the food industry, being described as an industry with several unorganised activities, it is hard for SMEs to find the right collaborations by themselves. It can be argued that these relationships, initiated by the geographical centre point of the organisations make up what Papaioannou, Wield & Chataway (2009), expressed as the non-economic components of an innovation ecosystem. In other words, the potential relationships and collaborations between actors can be argued to make up part of the environment of an ecosystem due to the centre points facilitation activities.

In table 2, a list of actors is presented, originating from the data collection. It should be noted that the actors represent a snapshot of the actors that are currently involved in the ecosystem. This means, that there might have been actors in the ecosystem, that due to the dynamism of the system, have left, thus not shown in the table. The actors that each organisation is collaborating with at the time of the interview is highlighted with an x. What can be derived from the data is that the ecosystems are quite similar in which actors they collaborate with. CPH-Food is the organisation that collaborates with the fewest actors. However, it is explained by the limitations to the project, stipulating that they must exclude some actors. Furthermore, the lack of restaurant collaborations is striking. Restaurants could be seen as the actor for the

refining of a food product, able to be innovative in new ways of cooking or blending ingredients. In a report from the restaurant industry (Larson, Fultz, Rampoldt, 2016), it is expressed how restaurants today take a larger role in the innovation process, not seen in the data of this thesis. This implies that there is potential gain by including restaurants in ecosystems as an active actor in order to share knowledge and be part of the innovation process together with other actors. The same goes for consumers, not being represented in any of the researched organisations. Including the customers in the innovation process are favoured, not only due to the possibility to develop food suiting the want and need of the market, but also due to the consumer-innovation perception, described by Guerrero et al., 2009 in chapter *2.6.1*.

Actors	DFC	RISE	Krinova	CPH-Food
Small firms	x	x	x	x
Medium firms	x	x	x	x
Large firms	x	x	x	
Public organisations	x	x	x	x
Government	x	x	x	x
Universities	x	x	x	x
Students	x	x	x	x
Private financers	x	x	x	
Public financers	x	x	x	x
Consumers			x	
Entrepreneurs	x	x	x	x
Hospital	x			
Restaurants				
Consultants/Experts	x	x	x	

Table 2. *Illustrating the actors that are included/in cooperation or considered partners. X indicates collaboration.*

5.1.1 Active Actors

One of the major findings in this thesis is the need for actors to be *active* in order to be part of the ecosystem. The suggestion of being active was originated from previous literature on ecosystems. Simatupang, Schwab & Lantu (2015), argue that in order to be considered an actor in an ecosystem, active participation is required. The respondents in this thesis confirmed such need of activeness by their actors. If an actor is not active, they would either be excluded from the ecosystem by the other actors or the centre point facilitator, or, they would leave by them self, not perceiving any gain in their participation.

The findings provide an important difference in relation to innovation systems and sectoral innovation systems. The literature by Lundvall (1992), Nelson (1993) and Malerba (2006), does not suggest any active element by actors in the formentioned systems, rather suggesting that actors are “members” of a system. Such members could be argued to be active or passive, as no restraints are specified. In the critique of the innovation systems and sectoral innovation systems, the inflexibility and long lead times are emphasised. As the existing food innovation system seems to be insufficient in aiding the creation of innovative food, due to the expressed incremental level of innovation and the high failure rate of new products (Winger & Gavin, 2006), there is a need for change in the innovation framework. The industry shift from large-scale producers to small entrepreneurial start-ups and SMEs in the food industry, expressed by KRI1, as well as the start-up report (Livsmedelsföretagen, 2017) confirms such need. Inflexibility and restraints in agility and adaptability is not favoured by SMEs, expressed in the food industry report by the United Nations (Winger & Gavin, 2006). This gives, that SMEs wanting an active part in the creation of innovative food, facing financial strains and/or lack of knowledge, would be favoured by collaborating in innovation ecosystems.

5.2 Knowledge sharing

Drawn from the empirical findings, the four investigated organisations all stated that their main role in the creation of innovative food, is to facilitate the sharing of knowledge between actors. The four main types of knowledge that were employed in this thesis, deriving from the literature; *scientific, technological, market* and *business*, were shown to be essential to the organisations and the creation of innovative food. However, the question of typology and meaning of words must be brought to attention. As an example; the meaning of *scientific knowledge* might implicate different things for different respondents. By analysing the respondents' answers for each respective type of knowledge and cross-compare them, the answers were considered to all be incorporated in this thesis definitions of the types of knowledge, presented in chapter 2.6.2.

The ways of sharing knowledge were found to be highly diverse. There were however both similarities and differences in the activities organised by the organisations as well as the actors' way of searching for knowledge. All of the organisations organise a diverse set of activities aiming to share knowledge between actors. The activities ranged from; conferences, round table discussions and hackathons, to, student presentations, and master-classes, see chapter 4.1, 4.2, 4.3 and 4.4 for further descriptions of activities. Some of the activities were open for all actors currently collaborating with the organisation, while some were based upon exclusive selection of actors by the facilitator, after having observed a potential fit between actors. It was however expressed by CPH1, at CPH-Food, that several smaller actors are not aware of the possibility to, or think that they cannot, collaborate with ecosystems, universities, and larger firms. From the firms' perspective, searching for information is however considered to be imperative for firms in order to survive. According to McKelvey (2016), if a firm does not search for information (in this thesis unanimous with knowledge) – or does not find opportunities – the firm is likely to vanish, due to market selection. This means that firms, and other actors, have the incentive to search for knowledge. Based on the dynamic character of an ecosystem (Mercan & Göktas, 2011), collaborations and knowledge sharing will be based on market need. This further strengthens the role of the centre point of an ecosystem to be of a facilitating character. While this thesis argues that there is a geographical centre point in an ecosystem, the environment of the system is unbound by geography. The environmental characteristics of the ecosystem can be linked to McKelvey's (2016) theories about innovation spaces:

> *An innovation space constitutes a geographical context, which affects innovation through a process of interaction of firms spanning industry as well as the regional/ national institutional setting. Because innovation space can be analyzed as this interplay, the innovation space is not bounded by geography per se.* (McKelvey, 2016, p796)

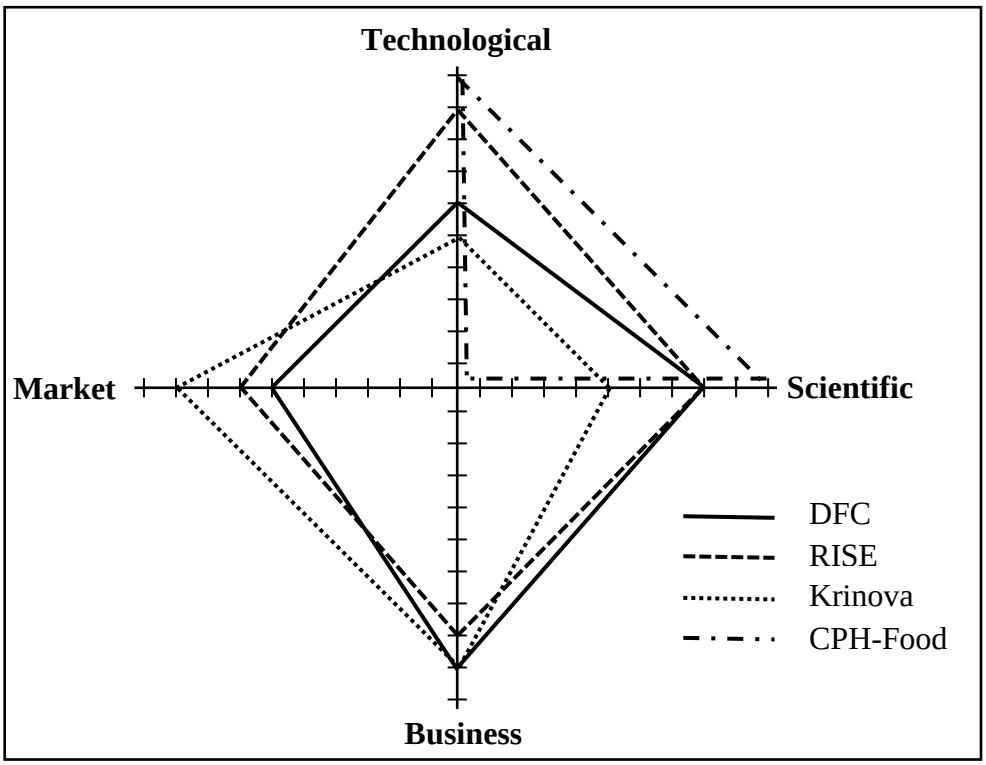
As argued by McKelvey (2016), the interplay between actors make up the innovation space. In the context of ecosystems, it can be argued that the environment is made up of such innovation spaces. Furthermore, cross-cultural differences between the respondents were found to be based on the proactiveness of the respective organisations. The Danish respondents all expressed how several of their activities were done in a proactive way. The Swedish respondents, on the other hand, expressed how the Swedish food industry is highly responsive in their activities. Too little data on respective country's policies, culture and means of innovation are incorporated in the research, in order to draw any conclusions on reasons or effects by such tendencies.

Expressed by all four respondents were, that the role of their respective organisation was to facilitate the demand of knowledge within their network of actors, and to bring in new actors

to the network. This implies a linkage between the retrieved data and the existing literature, indicating that the role of the ecosystems centre point is to have an overview of the environment, aiding actors by facilitating knowledge sharing in the environment and connecting actors that could draw potential benefit from each other. The facilitating role is further strengthened by linking the retrieved data with Hirsch-Kreinsen, Jacobson & Robertson (2006), who points out that the main source of incremental innovation in a low-tech industry is located at the stock of existing knowledge. They argued that innovation, therefore, depends on the interaction between actors, and the employment of knowledge, distributed through the exchange in formal and informal networks.

Sharing knowledge means that there is a certain level of openness involved where both giving and taking is needed. Linking such sharing of knowledge with the theories of open innovation (Chesbrough, Vanhaverbeke & West, 2006) and especially with the perspectives of outside-in and inside-out (Chesbrough 2011a), it entails a need for actors to overcome the syndromes of openness, being "not sold here and "not invented here". When such syndromes have been taken in to account, and possibly overcome, there is further need to account for the paradox of openness (Laursen & Salter, 2014). This means that while collaborative action is favoured in the creation if innovative food, the protection after market release is equally important. As the food industry is a low-tech industry, with little possibility to protect innovations by patents, it is suggested that clear agreements of ownership needs to be discussed and agreed upon in collaborations, for the industry to not take harm of an increase of openness.

Model *5* illustrates the knowledge sharing between the researched ecosystems. Krinova, functioning as an incubator and science park has a clear focus on sharing market and business knowledge. Their partnership with the Kristianstad University, not being a technical university, aids the creation and diffusion of knowledge as well as the actors' requests of specific knowledge related to market and business. DFC and RISE have a quite evenly distributed amount of knowledge in their ecosystems, with a slight tendency of being technological and scientific oriented. In the case of CPH-Food, the ecosystem exclusively shares scientific and technological knowledge due to their restraints, and due to their partnership with the Technical University of Denmark. The type of knowledge does neither indicate the quality of the ecosystems nor the success, or amount of innovative food created within the ecosystems environment. The type of knowledge shared has in the empirical result been shown to depend on members interest, financers interest and university connections. Indications from CPH-Food was furthermore that direct limitations from the region (functioning as project owner and financer), determined the type of knowledge shared within the ecosystem.



Model 5. *Model illustrating the sharing of the four knowledge types between the researched ecosystems*

5.3 Geographical location

In regard to geographical location, all of the four organisations presented in this thesis have a geographical local centre point, in the form of an incubator, technology park and/or research facility. The thesis does in its definition of an innovation ecosystem in the food industry, include that a geographical centre point should be part of the ecosystem. Such inclusion is derived from the previous literature of entrepreneurial ecosystems by; Cohen (2006); Mercan & Göktas (2011); and; Theodoraki, Messeghem & Rice (2017). Gauthier, Penzel, and Marmer (2017) goes as far as stating that an entrepreneurial ecosystem is limited to a 60-mile (100-km) radius around a centre point. This thesis argues that such harsh environmental strains limit the potential of the ecosystem. Opposing such limitation; the geographical locality does in this thesis not constitute the limitations of an innovation ecosystem in the food industry. The findings rather suggest how the environment of the ecosystem is linked to the above discussed innovation space (McKelvey, 2016), in which the knowledge sharing takes place.

The findings furthermore indicate that the location of the innovation ecosystems centre point is dependent on the actors in its proximity. The examined organisations are all located in agricultural dense areas, except DFC-Food, located in a major city. The other organisations are however in close proximity to a large or major city, putting them close to universities, hospitals, governmental institutions etc. The food industry and especially the food itself is something that has a strong geographical linkage. This linkage is mainly dependent on tradition and culture (Boer, Helms, & Aiking, 2006; Olsen et al., 2007). This means, that where agricultural and breeding activities are dense, and where actors partaking in food innovation are located, it generates a beneficial environment for an innovation ecosystem centre point to be located.

5.4 Financing

The section regarding financing is divided in two. The first section deals with the financing of the ecosystem and how it affects the role and the focus of the activities organised. The second part deals with the ecosystems means of financing firms and projects that aim to create innovative food.

5.4.1 Financing of the innovation ecosystems

All of the four organisations presented in this thesis receive financing from a diverse set of financers. In the case of DFC, the majority of the financing come from the membership fees (55%) and the rest from different governmental fund as well as EU funds, presented in chapter *4.1*. In the example of RISE, presented in chapter *4.2*, the financing comes from the industry (54%) and the rest from governmental, EU and public funds. For Krinova, presented in chapter *4.3*, the majority (80%) comes from the municipalities in the region and the rest from the University of Kristianstad. In the example of CPH-Food, their financing is entirely made up of regional and EU grants, presented in chapter *5.4*. However, what is interesting in the financing scheme, is the impact the different financers have on what mission and role the ecosystem is to take. In the case of DFC, where the majority of financing is coming from member fees, it is the members that decide the mission of the organisation. For RISE on the other hand, where the majority of financing likewise is provided the industry, it is the government, financing 19%, that sets the mission of the research institution. For Krinova, as the entirety of financing is derived from public funds, it is the university and municipalities that sets the mission. In the case of CPH-Food, also receiving their entire financing from public grants, it is the university and region that sets the mission of the project.

The data available in this thesis is insufficient in order to conclude what implications on innovative food the different type of financers has. However, some indications derived from the respondents' answers during the semi-structured interviews, points in the directions of governmental and public financing having a rather narrow mission statement, steering the role of the ecosystem. This in opposition to organisations with a market-based mission, deriving from the members' interests. Steering and governing the focus of the local centre point of an ecosystem might be contra productive, as Mercan & Göktas (2011) argues that ecosystems are uncappable of being governed by public policies and limiting frameworks, hindering the dynamism of such a system. Moreover, with such large portions of the ecosystems financing coming from public funds, it can be argued that such financing is vital to the organisations survival. The finding indicates the governmental role in the creation of innovative food, as a direct or indirect investor. When the financial system of food innovation is to be configured, as asked for by the industry, the question if an increased governmental support should be favoured before a shift to private financing in the industry needs to be addressed.

5.4.2 Financing of innovative food

The four organisations all aid the creation of innovative food by either direct financing or by connecting the company with appropriate financiers. DFC finances member companies and projects between actors, they also connect companies to private investors and Venture Capital firms. RISE do not finance companies or innovation projects, but can connect companies to financers and aid them in the process to apply for applicable grants. Krinova receives national and regional grants, which they later can use to finance projects and companies. CPH-Food finances the cost of the hours spend by the research team, through EU and regional funds, only allowed to aid small and medium-sized companies.

Furthermore, all respondents expressed that there is a need for more capital to be invested in the food industry. The financing should aid the small and medium sized companies as it is such companies that need financial aid. KRI1 expressed the need to help the industry shift by saying:

> *The large-scale industry in food is declining a lot in Sweden. However, the SMEs and start-ups are growing like crazy "hallelujah moment"! However, we do not have the system, financiers and framework to aid such development.* (KRI1, 2018-04-17)

What can be derived from the data, is the systems different financial means of aiding the development of innovative food. Whilst most of the financing originates from public grants and governmental bodies, it is the ecosystem that later can distribute the fund to the projects and companies they seem fit. If such investments do not occur in the ecosystem for whatever reason, all of the four respondents expressed their ability to connect companies with investors operating in the food industry. Therefore, one part of the role of an innovation ecosystem in the food industry is to provide financing, either directly, or indirectly by sharing information about appropriate actors in the finance industry.

5.5 University connections

In this thesis, scientific and technological knowledge have been expressed by the four respondents to stem from universities, research institutes or internal research. The University connections are furthermore expressed as an area where further improvements in collaborations should be emphasised. Out of the four researched organisations, Krinova and CHP-Food are fully or partially owned and managed by a University. CPH1 expressed how collaborations have to be pursued from two directions. Information about, and incentives to, collaborate with a University need to reach SMEs in the food industry. Today, several companies believe that such collaborations are out of their reach, therefore not pursuing them. CHP1 further expressed how universities need to work proactively in their search for partnerships, contacting SMEs with an offer of collaboration. In the paper of McKelvey & Ljungberg (2017), it is proposed how firms in a low and medium technology industry (as the food industry) can access state-of-the-art information by interacting with universities. It is further proposed that University collaboration can strengthen firms' internal capabilities to innovate as the University scientists can act as information sources, sharing knowledge with the firm. Furthermore, by interacting and collaborating with students, as all of the respondents expressed their organisations to do, the sharing of novel research is improved.

In order to define a University's role in the innovation process, Etzkowitz (2003) used the triple helix concept. According to the triple helix approach, the government plays the role of supporting steady relations and interactions by setting the rules for the industry. The mission of the University in the triple helix concept is to create, improve and diffuse new knowledge and technology (Mercan & Göktas, 2011). Etzkowitz (2003) is of the opinion, that an increasing part of innovation is based upon the triple helix framework. The augmented importance of knowledge in the innovation process, and the universities role in the creation and diffusion of such, displays a linkage with the empirical results of this thesis as the University-industry collaborations were highlighted as very important. All of the four respondents expressed that there is a need to further strengthen such partnerships by launching new, and further develop existing, activities involving researcher and students.

With the existing literature at hand and this thesis empirical indications, it can be argued that universities hold a very important role in the creation of knowledge, important for the creation of innovative food. The diffusion to the food industry is generated through the local centre points collaborative actions with the University, and by the connecting of actors directly with a University.

5.6 Ecosystem or not Ecosystem?

5.6.1 What is an Innovation Ecosystem in the Food Industry?

One of the goals of this thesis was to answer the question *What is an innovation ecosystem in the food industry?* This question was approached by testing the theoretical definition of an innovation ecosystem, presented in chapter 2.6.2 and explained in chapter 2.7. Based upon the empirical results, presented in chapter *4*, the four organisations subjected to this thesis, DFC, RISE, Krinova and CPH-Food, are confirmed to match the parts of the definition.

The need of *Actively participating actors* was suggested by Simatupang, Schwab & Lantu (2015), to be a prerequisite in order to be considered an actor in an ecosystem. The respondents in this thesis confirmed the need for active participation, which was elaborated upon in chapter 5.1.1. S*haring purposive inflows and outflows of knowledge*, originated from Chesbrough, Vanhaverbeke & West's (2006) thought on open innovation and the sharing of knowledge, as well as Cohen's (2006) and Theodoraki, Messeghem & Rice's (2017) definitions on entrepreneurship ecosystems, suggesting collaborative actions between actors. The sharing of knowledge was confirmed by the four respondents in this thesis to be the core of the innovation ecosystem and the local centre points' main activity as a knowledge facilitator, findings presented in chapter *4*. Employing the concept of a *geographical centre-point* stem from the literature on entrepreneurship and innovation ecosystems, presented in chapter 2.5.2. The four researched organisations can all be denoted as local centre points of an ecosystem based on their fit with the presented definition. This implies that whilst it is possible to research and illustrate the local centre point, illustrating the limiting borders of an ecosystems environment is very hard, if not impossible as Mercan & Göktas (2011) suggest. The suggested *unbound environmental limitations* are linked to McKelvey's (2016) thoughts on innovation spaces, being geographically unbound and confirmed by the researched organisations as they stated that they collaborate with local, national and global actors.

Disfavouring the adaption of the ecosystem terminology, Papaioannou, Wield & Chataway (2009), were concerned with the failure to capture the complexity of the socially dynamic environment of knowledge and innovation. However, there are arguably benefits of employing the terminology in the food industry. The dynamic framework called for by the industry and by scholars alike, done by; Winger & Gavin (2006); Traitler, Watzke & Saguy (2011); Bayona-Saez et al. (2017), emphasizes the need to implement a new framework in favour of the existing food innovation system. By comparing the parts of the definition with empirics and theories, it is argued that the definition holds value. The differences expressed in relation to innovation system and sectoral innovation systems, chapter 5.1.1, provides ground for the literature and food industry to adopt the terminology.

5.6.2 The Role of an Innovation Ecosystem in the Food Industry

Derived from the data collected in this thesis, an attempt to describe the role of an innovation ecosystem is performed. The main role is to facilitate the sharing of knowledge between the innovation ecosystem's actors, expressed by all respondents. The knowledge shared can originate from universities and research institutions, directly from actors or by the local centre points own activities. The interplay between actors, i.e. the knowledge sharing and

collaboration, is linked to McKelvey (2016) theories on innovation spaces, meaning that the knowledge sharing makes up the environment of the ecosystem. The activities facilitating knowledge sharing by the four investigated ecosystems were found to be highly diverse, discussed in chapter *5.2*. The need for knowledge sharing activities in the food industry, in order to innovate, is stressed by Bayona-Saez et al. (2017), accentuating the importance of the denoted main role of an innovation ecosystem.

Furthermore, the innovation ecosystems role is to aid initiatives within the industry, by enabling the creation, acceleration and growth of initiatives aiming to create innovative food and to finance such initiatives and/or connect the initiative to private or public financiers. The initiatives were found to mainly originate from three different sources. Firstly, innovative food initiatives can come as top-bottom directives from public institutions, e.g. government and universities, stipulating the aim by contributing with financing targeted at specific areas. Such initiatives were expressed to frequently occur according to CPH1 and RAB1. The initiatives arising from universities can be linked to Etzkowitz (2003) theories of the triple helix concept to define a university's role in the innovation process. Such role is explained to derive from universities employing an interactive, rather than a linear model of innovation, being proactive and in direct collaboration with their environment. According to the triple helix approach, the government plays the role of supporting steady relations and interactions by setting the rules for the industry, described by Lundvall (1992), as setting the rules of the game. However, the collected data in this thesis rather implicates a direct involvement by the government and its ministries, expressed by RAB1 and KRI1, to have increased in Sweden during the recent years. The lack of appropriate data in this thesis hinders further analysis of such governmental involvement. However, some implications of the increased attention towards the food industry is found in the newly released, and Sweden's first ever, long-term national food strategy (2017), as well as the expressed, by RAB1 and KRI1, direct involvement and increase in financing by the government.

Furthermore, initiatives can also originate; bottom-up, where actors request aid by the ecosystem, expressed by KRI1 and DFC1 to frequently occur. Such initiatives were stated to mainly originate from SMEs, that faced obstacles in their development in innovative food. By contacting a local centre point of an ecosystem, lack of knowledge and financing were expressed to be the main reason for collaboration. RAB1, expressed the urgent need for an increase in platforms and networks for SMEs to access information about ongoing innovative food initiatives calling for collaboration. The issue of innovating in the food industry was researched by Traitler, Watzke & Saguy (2011), who already a few years ago alerted that SMEs in the food industry were struggling with innovation, calling for new and open ways of collaboration. The innovation ecosystems role in bottom-up initiatives is to connect appropriate actors with each other, as well as aid the actors with innovation processes and if possible finance the initiatives.

The third source of initiatives are the ones originating from the ecosystem itself. When areas in need of development are discovered, and no actor is currently involved in the development in the field, the four respondents expressed the ecosystems role in conducting research in such fields, if thought beneficial to the food industry. RISEs, role in such research is to conduct scientific research in a lab environment, whilst Krinova partakes in the development of business and process innovation in order to aid the industry. CPH-Food undertakes scientific and technological research in lab environment whilst DFC does not conduct any research at their local centre point.

6. Concluding discussion

In the following section, the concluding discussion of the thesis is presented by answering the guiding questions of the thesis. Thereafter, implications are offered connecting the conclusions to previous literature, consolidating the value of the results before presenting suggestions for further research.

The aim of this thesis has been to investigate the role of an innovation ecosystem in the creation of innovative food. In order to reach the aim, a set of questions needed to be clarified and answered. Initially, the question of *what is innovative food* required an answer. Based on previous literature, industry reports and the empirical data collected, the presented definition in this thesis holds the answer:

> *Innovative food can be considered innovative due to the addition of, or replacement with, unusual ingredients; the recombination of products into new blends or products; being processed and/or cooked in a way novel to the product; successfully penetrating a new market coming from a different origin or culture.* (the author).

Furthermore, due to the lack of previous research in the field, there was a need for a development of the literature concerning innovation ecosystems in the food industry. The thesis asked the following question; *What is an innovation ecosystem in the food industry?* The question was answered by testing the presented definition's applicability at the four researched organisations.

> *An innovation ecosystem in the food industry consists of actively participating actors and their relations, sharing purposive inflows and outflows of knowledge to enable the creation of innovative food, where knowledge sharing is facilitated by a local geographical centre-point with unbound environmental limitations.* (the author).

The definition and its background, presented in chapter *2.6.2* and explained in chapter *2.7*, was found valid, offering benefits to the industry. The applicability and benefit to the industry are elaborated upon in chapter *5.6.1*. One of the important findings, and the major difference from other types of innovation systems, is the conclusion that actors need to be active in order to be part of an ecosystem. The findings link well with Coen's (2006) definition, arguing that an ecosystem develop innovations or businesses, to then "release" them from the system, giving room to new development. In an innovation ecosystem in the food industry, it was found that only active actors are included in the system, and, the innovative food created an presented to the market, is not recognised as a part of the innovation ecosystem.

Moreover, in order to investigate what influences the creation of innovative food, the thesis employed the theories of knowledge sharing. To do so, the following question was asked; *What type of knowledge is relevant in the creation of innovative food?* As suggested by the literature, the empirical results confirmed that the four employed types of knowledge; scientific, technological, business and market, were the fundamental in the creation of innovative food. An important finding was the need for a mix of the different types of knowledge in the innovation process, as discussed in the analysis, chapter *5.2*. Each of the researched ecosystems shifted slightly in what type of knowledge that was shared, mainly depending on; the directives by the ecosystems financers; or by the ecosystems members "want" or the expressed need by the partnering actors.

By answering the above-covered questions, the thesis set out to answer the research question: *What is the innovation ecosystem's role in creating innovative food?*

The answer to the research question is as follows. The main role of an innovation ecosystem in the food industry is to facilitate the sharing of knowledge between actors. Due to the unbound environment of an ecosystem, the facilitation is concluded to be dependent on a local geographical centre point. The knowledge sharing originating from such centre point is done by arranging a multitude of activities for actors within, or working with, the food industry. Such events aim to display novel research, industry trends and market insights, amongst other key features in order to innovate. Another way for the ecosystem to share knowledge is done by directly connecting actors, with the aim of a direct exchange of knowledge between the actors. Functioning as a bridge between creators of knowledge and the food industry, has in the empirical research been expressed as a very valuable activity, with a unanimous aim of increasing such collaborations.

Moreover, the innovation ecosystems role is to aid innovative initiatives within the food industry. Suh initiatives are expressed to originate from three sources. From (1) top-bottom directives from public institutions, stipulating the aim by contributing with financing targeted at specific areas. Initiatives can also originate; (2) bottom-up, where actors request aid by the ecosystem. The third source of initiatives are the ones (3) originating from the ecosystem itself, conducting research and innovative activities in fields thought beneficial to the food industry.

The third identified role of an innovation ecosystem is the financing of innovative food.
Of the four researched organisations, it was concluded that three out of the four provides financial aid to actors developing innovative food. However, all of the ecosystems connected initiatives to external financers, both private and public, and helped SMEs with the process to apply for grants and investments. The indications of a shift in the food industry, from large-scale producers to SME, comes with a need of an improved financial structure in the food industry, expressed by KRI1, as many of the smaller companies lack financial power. It was stated by KRI1, RAB1, and DFC1, that further investments in the food industry are needed in order to drive innovation, implying that actors in the financial business need to be brought into the collaboration of innovative food in order to see the potential of their investments.

To summarise the role of an innovation ecosystem in the food industry; The role is to facilitate the sharing of the four types of knowledge between actors, through organising appropriate activities and by connecting actors with each other. To aid the industry by enabling the creation, acceleration, and growth of initiatives aiming to create innovative food and to finance such initiatives and connect the initiatives to private and public finances.

6.1 Implications

The conclusions from this thesis implicate that by increasing the sharing of knowledge and the level of openness in the food industry, more innovative food will be created through collaborations, in line with Bayona-Saez et al.'s (2017) arguing that innovation in food depends on the sharing of knowledge between actors. Such findings should function as an indication for the food industry to actively search for partnerships and to share knowledge in order to change the high failure rate of new products in the industry, expressed by Winger & Gavin (2006), and in order to develop radical innovations, sought for by Bayona-Saez et al. (2017) and Winger & Gavin (2006). The results furthermore confirm that the existing food innovation system is out to date and insufficient in aiding the increase in innovation activities by SME, in line with

Traitler, Watzke & Saguy (2011), alerting the industry that urgent attention to the innovation framework was needed.

The findings in this thesis are thought of as novel due to the lack of previous research of innovation ecosystems in the food industry. The results could therefore function as a practical aid to the industry in the creation of innovation ecosystems. Creating an ecosystem is hard due to dynamic nature of its environment (Mercan & Göktas, 2011). However, by enabling collaboration and knowledge sharing through creating local centre points in advantageous geographical locations, the prerequisites for the ecosystems environmental development will be favoured. The research conducted in this thesis implies that a guide to create innovation ecosystem can be generated, highlighting the main roles by an ecosystem, being; knowledge facilitating, aiding and creating initiatives and financing initiatives to create innovative food. One of the main implications is that in order to create an innovation ecosystem, the creator needs to pursue actors willing to actively participate in the ecosystem, allowing for openness in the creation of innovative food. The implications go in line with Pisano and Verganti's (2008) discussion of openness becoming an increasingly important concept in low-tech industries. Furthermore, the industry's need for a framework accounting for dynamism and flexibility, expressed by Winger & Gavin (2006), is met by creating more innovation ecosystems, proving the results of this thesis valuable as they can aid such development.

Moreover, the results from this thesis are suggested to benefit the four researched innovation ecosystems, and suggestively other existing innovation ecosystems in the food industry. Through confirming that the ongoing activities are beneficial to the food industry's expressed need for a dynamic and flexible framework (Traitler, Watzke & Saguy, 2011), and more importantly, provide implications for development. Such implications are once again the ones used for developing new ecosystems, favouring the initiation of collaboration with active actors, as well as employing further openness in the creation of innovative food. The results could furthermore be used to improve the activities and events organised by the ecosystems, aiming to educate the industry on openness in the innovation process, as it potentially could lead to a decrease of failed products in the food industry. In the initial process of gaining an understanding of the food industry, several restaurants, considered to be innovative in their cooking, were contacted. The reluctant attitude to participate in any type of interview aligns with the results from the empirical data, in regard to the absence of restaurant-connections in the innovation ecosystems. The same goes for the lack of consumer participation in the innovation ecosystem activities. In order to cover the entire food industry and improve the level of innovation, it is suggested that activities and incentives for restaurants and consumers to be actively participating in the ecosystems are organised.

The four researched ecosystems all slightly differenced in what type of knowledge that was mainly shared. Indications towards two different types of orientations were found to be; scientific-technology oriented ecosystems, and; business-market oriented ecosystems. Further research of the orientations is suggested in chapter *6.2*. However, different orientations were argued to have some implications of what type of innovative food products were being created. According to McKelvey (2016), firms help to seize and create opportunities in their innovation space, over time, which in this thesis is argued to be the environment of the ecosystem. McKelvey argues how three axes of opportunities can be used to analyse the environment. The first axis is creation of technological opportunities through scientific and technological knowledge, which could be argued to link with the ecosystems that have a scientific and technological orientation. The second axis is the creation of market opportunities related to new market and customer knowledge, linking with ecosystems having a market and business

orientation. The third axis is the creation of productive opportunities, also linking with ecosystems having a market and business orientation. However, as concluded in this thesis, all types of innovative food require a diverse set of knowledge in the innovation process (Bayona-Saez et al., 2017). The data collected from the four ecosystems can therefore be said to be inconclusive in answering the orientations impact on the type of innovative food created, however suggesting interesting questions for future research, suggested in chapter *6.2*.

6.2 Suggestions for Future Research

As the empirical research in this thesis only contains four organisations, the validity of the conclusion and its acceptance on a general level for the Swedish and Danish food industry can be questioned. If further ecosystems would have been included in the study, the generalisability within the food industry would have been strengthened. However, this thesis set out to investigate what an innovation ecosystem in the food industry is, as well as to answer the question of what role such innovation ecosystem has. Based on the empirical result and its connection to the theoretical framework, it is nevertheless argued that the thesis successfully has answered its questions, fulfilling the expressed aim. It is, however, suggested that a quantitative study is conducted, aiming to research what type of knowledge is shared on a broader scale, and in order to investigate how the defined role of an ecosystem holds when subjected to a larger population.

As discussed in the implications, the four researched ecosystems slightly differ in what type of knowledge that was shared. It is suggested that future research investigates the two different types of orientations that was found, being; scientific-technology oriented ecosystems, and; business-market oriented ecosystems, presented in model *5*. Such research could lead to a taxonomy of different types of ecosystem and their orientation, as well as what activities and actors are optimal in each respective type of ecosystem. Furthermore, by conducting such research, the relationship between the type of orientation and type of innovative food could be investigated. Activities and financing could then be targeted at the right innovation ecosystem, increasing the wanted effects by financing. Furthermore, the findings could benefit the industry in aiding SMEs looking for collaborations and financing, by guiding them to the right type of ecosystem, based on the type of knowledge sought and innovative food developed.

It is suggested that future research pays attention to universities' role in the creation of innovative food. As the university-ecosystem relationship where favoured and deemed important by the four ecosystems researched, studies aiming at uncovering the direct role by universities should be welcomed by the industry, as well providing literature explaining the nature and the benefit of the industry-university relations. Lastly, it is suggested that the importance, and the role of public financing in the food industry is researched. The empirical result in this thesis implicated that a large portion of the ecosystems financing is derived from public grants, providing interesting setting for future research, as the industry is aiming to increase its innovative activities.

7. Reference Literature

A National Food Strategy for Sweden. (2017). *More jobs and sustainable growth throughout the country*. Government bill 2016/17:104. Stockholm: Ministry of EnterpRISE and Innovation.

Ács, Z. J., Szerb, L. & Autio, E. (2015) *Global Entrepreneurship Index 2015*, The Global Entrepreneurship and Development Institute, Washington, DC.

Amilien et al. (2005). From local food to terroir product? *Anthropology of Food, 4.*

Avermaete et al. (2004). The impact of firm characteristics and macroeconomic performance on innovation in small food firms: Case study from Belgium, Ireland and UK. In de Noronha Vaz, T., Viaene, J., Wigier, M. (Eds.), *Innovation in small firms and dynamics of local development*, Scholar Publishing House, Warsaw.

Bernard, H.R. (2011). "*Research Methods in Anthropology*", Altamira Press, US.

Bryman, A. & Bell, E. (2011). *Business research methods.* 3. ed. Oxford: Oxford University.

Bryman, A. (2011). *Samhällsvetenskapliga metoder.* 2., [rev.] uppl. Malmö: Liber.

Boer, J., Helms, M., & Aiking, H. (2006). Protein consumption and sustainability: diet diversity in EU-15. *Ecological Economics*, 59.

Chesbrough, H. (2003). Open Innovation: The New Imperative for Creating and Profiting from Technology, *Harvard Business School Press*, Boston, MA.

Chesbrough, H., Vanhaverbeke, W. & West, J. (2006). *Open Innovation: Researching a New Paradigm*, Oxford University Press, New York, NY.

Chesbrough, H. (2011a). Bringing open innovation to services. (Report). *MIT Sloan Management Review*, 52.

Chesbrough, H. (2011b). *Open services innovation: rethinking your business to grow and compete in a new era*. First., San Francisco, CA: Jossey-Bass

Clarysse, B. et al. (2014). Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems. *Research Policy*, 43(7).

Cohen, B. (2006). Sustainable valley entrepreneurial ecosystems. *Business Strategy and the Environment, 15.*

Durst, S., & Ståhle, P. (2013). Success Factors of Open Innovation – A Literature Review. *International Journal Of Business Research And Management*, 4(4).

Earle, M. (1997). Review: Innovation in the food industry, *Trends In Food Science & Technology*, 8, Molecular and Microbial Polymer Imprinting Technology.

Earle, M.D. & Earle, R.L. (2000). *Building the future on new products*. Leatherhead Publishing, England.

Edquist, C. (2005). Systems of Innovation: Perspectives and Challenges, in Oxford Handbook of Innovation. *Oxford University Press*, New York.

Eriksson, L.T. & Wiedersheim-Paul, F. (2014). "*Att utreda, forska och rapportera*", 10 th. edn. Stockholm: Liber.

Etzkowitz, H. (2003). Innovation in Innovation: The Triple Helix of University-Industry-Government Relations. *Social Science Information*, 42(3).

Fagerberg, J. (2004). *Innovation: A Guide to the Literature.* The Oxford handbook of innovations, Oxford University Press.

Foster, G. & Shimizu, C. (2013). *Entrepreneurial Ecosystems Around the Globe and Company Growth Dynamics, Report Summary for the Annual Meeting of the New Champions 2013.* World Economic Forum.

Freeman, C. (1987). *Technology Policy and Economic Performance: Lessons from Japan.* London: Pinter.

Gauthier, J. F., Penzel, M. & Marmer, M. (2017). *Global startup ecosystem report 2017*. San Francisco: Startup Genome.

Gawer, A. & Cusumano, M.A. (2014). Industry Platforms and Ecosystem Innovation. *Journal of Product Innovation Management*, 31(3).

Gellynck, X. & Kühne, B. (2008). Innovation and collaboration in traditional food chain networks. *Journal on Chain and Network Science*, 8(2).

Global Innovation Index. (2009-2010). https://www.globalinnovationindex.org/userfiles/file/GII-2009-2010-Report.pdf, Accessed on 06 April 2018.

Gobble, M.M. (2014). Charting the Innovation Ecosystem. *Research-Technology Management*, 57(4).

Grimpe, C. & Sofka, W. (2009). Search patterns and absorptive capacity: low- and high-technology sectors in European countries. *Research Policy*, 38(3).

Guerrero et al. (2009). Consumer-driven definition of traditional food products and innovation in traditional foods. A qualitative cross-cultural study. *Appetite*, 52(2).

Hekkert, M. P. et al. (2007). Functions of innovation systems: A new approach for analysing technological change. *Technological Forecasting & Social Change*, 74(4).

Henson, S. (1995). Demand-side constraints on the introduction of new food technologies - the case of food irradiation. *Food Policy*, 20(2).

Hirsch-Kreinsen, H., Jacobson, D. & Robertson, P. (2006). Low-tech Industries: Innovativeness and Development Perspectives - A Summary of a European Research Project, *Prometheus*, vol. 24, no. 1.

Hirsch-Kreinsen, H. & Jacobson, D. (eds) (2008) *Innovation in Low-Tech Firms and Industries. Northampton*, MA: Edward Elgar Publishing.

Huberman, A.M. & Miles, M.B. (2002). "*Qualitative Researcher's Companion*", Thousand Oaks; London: SAGE Publications Inc.

Jackson, D. (2015). *What is an Innovation Ecosystem?* National Science Foundation, Arlington.

Jönsson, H. (2005). *Mjölk: En kulturanalys av mejeridiskens nya ekonomi*. Eslöv: B. Östlings bokförlag Symposion.

Kühne et al. (2010). Innovation in traditional food products in Europe: Do sector innovation activities match consumers' acceptance? *Food Quality and Preference*, 21(6).

Kvale, S. & Brinkmann, S. (2009). *Den kvalitativa forskningsintervjun.* 2. ed. Lund: Studentliteratur.

Larson, M., Fultz, P. & Rampoldt, J. (2016). *An appetite for change – Key trends driving innovation in the restaurant industry*. https://assets.kpmg.com/content/dam/kpmg/pdf/2016/07/kr-gtl-an-appetite-for-change.pdf. Accessed on 27 April 2018.

Laursen, K. & Salter, AJ. (2014). The paradox of openness: Appropriability, external search and collaboration. *Research Policy*, 43(5).

Lindberg, H. (2008). Politikbyte och idéernas betydelse: Reformeringen av den svenska Jordbrukspolitiken, *Historisk Tidskrift, 128:1*.

Livsmedelsföretagen. (2017). *Startuprapporten*. https://www.livsmedelsforetagen.se/medlem/dokument/startuprapporten2017/, Accessed on 18 April 2018.

Lundvall, B. Å. (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, London: Pinter.

Malecki, E. (2017). Entrepreneurship and entrepreneurial ecosystems. *Geography Compass.*

Malerba, F. (2006). Sectoral Systems: How and why innovation differs across sectors. In the Oxford handbook of innovation. *Oxford University Press.*

McKelvey, M. (2016). Firms navigating through innovation spaces: A conceptualization of how firms search and perceive technological, market and productive opportunities globally. *Journal of Evolutionary Economics*, 26.

McKelvey, M. & Heidemann Lassen, A. (2013). *Managing Knowledge Intensive Entrepreneurship*, Edward Elgar Publishers, Cheltenham, UK.

McKelvey, M. & Ljungberg, D. (2017). How public policy can stimulate the capabilities of firms to innovate in a traditional industry through academic engagement: the case of the Swedish food industry. *R&D Management*, *47*(4).

McKelvey, M. & Zaring, O. (2016). *Sveriges entreprenöriella ekosystem: företag, akademi, politik.* Entrepreneurship and Small Business Research Institute, Stockholm.

Metcalfe, S. & Ramlogan, R. (2008). Innovation Systems and the Competitive Process in Developing Economies. *The Quarterly Review of Economics and Finance*, 48.

Mercan, B. & Göktas, D. (2011). Components of Innovation Ecosystems: A Cross-Country Study. *International Research Journal of Finance and Economics*, 76.

Miller, G. T. (1975). *Living in the Environment: Concepts, Problems and Alternatives*. Wadsorth, Belmont, CA.

Moore, J. F. (1996). *The death of competition: leadership and strategy in the age of business ecosystems*, Chichester: Wiley.

Moskowitz et al. (2006). Steps towards a consumer-driven "concept innovation machine" for food and drink. *Food Quality and Preference*, 17(7–8).

Mowery, C. & Sampat, B. (2006). Universities in national innovation systems, in Oxford Handbook of Innovation. *Oxford University Press*, New York.

Nelson, R. (1993). *National Systems of Innovation: A Comparative Study*. Oxford University Press.

OECD/Eurostat. (2005). *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition*, The Measurement of Scientific and Technological Activities, OECD Publishing, Paris.

Olsen, S. O. et al. (2007). Exploring the relationship between convenience and fish consumption: a cross-cultural study. *Appetite*, 49(1).

Papaioannou, T., Wield, D. & Chataway, J. (2009). Knowledge Ecologies and Ecosystems? An Empirically Grounded Reflection on Recent Developments in Innovation Systems Theory. *Environment and Planning C: Government and Policy*, 27(2).

Pisano, G., & Verganti, R. (2008). Which kind of collaboration is right for you? *Harvard Business Review* 86, pp. 78–86.

Robertson, P., Smith, K., & von Tunzelmann, N. (2009). Innovation in low- and medium-technology industries. *Research Policy*, 38.

Rubin, H. J. & Rubin, I.S. (1995). "*Qualitative interviewing: The art of hearing data*", Thousand Oaks, CA: Sage Publications.

Ruona, W.E.A. (2009). "Analyzing Qualitative Data". In: Swanson, R.A. & Holton III, E.F., (edt.), (2009) "*Research in Organizations; Foundations and Methods of Inquiry*", San Fransisco: Berret-Koehler.

Schumpeter, J. (1934). *The theory of economic development.* Harvard University Press.

Simatupang, T. M., Schwab, A., & Lantu, D. C. (2015). Introduction [special issue on building sustainable entrepreneurship ecosystems]. *International Journal of Entrepreneurship and Small Business*, 26.

Tellström, R. (2015). *Hunger och törst: Svensk måltidshistoria: Från överlevnad till statusmarkör*. Stockholm: Forum.

Theodoraki, C., Messeghem, K., & Rice, M. P. (2017). A social capital approach to the development of sustainable entrepreneurial ecosystems: an explorative study. *Small Business Economics.*

Traitler, H., Watzke, H.J. & Saguy, I.S. (2011). Reinventing R&D in an open innovation ecosystem. *Journal of food science*, 76(2).

Winger, R., & Gavin, W. (2006). *Food product innovation: A background paper*. Rome: Food and agriculture organization of the United Nations.

Yin, R. K. (2011). *Qualitative research from start to finish*. New York: Guildford Press.

Appendices

Appendix 1

The OECD manuals definition on four types of innovation (OECD, 2005 p16-17, p47-53)

"**Product innovation:** A good or service that is new or significantly improved. This includes significant improvements in technical specifications, components, and materials, software in the product, user friendliness or other functional characteristics".

"**Process innovation:** A new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software".

"**Marketing innovation:** A new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing".

"**Organisational innovation:** A new organisational method in business practices, workplace organisation or external relations".

Appendix 2

Interview Guide

Topic area 1: Personal & Organisational background

- Could you please start and introduce yourself shortly?
- Name:
- Position:
- Could you please introduce the organisation shortly?
- Name:
- Location:
- Size:
- Age:
- How is your organization financed?
- What is the main interest of your organisation?

Topic area 2: Innovative Food

Food can be considered innovative due to the addition of, or replacement with, new ingredients; the recombination of products into new blends or products; being processed, cooked and/or presented in a way novel to the product; successfully penetrating a new market coming from a different origin or culture; and always being temporary innovative before becoming traditional food.

- What is innovative food to your organization?
- What is your role in the creation of innovative food?
- How do your organization facilitate the creation of innovative food? (physical, network, conference, internet, financing, incubator, university connections, raw materials, geographical location)
- Do you have any examples of innovative food products facilitated by your organization?
- Can you tell the journey of this product? – Actors, functions, todays state.

Topic area 3: Innovation Ecosystem and Knowledge sharing

An innovation ecosystem in the food industry consists of actively participating actors and their relations; sharing purposive inflows and outflows of knowledge to facilitate innovative food; operating in a local geographical centre-point with environmental limitations by institutional policy and the culture.

- What actors are involved in your ecosystem?
- How do the different actors interact?
- What is your role in their interaction?
- What type of knowledge is shared within your ecosystem?
- **Scientific**

Is created by years of studies, often originating from universities or research centres, involving chemistry, engineering, microbiology, and nutrition research. Scientific knowledge in the food industry consists of the biological, physical, and chemical makeup of food; the causes of food deterioration; and the causal concepts of food processing. Scientific

knowledge can be used to develop innovative food by new ways to recombine, process, preserve, and store ingredients and/or food.

- **Technological**

Is the knowledge of how to take animal, vegetable, or marine materials and convert them into final products through the application of machinery, energy, labour and scientific knowledge. This type of knowledge is generated by firm experience and through universities and research centres.

- **Market**

Is referring to information gathered from past and current customers and markets. The knowledge further entails an understanding of what current and future customers and their markets seeks. Hence, it consists of the wants and needs by customers and the understanding of the market dynamics, diversities and industrial trends and dynamics over time. In the food industry, customers and market specifics differ a lot due to demography and geography. By gaining market information, the development of innovative food can be adapted to and/or by the most favorable market.

- **Business**

Is consisting of how to create, run and develop a business. This type of knowledge is generated by experience and experts and is involving information regarding, organizational design, financing, management techniques but also the information regarding an industry's laws and regulations. Business knowledge can aid the development of innovative food in ways of facilitating organizational and managerial thresholds, gaining financial opportunities and building a business case around the development of innovative food.

- Rate the above type of knowledge shared within your ecosystem as per amount of knowledge and not in relation to other knowledge. 1-10?

Topic area 5: Financing

- How are the innovations financed today?
- How important is financing in the development of innovative food?
- How important is external financing in the development of innovative food?

Topic area 4: Improvements

- How could your organisation better facilitate innovation?