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Startups: key to open innovation success in the Agri-Food sector

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Abstract

The Agri-Food sector faces significant challenges, including a growing world population, globalization, and technological changes. Open innovation (OI) is becoming inevitable to deal with these challenges and for long-term competitive advantage of the Agri-Food companies. Startups can play a key role in corporate's open innovation strategies. Although corporate-startup collaborations (CSCs) are already more prevalent in research and business practice in high-tech sectors, this phenomenon is new in the Agri-Food sector. By combining literature on CSCs in high-tech sectors with OI literature in Agri-Food, a framework was developed to initiate and manage CSCs. Best practices should focus on alliance formation, strategic fit, governance mode, access to resources, relationship & trust, and IP protection. A retrospective case study on StartLife and Foodcase confirmed that a CSC could be key in improving innovation performance and increasing competitive advantage. It also confirmed the importance of mediating and moderating factors influencing how the CSC leads to competitive outcomes, and that a dynamic view on the CSC is required.

Keywords: Open innovation, startups, corporate collaborations

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1. Introduction

This research explores the role of startups in open innovation strategies of established EU food firms. The relation between the innovation strategies and competitiveness of EU food firms will receive particular attention. This chapter will first introduce the background of the planned research followed by a first problem analysis. This problem analysis will also highlight the relevance for this research. Next, the hosting organization of this thesis will be introduced: StartLife. Thereafter, the research objectives and questions will be presented, as well as the research framework. Lastly, the technical design for this thesis will be explained.

1.1 Research background

1.1.1. Project introduction

'Corporates should embrace startups to stay ahead of the game'. With this mantra Neelie Kroes - former EU commissioner for the Digital Agenda - kicked off the Startup Friday event, hosted by ABN Amro on May 22nd, 2015. The day before she had a swift appearance at the finals of the 2015 Philips Innovation Awards. Both times, the message was loud and clear.

European pleas for corporate-startup collaboration are, however, not limited to the digital agenda. The same sound can be heard in the agriculture & food (Agri-Food) domain. Collaboration between corporates and smaller companies in an open innovation system is also an explicit part of a large scale European wide research project COMPETE . This project has run for three years and will be coming to an end in September 2015. This research contributes to the tasks of the project related to further investigating open innovation approaches, particularly by highlighting the involvement of startups in the open innovation strategies of EU Agri-Food firms.

1.1.2. Problem analysis

According to the FAO (2015) food production will need to increase by 60% to feed a population of 9 billion people in 2050. On top of that, consumers require increasingly healthy, safe and affordable food (Sarkar & Costa, 2008). Upon facing these fundamental challenges it is no surprise that the EU allocated an unprecedented budget of €4 billion to innovation in Agri-Food and related domains. In the light of this, it is increasingly recognized in the EU that open innovation can contribute to solve these innovation challenges . Among the EU countries, the Netherlands looks like one of the frontrunners in fostering open and collaborative innovations. In 2011 the Dutch government first of all introduced the so-called "top sector policy" with the aim to promote innovation in nine sectors most valuable to the Dutch economy (Rijksoverheid, 2015a). Agri-Food is one of those nine sectors (Hollandtrade.com, 2013). Within the top sector policy, open collaboration between business

(large and small), academic institutions, and government is considered the way forward. In the AgriFood sector a total of €512 million was invested for this purpose (Rijksoverheid, 2015b). In 2012 the 'Provinciale Staten' (States-Provincial, PS) of Gelderland drafted a proposition to implement this top sector policy to promote a sustainable and internationally competitive economy of Gelderland, based on innovative Food- and Health sectors. Open innovation, collaboration with startups and a facilitating role for incubators are principal themes in the PS's proposition (Provinciale Staten van Gelderland, 2012).

The focus on open and collaborative innovations in the Agri-Food sector of the Dutch Government is justified and supported by evidence and prior knowledge highlighting the emergence of new drivers and the increased relevance of openness in the Agri-Food domain. One of the most prominent drivers is technology pressure (Garcia Martinez et al., 2014), whereby technology intensity, turbulence and convergence are all increasing in the Agri-Food sector. Knowledge in this sector is distributed to a large extent in other sectors (Sarkar & Costa, 2008), so advances in for example nanotechnology present clear opportunities for open collaboration with external partners (Garcia Martinez et al., 2014).

It has been observed how clearly food firms express the intention to participate in open innovation ecosystems themselves, and are actively looking for ways to collaborate with startups (e.g. Chesbrough, 2006; Fortune Magazine, 2015; Van Lohuizen, 2015; Unilever, 2015).

So even though the food industry is traditionally considered mature and to have a low degree of innovation (Sarkar & Costa, 2008; Pascucci, Royer & Bijman, 2012) it has become clear that there is much ambition from all sides (European, national and regional government and business) to participate in open innovation ecosystems. This is supported by empirical evidence and research results. For instance engaging in open collaborations is found to positively impact innovation performance (Leiponen & Helfat, 2010) and financial performance (Inauen & Schenker-Wicki, 2011; Lichtenthaler, 2011). Open innovation could thus be key in moving the Agri-Food sector forward. Agri-Food, after all, is faced with the arduous task of providing healthy, safe and affordable food in a rapidly changing technical and economic environment (Menrad, 2004; Sarkar & Costa, 2008; Dries, Pascucci, Török & Tóth, 2014).

Although innovation research in Agri-Food remains limited (Bigliardi & Galati, 2012), especially empirical open innovation research, the body of research (both theoretical and empirical) into open innovation systems in Agri-Food is increasing (e.g. Garcia-Martinez, 2014; Saguy, 2011; Sarkar & Costa, 2008). Despite this growing interest, one important stakeholder is underexposed: the Agri-Food startup.

The potential value of collaboration between established food firms and startups is acknowledged (Traitler, Watzke & Saguy, 2011; Arcese, Flammini, Lucchetti & Martucci, 2014; Fortune Magazine, 2015). Also, the involvement of startups in the innovation process of established firms is well researched in for example the high technology sector (e.g. Gregory Henley, 2007; Weiblen & Chesbrough, 2015). Currently, however, there is not sufficient empirical evidence for and research into the involvement of early-stage startups in open innovation strategies in the Agri-Food sector. In general, research confirms that open innovation is mostly adopted by larger companies (Bianchi et al., 2011; Huizingh, 2011). As

such, it is necessary to gain adequate insight in the perspective and potential of startups in open innovation strategies. Now, there is an important missing link in organizing effective open innovation systems in the Agri-Food sector.

1.1.3 StartLife

StartLife is the valorization center of Wageningen University, focused on the domains of Food, Agriculture and the Bio-based economy (StartLife, 2015). Its Centre for Entrepreneurship was founded in 2008 as collaboration between WUR, the province of Gelderland and several organizations in the Agri-Food domain. Since 2008 it has facilitated over 200 startups (Schober, 2015). StartLife promotes co-development and co-innovation processes, to frequently translate academic research into market-ready ready products (Schober, 2015) and hence applies an open innovation approach. As such, it matches startups to corporates, research institutes and other stakeholders. In 2014 StartLife launched StartHub Wageningen, the student startup incubator to facilitate WU students with startup ambitions. At StartHub Wageningen knowledge spillovers and network effects are key to accelerate students' ideas into real startups (StartHub Wageningen, 2015).

1.2. Conceptual research design: research questions and goals

The goal of this study is to explore the potential for startups in open innovation strategies of EU food firms, in order to increase the competitiveness of EU Agri-Food firms. Therefore the primary unit of analysis in this research will be the startup, and its role and position in open innovation strategies of established EU food firms.

The main research question is: 'How can open innovation systems involving startups in the Agri-Food contribute to the competitiveness of EU food firms?'

To answer this research question, the following sub questions were derived:

1. What are best practices and key success factors of corporate-startup collaborations (CSCs) in the high-tech sectors?

2. How do open innovation strategies [involving startups] relate to the competitiveness of EU food firms?

3. How do current CSCs in Agri-Food compare to the structure, practices and potential of CSCs as outlined in the literature?

Collaboration between established firms and startups is a new phenomenon that has not yet received much scientific attention in the Agri-Food sector. In order to arrive at an answer to the central research question, lessons are therefore drawn from the high-tech sector where this phenomenon has been around for a longer period of time (Chesbrough, 2012). That is the research aim of the literature review of SRQ 1. SRQ 2 aims to make clear how OI in Agri-Food can contribute to the competitiveness of EU food firms. The findings of SRQs 1 and 2 are used to establish the theoretical framework for the empirical part of this research. The third SRQ aims to learn about the current 'state of affairs' with regard to CSCs in the Agri-Food sector. Two example cases are used to compare current practices and outcomes to the OI and CSC literature. Based on that comparison between empirics (what the current performance of CSCs is) and theory (what the ideal performance of CSCs is), recommendations for future practice can be derived.

2. Literature Review

This chapter will first establish two frames of reference for this research. First, it is relevant to make the distinction between established food firms and startups because, as Steve Blank puts it, a startup is not a smaller version of a large company (Blank & Dorf, 2012). The distinct characteristics of these two types of companies will provide clear touching points in this research. The second frame of reference is the difference between open and closed innovation. Part two of this literature study will answer sub research questions 1 and 2. The problem analysis together with the results of the literature study will be used to establish the theoretical framework for the empirical part of this research. The theoretical framework contains the elements of open innovation involving EU food firms and startups that will be qualitatively studied.

2.1 EU food firms versus startups

For this research a distinction is made between established firms (corporates) and startups. Steve Blank, leading author on startups and innovation, presents the following definition of a startup: 'A startup is a temporary organization in search of a repeatable and scalable business model' (Blank & Dorf, 2012). This repeatable and scalable business model is also what sets startups apart from 'regular' SMEs, who operate much more in a geographically and growth constrained environment (Thiel, 2014). Eric Ries, renowned author of The Lean Startup, has a somewhat different definition: 'A startup is a human institution designed to create a new product or service under conditions of extreme uncertainty' (Ries, 2011). In this definition, Eric Ries does not distinguish size, sector or industry. The most important part is the condition of extreme uncertainty, where customers, markets and other crucial parts of the business model are fully unknown, unlike what is generally the case at established companies. Steve Blank also recognizes this, and states: '(...) large companies' size and culture make disruptive innovation extremely difficult' (Blank & Dorf, 2012). In the research at hand both Blank's and Ries' definitions apply, as they are complementary in application. Aside from an undefined business model, agility is what characterizes startups and what will be referred to throughout this research. 'Agile' in essence means moving quickly and easily. Agile development is defined as '(...) an incremental and interactive approach to engineering that enables product or service development to iterate and pivot to customer and market feedback.' (Blank & Dorf, 2012: p.xv). Although originating in software development, agile management is applicable to startups of all types in all industries (Forbes, 2014). For startups agility translates into short, iterative cycles of innovation as presented in figure 1 of appendix I. Minimum viable products (MVPs) are used to enter the market quickly and involve customers from the beginning of the product development. This lean (Ries, 2011) approach minimizes risk, time and money. Customer development is a frequently used underlying methodology of agile development. Customer development is a series of four steps towards a repeatable and scalable business model. This series is presented in figure 2 in appendix I. Within this process, entrepreneurs engage potential customers from the beginning. The above is in line with the conclusion of Lee, Park, Yoon & Park (2010) that small companies are already externally oriented and that open innovation is not new to them. Steve Blank's customer development model (Blank & Dorf, 2012) encompasses four stages. In the customer discovery stage the main goals is testing whether the business model is

correct and that the product really solves a customer problem and need. In the customer validation stage the goal is to develop a repeatable sales model, with a proven customer and market. The third stage is customer creation. Now that the business model and market are validated, the startup creates end-user demand and starts growing. In the fourth stage, company building, the startup transitions from a learning and discovery oriented company into a 'well-oiled machine engineered for execution' (Blank & Dorf, 2012).

In this research, startups are further delimited to those relying on not only business model innovations but also technological innovations. With regard to the technological innovativeness, the concept of Technology Readiness Level (TRL) is used to distinguish startups based on the stage of development in which they are. For innovative technologies there is generally a long development time, before a novel idea is ready to be produced on market scale. Using the TRL is a uniform way to compare startups based on the technological maturity. The European Commission (2014) distinguishes nine such TRLs, presented in box 1.

For this research the focus will be on OI systems involving early-stage startups, occupying TRLs 2, 3 and 4. In these stages, both the need for and the potential added value of open innovation is most present (Saguy, 2013). Collaboration between established firms and startups in TRL 2,3 or 4 are characterized as 'asymmetric' partnerships (Minshall et al., 2008), whereby the difference in experience, resources and capabilities is emphasized. No formal definition of an established company is used in this research. Such a company is understood to largely build on what's already proven to be successful, to be risk-averse and to have the whole business model figured out. Established firms are also referred to as 'incumbents' and 'corporates'. For this research, the focus will be on multinational European food firms with an annual revenue of at least €1 billion and a yearly R&D budget of at least 5% of the annual revenue.

Box 1. Nine technology readiness levels

TRL 1 – basic principles observed

TRL 2 – technology concept formulated

TRL 3 – experimental proof of concept

TRL 4 – technology validated in lab

TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)

TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)

TRL 7 – system prototype demonstration in operational environment

TRL 8 – system complete and qualified

TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

The differences between corporates and startups, as applicable to this research, can be summarized according to table 2.1.

Table 2.1. Differences between corporate and startup

	Corporate	**Startup**
Goal	Executing business model in which the customer, the problem and the required product features are known.	Seeking a repeatable, scalable and profitable business model.
Approach	Product development	Customer development, agile development
Nature	Established organization	Temporary organization
Nature of innovation	Mainly incremental	Mainly radical
TRL	Low (1-4) to medium (5-8)	High (9)
Risk behavior	Risk-averse	Operate in environment of extreme risk
Revenue	>€1 billion annually	€0 to €10 million annually

2.2 Open versus closed innovation

Innovation is a key element of business success (Leal-Rodríguez, Eldridge, Roldán, Leal-Millán, and Ortega-Gutiérrez, 2015). In this case, innovation is defined as: 'The first commercial application or production of a new product or service' (Freeman & Soete, 1997: p.1). However, technological advances (Dries, Pascucci, Török & Tóth, 2014), a changing business environment and a different global competitive landscape (Garcia Martinez et al., 2014) mean that an organization can no longer innovate in isolation (Dahlander & Gann, 2010). In other words, there are clear drivers for more 'openness' in firms' innovation strategies. Below, a general distinction is made between open and closed innovation to present the perspective of this research. At the same time an important nuance to this perceived dichotomy is that open versus closed innovation is not that black and white. Rather, it is generally accepted that innovation strategies fall somewhere on a continuum and have a certain degree of openness (Enkel, Grassmann & Chesbrough, 2009; Garcia Martinez, Lazzarotti, Manzini & Sánchez García, 2014). Also, some aspects of the same innovation process can be open while other aspects are closed (Dahlander & Gann, 2010).

Building on existing research into classifying the open innovation continuum, this section will conclude with a typology of open innovation that is considered most applicable for this research.

Closed innovation

Closed innovation can be described as '[a model] in which a single firm uses its own internal resources and capabilities to undertake all the activities that form part of the generic innovation process' (Smith, 2010: p.121). Rothwell (1994) describes four processes that fall under the closed innovation umbrella. The first is the Technology Push model, which 'assumes that more technology, brought about by additional expenditure on R&D, will lead inexorably to more innovation' (Smith, 2010: p.114). The second is the Demand Pull model, in which the market comprises the source of new innovation opportunities. Third is the

Coupling model, which combines the previous two and incorporates feedback loops between all different steps of the innovation process, to highlight their interaction and interdependence. Fourth is the integrated model, in which there is a reliance on teams to integrate the various functions of the innovation process from the start. As depicted in figure 4, closed innovation entails that all processes related to the development of ideas through the innovation funnel take place in-house, without involvement of external parties. This also means that companies applying closed innovation are often vertically integrated (Smith, 2010). Underlying closed innovation is the assumption that innovation requires control, and that externally developed technologies or ideas are unavailable or lack sufficient quality (Chesbrough, 2004).

Open innovation

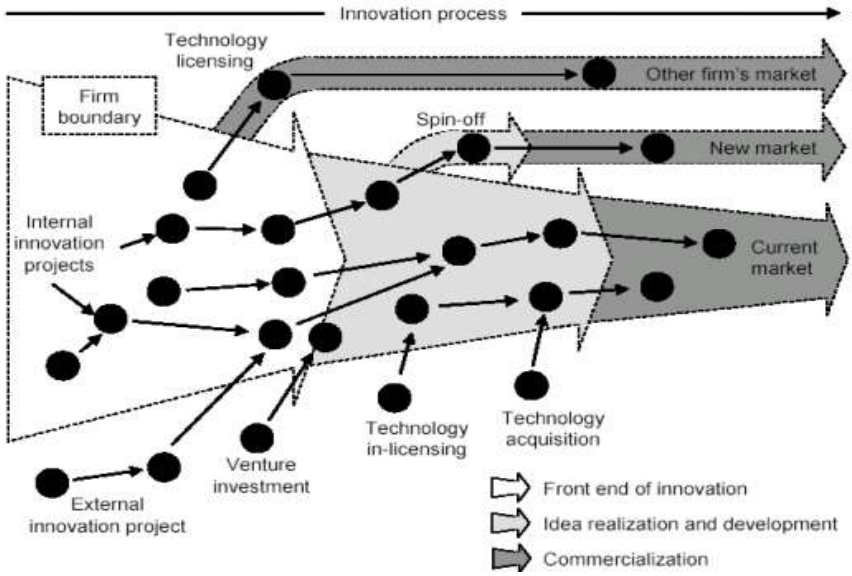
Over the last years, firms have changed their closed innovation strategies, and obtained a large part of their technologies from external sources (Lichtenthaler, 2009). In other words, there is a clear trend towards innovation collaboration across the boundaries of the firm, a trend towards open innovation (Garcia Martinez, Lazzarotti, Manzini & Sánchez García, 2014). As Lichtenthaler explains, open innovation is for many firms a requirement rather than an option, as they cannot do everything in-house. Building on previous definitions from open innovation scholars, Lichtenthaler (2011: p.77) defines open innovation as '(...) systematically performing knowledge exploration, retention, and exploitation inside and outside an organization's boundaries throughout the innovation process'. Lichtenthaler (2009) and Clarke, Evald & Munksgaard (2012) found that this move to open innovation is especially relevant for industries that are highly dynamic, have a high degree of complexity and show an increasing diversification of technologies. As described in the problem analysis, this characterization increasingly applies to the Agri-Food sector as well.

In order to classify empirical findings and further develop the open innovation theory, it is necessary to establish a framework of open innovation. Previous literature reviews have each developed such a framework for classification (Dahlander & Gann, 2010; Lichtenthaler, 2011; Huizingh, 2011).

First, the inbound versus outbound open innovation dimension can be distinguished (Lichtenthaler, 2011). Inbound open innovation refers to external knowledge being used internally (Huizingh, 2011). External sources of innovation are especially applicable to filling gaps and fixing 'blind spots' in the current business model of an organization (Chesbrough, 2003), to keep the current business model aligned with the innovation strategy. Outbound open innovation refers to ideas being developed within an organization and commercialised through external organizations, in an open exploitation process (Lichtenthaler, 2009). Chesbrough (2003) distinguishes four activities for inbound open innovation. First, external innovation projects can bring forth new ideas for the host organization. Second, a company can use venture investments to fill a gap in the current business model, by investing in a startup company developing a specific technology. Venture investments are a powerful way to learn about the market in a more direct and comprehensive way than could be achieved by market research (Chesbrough, 2003). The established company can use its knowledge and resources to guide and support the startup, and can be an early adopter of the technology. This method of venture investing to support R&D is what Campbell, Birkinshaw,

Morrison & van Basten Batenburg (2003) refer to as 'innovation venturing'. Third, technology in-licensing is applied when a company insources a specific technology from an external organization. Further development and commercialisation of that idea can take place within the host organization, with its own resources (Smith, 2010). Fourth, technology acquisition means there is a transfer of ownership of the technology, the product or service (Chesbrough, 2003). An organization can choose to acquire an entire startup company to receive ownership of- and apply the technology that the startup developed. Acquisition of a startup can follow a venture investment in that startup, when the established company realizes, for example, that the startup has become essential to its strategy (Chesbrough, 2003). For outbound open innovation Chesbrough (2003) distinguishes two activities. The first is technology licensing, which occurs when a company has developed an idea or technology, which it cannot directly apply in its own operations at that moment. By licensing it through an external organization, the company is still able to capture the value of the technology, product or service, through another firm's market. The second is a (university) spin-off. Universities and established companies both have incentives to collaborate. Firms could for example sponsor university research, the results of which the company can later apply in its own operations. But universities can also find new markets for their ideas through a university spin-off, defined by Shane (2004: p.4) as '(...) a new company founded to exploit a piece of intellectual property created in an academic institution'. University spin-offs thus transfer knowledge from university research into societal application (Rasmussen, 2006). Figure 2.1 shows all inbound and outbound OI activities introduced by Chesbrough (2003) and their likely place in the innovation process. The inbound-outbound dimension relates to Lichtenthaler's (2011) knowledge processes of exploration, retention and exploitation. Here, the authors included retention to account for the need to store and manage knowledge over time. In this research, the will be on exploration and retention, which provide the best-defined frames of reference. The inbound-outbound dimension can be further elaborated by the key activities distinguished by Bianchi, Cavaliere, Chiaroni, Frattini & Chiesa (2011). For both inbound and outbound open innovation the authors grouped activities into three groups. First, non-equity alliances (partnerships) entail that firms partner with other firms and institutes to pursue common innovation objectives. Second, through purchasing and supply of scientific knowledge and technologies firms externalise specific phases of the innovation process. The third group, licensing agreements (in and out), was already described.

Figure 2.1. Open innovation



Source: Adapted from Chesbrough (2003).

The second open innovation dimension that can be distinguished is the equity dimension, i.e. whether equity is directly involved in the collaboration. Figure 2.2 classifies open innovation types based on the inbound-outbound dimension and the equity dimension. The resulting matrix with quadrants A, B, C and D highlights the key open innovation activities found by Chesbrough (2003), Dahlander & Gann (2010), Bianchi et al. (2011) and Weiblen & Chesbrough (2015). This research applies an emphasis on open collaboration, and as such the focus will be on the non-equity types of open innovation, i.e. the bottom row of figure 2.2. Still, lessons from other forms of open innovation are incorporated as well. Quadrant B, outbound venturing, is of very little relevance to this research, as this research looks into collaboration alliances between existing corporates and startups as separate entities.

An important observation is that the above classification has a one-sided perspective. Whether an open innovation project is inbound or outbound depends on the perspective of either the established company or the startup. Unless otherwise specified, the perspective of the established company is taken with regard to the open innovation activities.

Figure 2.2. Typography of open innovation types and activities.

	Inbound innovation	Outbound innovation
Equity involved	**A** Technology in-licensing; Technology acquisition; Purchase of scientific services; Corporate venturing.	**B** Technology licensing; Spin-off; Supply of scientific services; Corporate incubation.
Equity not involved	**C** External innovation project; Non-equity alliance; Crowdsourcing; Startup program (outside-in).	**D** Non-equity alliance; Revealing internal resources to external environment; Startup program (platform).

Source: Own elaboration.

3. Methodology

Multiple research methods will be used for this research (table 3.1). Section 3.1 will describe the general research strategy. Section 3.2 will describe the research methods in more detail, including the sample selection and operationalization, for the empirical part.

Table 3.1. Overview of research methods

Research question	**Research method**
Sub research question 1 What are best practices and key success factors of corporate-startup collaboration in the high-tech sectors?	***Literature review (1)***, in which 21 articles are selected. A detailed description of the literature review is presented in section 3.2.
Sub research question 2 How do open innovation strategies relate to the competitiveness of EU Agri-Food firms?	***Literature review (2)***, in which 11 articles are selected. A detailed description of the literature review is presented in section 3.2.
Sub research question 3 How do current CSCs in Agri-Food compare to the structure, practices and potential of CSCs as outlines in the literature?	***Retrospective case study***, in which a document analysis and expert consultation are performed.

Source: Own elaboration

3.1 Research strategy

This section will lay out the overarching research strategy, which presents the decisions and their relations about how the research will be conducted (Verschuren & Doorewaard, 2007). The topic of corporate-startup collaboration as an open innovation approach in the Agri-Food sector has not received much scientific attention yet, so this research is considered exploratory in nature. The first literature review will investigate best practices for corporate-

startup collaboration from high-technology sectors. From that lessons will be deduced for such practices in the Agri-Food sector. The second literature review will look into the relation between OI, the core of corporate-startup collaboration, and the competitiveness of established EU Agri-Food firms. The literature reviews will be used to establish the theoretical framework. This framework will be used to guide the case study. A case study will be performed to compare the theoretical findings of the literature review with current practice of OI in the Agri-Food sector. From this comparison, learnings are derived for future collaborations between startups and corporates.

3.2 Research methods

3.2.1 Literature review 1

A literature review was conducted to establish best practices for corporate-startup collaboration from high-tech industries. Various keywords were used to find relevant literature, as presented in table 2. For this literature review the Scopus database was used. Scopus returned the most as well as the most relevant hits on the topic of open innovation. The title, abstract and keywords were searched for combinations of the primary keywords 'open innovation', 'corporates' and 'startups'. Synonyms and alternative spellings of those keywords were also included.

For 'startup' the following synonyms were used: 'startup', 'startups', 'start-up', start-ups', 'new venture', 'new ventures', 'SME', 'SMEs', 'small company', 'small companies'. Although in principle SMEs differ substantially from startups, some researchers use 'SME' as an umbrella term that includes startups.

Table 3.2. Keywords used and resulting number of hits

Keywords	Number of hits	Keywords combined with	Number of hits
"open innovation" AND startup	206	collaboration	119
"corporate innovation" AND startup	8		
innovation AND startup	4666	collaboration AND "best practices"	114
startup AND corporate AND collaboration	40		
"corporate entrepreneurship"	450	collaboration	87
"corporate venturing"	150	"best practices"	89
		"open innovation"	9

Source: Own elaboration

Thus, a total of 466 articles was found using the keyword combinations mentioned in table 2. After correcting for doubles, publishing date and wrong language, a list of 427 articles was

established. After reading the titles of those 427 articles, 284 articles were removed based on the exclusion criteria listed below and possible doubles:

- Non-relevant industry (e.g. food, services, education).
- No open innovation perspective
- Focused on wrong type of company (e.g. family business).
- Focused solely on innovation of startups or corporates, instead of on the collaboration
- Focused on open collaboration with universities/academia

The abstracts of the remaining 143 articles were read. Based on the inclusion criteria mentioned below, 116 articles were removed:

- Article written in Dutch or English
- Article published after 2000
- Research has open innovation perspective
- Research is embedded in high-technology sectors
- Research is startup-centric; focused on startups in TRL 2-4
- Research focuses on actual collaboration, not just direct financial gains
- Research focuses on externally originated ventures, not ventures created inside corporate
- Research provides insight in best practices and/or success factors

Of the remaining 27 articles, 3 articles could not be retrieved. The other 24 articles were read entirely and judged on the inclusion criteria. From the references, one additional article was included in the analysis. Four articles did not pass the inclusion criteria after they were read entirely. Vaizler & Gordon (2012), for example, did not have an open innovation perspective, but focused solely on corporate venturing to create new revenue streams. Rajagopal (2006) focuses only on inside-out venturing whereby the corporate parent creates new business through spinning out. Thus, a total of 21 articles was analyzed for literature review 1.

3.2.2 Literature review 2

To answer the second SRQ ‘How do open innovation strategies [involving startups] relate to the competitiveness of EU food firms?’ and complete the theoretical framework a second systematic literature review will be conducted. The approach will be analogous to that of SRQ 1. Again, the Scopus database will be used to search on different combinations of the keywords ‘open innovation’, ‘competitiveness’ and ‘food industry’, including synonyms and alternate spellings. Title, abstract and keywords were searched. To complement this, Google Scholar will also be searched for the keywords ‘open innovation’, ‘competitiveness’ and ‘food industry’. This time, title only will be searched.

Table 3.3. Keywords used in literature review 2

Keywords	Number of hits	Keywords combined with	Number of hits
"open innovation" AND competitiveness AND food	9		
"open innovation" AND performance AND food	10		
"open innovation" AND evidence AND food	5		

Source: Own elaboration

From the book Open Innovation in the Food and Beverage Industry, which is a one-time published collection of research, one additional publication was selected and included up-front in the list of titles.

The resulting list of 25 publications will be judged on the title exclusion criteria presented below, and checked for doubles:

- Non-relevant industry
- No open innovation perspective
- Focused on open collaboration with universities/academia

Based on the exclusion criteria 8 publications were removed. From the resulting selection of 17 publications all abstracts will be read and evaluated on the inclusion criteria listed below:

- Article written in Dutch or English
- Article published after 2000
- Research has open innovation perspective
- Open innovation relates to quadrants A, C and/or D of table 1
- Research is embedded in Agri-Food sector
- Research aims to better understand relation between open innovation and competitiveness

After reading the abstracts, another 4 publications were removed. Of the resulting selection, 1 publication could not be retrieved. The remaining 13 publications of the resulting selection will be read entirely and judged again on the inclusion criteria. From the references of these articles, two additional articles were selected and included.

Reading all 14 publications, resulted in the exclusion of three publications that did not meet the inclusion criteria.

Of the 11 publications included in the final selection, the factors that determine or influence the relation between open innovation and competitiveness in the Agri-Food sector will be deduced, grouped and described. This information, along with the results of SRQ 1, will then

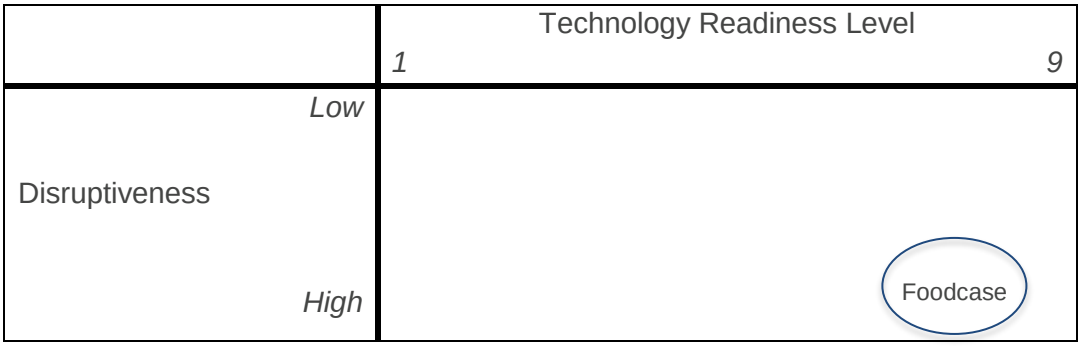
be used to complete the theoretical framework for the case studies in the empirical part of the research.

3.2.3 Retrospective case study StartLife

A retrospective case study will be used to answer the third sub research question 'How do current CSCs in Agri-Food compare to the structure, practices and potential of CSCs as outlines in the literature?' Case-study research is used to clarify management issues (Eisenhardt & Graebner, 2007). This method is particularly useful for 'how' and 'why' questions, as, compared to quantitative research, it gives a more in-depth insight into new areas of research (Siggelkow, 2007). In this thesis, the purpose is not to test hypotheses but to gain an understanding of how open innovation collaboration between corporates and startups is implemented to achieve a higher innovative performance and increased competitiveness. StartLife will be the unit of analysis of this case study, and as such its role and function in OI systems in Agri-Food will be studied. To example cases will be selected wherein StartLife has a facilitating role. Theoretical sampling for the example cases will be used, because only a limited number of cases can be studied and it is important that the process of open innovation can be studied in depth (Eisenhardt, 1989). In the example selection procedure, two dimensions will be taken into account. First of all, the degree of disruptiveness is considered, from incremental innovation to radical innovation. Second, the TRL is considered, from a readiness level of 1 till 10. The aim is to include examples of corporate-startup collaborations that occupy different parts of the resulting matrix (see figure 3). In other words, polar types of cases will be selected (Eisenhardt, 1989). Further, the following criteria are used in the theoretical sampling:

- The startup operates in the Agri-Food sector;
- There is adequate availability of- and access to resources covering the startup-collaboration;
- It is possible to follow-up in a later stage for further qualitative research involving the reprentatives of the corporate-startup collaboration.

Figure 3.1. Case selection based on degree of disruptiveness and TRL. Source: own elaboration



Source: Own elaboration

Based on the criteria, an exemplary case was selected: Foodcase. Foodcase is a Wageningen-based startup that has developed an innovative way to produce ready-to-eat meals that are shelf stable at ambient temperatures (Foodcase, 2015). Their primary market is the airline industry. To enter that market successfully Foodcase partnered with Gate

Gourmet, the market leading airplane catering and provisioning firm. Currently, the supply chain for airplane provisioning is built for frozen meals. Consequently, firms like Gate Gourmet are dependent on freezer storage and transportation (Gate Group, 2015). As such, the disruptiveness of a technology to produce meals stored at ambient temperature is considerable. At this moment, Foodcase is running market experiments to test the quality and marketability of their product. The stage of a proven operational environment is not reached yet (Gate Group, 2015). In summary, the current TRL of Foodcase is 8.

This exemplary case, in which StartLife has a facilitating role, will be analyzed using a document analysis and expert interviews. An overview of the documents that were used can be found in appendix IV. The document analysis will be complemented with expert interviews with Gitte Schober. Gitte Schober is director of the StartLife Centre of Entrepreneurship. She oversees and is involved in the Foodcase case. The CSC practices and outcomes that are found in the case study are analyzed based on the typography of figure 2.2 and the theoretical framework presented in figure 4.4. The resulting insights will be used to formulate recommendations to extend the theoretical framework can be made; as well as recommendations for future practice of CSCs in the Agri-Food sector. The documents for both example cases will be retrieved via the personal network of Gitte Schober, director of StartLife Centre for Entrepreneurship and public sources of the companies involved.

4. Results Literature Reviews

4.1 Lessons from high-tech sectors

This section presents the results of the literature review used to answer that first sub question: 'What are best practices and key success factors for s in the high-tech sectors?'. Open innovation is present across industries, such as consumer electronics, financial services, automotive and biotechnology (Huizingh, 2011). Yet, there is more evidence of open innovation activities in industries characterized as high-technology compared to those with a lower technology intensity (Chesbrough & Crowther, 2006; Arcese, Flammini, Lucchetti & Martucci, 2015). Therefore, the first sub question zoomed in on best practices and effects of collaboration between established firms and startups in high-technology industries (e.g. biotechnology and information technology).

In Appendix II, an overview of the main results of the literature review is included. This section will present the lessons derived from the literature on those industries, in the form of practices and success factors. These factors are grouped into six groups: alliance formation, strategic fit, governance mode, access to resources, relationship & trust, and IP protection.

4.1.1 Alliance formation

The first best practice identified in the literature review is about the actual formation of a CSC. Colombo, Grilli & Piva (2006) indicate that many potentially beneficial CSCs are not formed because of the high transaction costs, i.e. the costs for startups associated with finding and screening potential corporate partners. The startups lack of social capital, i.e. the quality of its network, exacerbates this issue, as well as fear of losing the proprietary rights of its technology. Colombo, Grilli & Piva (2006) recommend that the startup seek sponsorship from reputable organizations such as VC or CVC investors or research institutes.

Specifically, VC sponsorship was found to help find commercial partners, whereas CVC and research institute sponsorship were found to help find technological partners (Colombo, Grilli & Piva, 2006). Next to making the search for collaboration partners easier, sponsorship can also help protect the startup from opportunistic behavior of the corporate. Sponsorship can however backfire when the sponsor demands an exclusive relation with the startup, or when potential corporate partners fear appropriation issues when (especially) a technological sponsor is involved (Colombo, Grilli & Piva, 2006).

4.1.2 Strategic fit

The decision to establish CSCs should not be based on the ambition of how much money will be earned through the initiative itself. Rather, the strategic fit between the initiative and the business strategy (existing- as well as future business lines) should be considered (Engel, 2011; Michalski, Näfe & Usein, 2006). Engel (2011: p.38) states that '[t]he principle measure is not how much the initiative will earn in its own right, but how much it will enhance operations, sales, profitability and value of the overall enterprise'. This could mean that selected startups produce complementary products or services (Weiblen & Chesbrough, 2015) that fill specific resource or knowledge gaps of the corporate (Michalski, 2006), or it could mean that specific new markets are addressed (Engel, 2011). Gregory Henley (2007) and Weiblen & Chesbrough (2015) also argue that the degree of strategic fit between the investing firm and the startup portfolio must be considered when, in that case, a corporate venture capital program is being set up.

Strategic fit can be achieved in several ways. Clarke, Evald & Munksgaard (2012) state that strategic fit is achieved through setting coherent screening criteria for startups that enter a CSC initiative. Napp & Minshall (2011) describe that the long-term strategic fit can be ensured by an effective matchmaking process, and by including technical expertise from the corporate's business unit in the due diligence process. Also, Markham et al. (2005) and Napp & Minshall (2011) recommend placing a corporate member of the CSC initiative in the board of the startup. This way it is possible to keep track of the strategic direction of the startup and to continuously align the strategic interests of the corporate and the startup. As long as this alignment is in place, the corporate can and should then give continuous endorsement to the startup to ensure the viability of the CSC (Mahdjour & Fischer, 2014).

4.1.3 Governance mode

According to Gregory Henley (2007) the number one reason why corporate venture capital initiatives fail is because a lack of clear objectives. The corporate's- and startups- objectives drive further decisions (Michl, Gold & Picot, 2013). Therefore, a clear and coherent corporate strategy is necessary, that determines how the corporate will 'create, capture and deliver value' (Markham et al., 2005: p.51). Based on the objectives and the strategy, the right governance structure must be determined (Dushnitsky & Shaver, 2009). The governance structure includes multiple considerations, which will all be listed and explained below.

The governance structure deals with, first of all, the organizational structure. The first way to classify the organizational structure is the equity dimension of the OI typography of figure 2. If the corporate is looking for control, insight and financial upside then an equity-stake structure makes sense (Weiblen & Chesbrough, 2015). Keil et al. (2008) and Gregory Henley (2007) found positive effects of small equity stakes, by increasing commitment both on the

side of the corporate and on the side of the startup. This result holds as long as the partners are moderately related to the focal company, i.e. neither completely unrelated nor highly related (Keil et al., 2008). However, equity structures also bring additional organizational costs (Weiblen & Chesbrough, 2015). Non-equity collaborations are applicable when the corporate's aim is to be faster in responding to opportunities emerging in its environment and looks to improve R&D and business development more than direct financial returns (Weiblen & Chesbrough, 2015). Here, one possibility is a startup program with multiple startups from where the 'good egg in the basket' will emerge (Weiblen & Chesbrough, 2015): the most promising startup with the most benefits to the corporate. The different structures are not mutually exclusive (Weiblen & Chesbrough, 2015).

A second way to classify the organizational structure is the inside-out versus outside-in dimension of figure 2. Transcending that dichotomy, two articles were found stating that combining both outside-in and inside-out activity leads to highest innovation performance (Ferrary, 2011; Michl, Gold & Picot, 2013). Other than that, one (inside-out) is not objectively better than the other (outside-in). Rather, this choice depends on the specific objectives of the CSC (Weiblen & Chesbrough, 2015). For example, if the objective is to harness external creativity to fill specific knowledge gaps than an outside-in collaboration makes most sense, whereby an already existing external startup is invited (Weiblen & Chesbrough, 2015).

Engel (2011) and Hess & Siegwart (2013) point out that the governance structure need to promote agility and speed. Engel (2011) explains, for example, that R&D organizations within corporates could establish agile development teams, to replicate the agility that comes naturally to startups. Minimum viable products (see section 2.1) can be developed and tested, with multidisciplinary teams (Engel, 2011) that combine both technological and business skills. To keep the momentum and speed of CSCs going at times when the corporate and startup encounter unknown issues, a network facilitator could be involved that is able to match one CSC's team to another and provide practice advice (Minshall et al., 2008).

A third consideration for the corporate is whether the CSC or the startup program is assigned legally to the central organization, or to a specific business unit for example. The first option is appropriate for longer-term goals, but accountability is less. The second option would be appropriate for growing the business through new products, markets and channels but can elicit short-term decision-making (Markham et al., 2005). Although this seems a technicality, the choice of how to embed the CSC into the corporate structure can have profound effects on the long-term vitality of the CSC (Markham et al., 2005).

Further, it was found that having an effective due diligence process in which such issues as use of brands (Hess & Siegwart, 2013), direct communication between corporate and startup (Napp & Minshall, 2011) are addressed promotes the effectiveness of the CSC. The due diligence process also includes the monitoring and managing of the CSC to evaluate its effectiveness (Markham et al., 2005; Napp & Minshall, 2011). A wide range of metrics can be used to this end. These metrics need to include strategic-, financial- and process metrics, qualitative- and quantitative metrics.

Lastly, it was found that the corporate should have a leading and directive role in the CSC (Michl, Gold & Picot, 2013; Engel, 2011). Specifically the CTO of the corporate organization is in the position to oversee all aspects of the CSC (Engel, 2011).

4.1.4 Access to resources

Harnessing external resources to complement the company's own knowledge and resource base is a fundamental principle of open innovation (Chesbrough, 2003; Michalski, 2006). Where previously the focus was on corporates, it became clear that startups have much to gain from access to complementary (Kim, 2012) resources when they collaborate with a corporate partner (Michl, Gold & Picot, 2013). With regard to this access to resources, a number of success factors were found.

The first is to enable an unrestricted resource exchange (Clark, Evald & Munksgaard, 2012; Hess & Siegwart, 2013; Michalski, Näfe & Usein, 2006). Michalski, Näfe & Usein (2006) describe that particularly in the early stages the startup depends on specialist experience of the corporate. This includes both technical and management expertise. Further, Michalski, Näfe & Usein (2006) found that unrestricted access to distribution channels and patents have a positive influence on the innovation performance.

Second, it was found that the exchange of resources could be bolstered and agreed upon up-front to prevent waiting (Marion & Fixson, 2014). But is should also remain possible for resource exchanges to occur ad-hoc when needed (Michl, Gold & Picot, 2013). Related to this, Marion & Fixson (2014) state the important role of the project manager in acquiring the right resources when needed, to ensure the collaboration stays on track. To make this work, Vanhaverbeke, Van De Vrande & Chesbrough (2008) mention that one possibility is for firms to learn new skills to enable recognition and absorption of resources originating externally. Alternatively, an external manager with complementary knowledge and (investor) relations, can be hired for this purpose (Markham et al., 2005; Michalski, Näfe & Usein, 2006). With regard to financial resources Engel (2011) explains that the corporate should dedicate these to the startup in (pre-determined) stages, to mitigate risk and apply the customer development process rather than all up-front.

Third, even though careful dedication of financial resources to the startup is required early on, the corporates should invest heavily to obtain a first-mover advantage after customer discovery and product- and market validation are succeeded. This 'pour it on' principle (Engel, 2011) is based on the knowledge that new markets generally consolidate quickly to two or three dominant players. The first mover captures a disproportionate share of the market. Thus, once a winning business case is present, corporates should deploy resources quickly to enable quick scaling of the startup (Engel, 2011).

Finally, Mahdjour & Fischer (2014) introduce early internationalization as a way to increase access to parental resources. By being able to focus on international markets early on, startups are enabled to tap into resources of subsidiaries of the corporate in those markets. This way, potential conflict is also avoided by taking away fear the corporate's fear of cannibalization in the primary domestic market. If the corporate itself does not have international experience, startups might still be able to access resources of key partners in those markets (Mahdjour & Fischer, 2014). One thing to keep in mind is that in an increasingly globalized world, different markets become less and less separated. Thus, the

danger of future conflicts increases. This is a trend to continually monitor (Mahdjour & Fischer, 2014).

4.1.5 Relationships and trust

Although previous findings indicated that the corporate should take the lead in CSCs (Engel, 2011) startups should also been given enough trust, and the corporate should not get unnecessarily involved (Michl, Gold & Picot, 2013). It requires a certain amount of flexibility from the corporate's management to balance the directive role with the ability to give the startup freedom to operate (Michl, Gold & Picot, 2013). Relationships and trust are informal factors, which are often ignored but are important to be conscientious about (Hess & Siegwart, 2013; Vanhaverbeke, Van De Vrande & Chesbrough, 2008). Hess & Siegwart (2013) and Idelchik & Kogan (2012) add that this commitment must come from both sides: the startup and the corporate. In line with previous findings, this two-way commitment might be achieved through minority equity investments from the corporate in the startup (Gregory Henley, 2007).

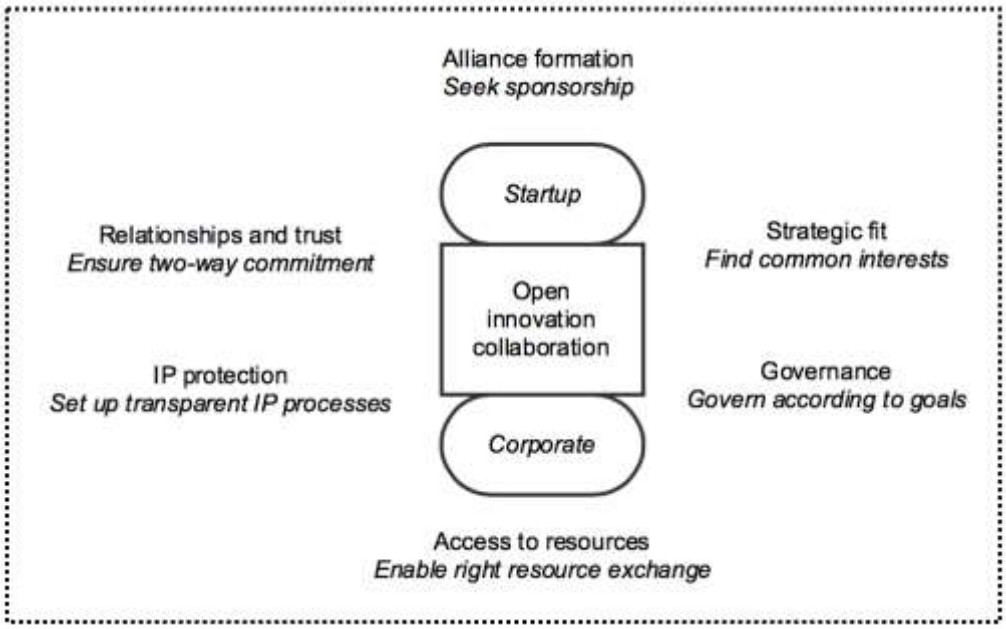
4.1.6 IP protection

One specific element of strengthening mutual trust in CSCs is to set up transparent intellectual property (IP) processes and guidelines (Idelchik & Kogan, 2012). Markham et al. (2005: p.57) further state that it is essential to 'insulate both the startup company and the investing corporation from each other with respect to cross-contamination of intellectual property'. A first best practice the authors propose is to only get commercial employees involved in the due diligence process, to avoid contaminating technical employees. Additionally practice Markham et al. (2005) recommend is to only let corporate technologists directly engage with the startups, rather than business-specific technologists. Hess & Giegwart (2013) propose a licensing scheme to arrange IP matters for products and technology and give partners an unlimited license to IP that is royalty-free. Idelchik & Kogan (2012) describe how General Electric, after complaints, had developed more flexible IP and terms and conditions to promote collaborations partners (startups) in sharing and developing new concepts and to strengthen the relationships. Weiblen & Chesbrough (2015) describe how the Joint Development Agreement (JDA) in Siemens' inbound CSC program is used to agree on IP handling, in a case-specific way. The JDA further outlines the activities, milestones and financial arrangements up-front. This approach is applicable when radical innovations are sought (Weiblen & Chesbrough, 2015). When the goal is to implement the startup's technology into the corporate's technology – i.e. when there is a clear divide between the two – then IP can be separated naturally (Weiblen & Chesbrough, 2015). Non-disclosure agreements can also aid the process of managing the IP process (Weiblen & Chesbrough, 2015). Dushnitsky & Shaver (2009) note that startups are less eager to seek backing from CVC in industries with weak IP regimes (e.g. software) because of fear of imitation. Although the right governance structure can mitigate IP issues, Dushnitsky & Shaver (2009) recommend corporates operating in industries with a weak IP regime to look for startups with which to collaborate from outside their own industry.

4.1.7 Conceptualization of best practices for CSCs

The six groups of best practices for CSCs derived from the literature review are conceptualized in figure 4.1.

Figure 4.1. Best practices for CSCs in high-tech sectors.



Source: Authors elaboration

4.2 Relation OI and competitiveness of EU food firms

This section outlines the results of the literature review used to answer that second sub research question: 'How do open innovation strategies relate to the competitiveness of EU Agri-Food firms?' In Appendix III, an overview of the main results of this literature review is presented.

The review of the extant literature about the relation between OI and competitiveness in the Agri-Food sector showed no direct connection. I.e. simply engaging in OI does not automatically relate to a change in competitiveness. Rather, two types of factors influencing that relation were found. First there are mediating factors, through which OI activities can lead to increased competitiveness. Second, moderating factors were found, which exert influence on the process. Two overarching mediating factor was found (innovation performance and value capture) and three types of moderating factors were found: the type of innovation, internal factors and external factors.

4.2.1 Mediating factors

The literature reviews showed two mediator factors. Mediator factors explain why how one event (OI activities) leads to another event (increased competitiveness); they account for the correlation (Baron & Kenny, 1986). The first is the overarching factor innovation performance (section 4.2.1.1) and the second is value capture (section 4.2.1.2). After both have been described, these mediating factors will be conceptualized (section 4.2.1.3) as part of the theoretical framework.

4.2.1.1 Innovation performance

It was found that OI activities increase innovation performance, and that innovation performance strengthens the competitive position of the firm (e.g. Bayona-Sáez et al., 2013;

Enzing et al., 2011; Kumar et al., 2012; Vanhaverbeke et al., 2007). Bayona-Sáez et al. (2013: p.75) found that an Agri-Food company's innovation performance is one of the most important factors in challenging '(…) major competitors, both on national and international markets'. Likewise, Enzing et al. (2011) describe that innovativeness is positively related to the long-term market performance. Thus, innovation performance was found to be the major mediator between OI and competitiveness. Innovation performance can be split up into three factors: innovation efficiency & speed (Enzing et al., 2011; Oughton et al., 2013; Sarkar & Costa, 2008), value added (Bonney et al., 2007; Garcia Martinez, 2014) and commercialization efficiency (Garcia Martinez et al., 2014; Sarkar & Costa, 2008).

Innovation efficiency and speed

Two main concepts constitute innovation efficiency and speed (whereby innovation is seen as the development of new ideas and technologies, thus not including the commercialization of those ideas): development costs and resource assimilation. First of all, OI can raise innovation efficiency through reduced development costs (Garcia Martinez et al., 2014; Pellegrini et al., 2014; Sarkar & Costa, 2008), for example when working together with suppliers (Garcia Martinez et al., 2014). Pellegrini et al. (2014) describe OI could increase staffing efficiency, because part of the innovation process is outsourced. Thus the innovation costs are shared. Also, development costs are reduced because through collaboration non-promising ideas are abandoned quicker, to avoid spending money on developing them. As such, risk-sharing was found to contribute to the innovation efficiency (Sarkar & Costa, 2008; Traitler et al., 2011). Second, the assimilation of new capabilities and resources also influences innovation efficiency (Garcia Martinez et al., 2014; Sarkar & Costa, 2008; Vanhaverbeke et al., 2007) by increasing the overall speed of the innovation process (Oughton et al., 2013; Traitler et al., 2011).

Value added

Traitler et al. (2011: p.R63) state that '[v]alue creation is the ultimate goal of any partnership: without it, the entire concept holds no real merit for either innovation partner'.

Bonney et al. (2007) report how Houston's Farm was able to create more differentiated products of a higher quality, thereby increasing the value added, through both downstream and upstream collaborations. Enzing et al. (2011) proposed that for a good-quality product a market will more easily be found. Garcia Martinez (2014) describes how company MCBC-UK, through OI, was able to 'escape the commoditization trap' with differentiation and deliver superior customer value. Co-creation with customers was the main driver of that result (Garcia Martinez, 2014). This way, the company MCBC-UK was able to increase competitiveness in a declining industry (brewery). Likewise, Bayona-Sáez et al. (2013) show that product differentiation is key in maintaining competitive advantage, over retail chains who are increasingly powerful and rely on supplying their private brands. Further, according to Vanhaverbeke et al. (2007) OI enables 'total solutions', which occupy a larger portion of the value chain, thereby increasing the value added for the customer. Finally, Sarkar & Costa (2008), based on four case studies, also found that the degree of product innovation and differentiation have a positive effect on the firm's market outcome, but that there comes a point of diminishing returns.

Commercialization efficiency

Enzing et al. (2011) relate a speedier introduction of new products to an increased competitiveness. Likewise, Sarkar & Costa (2008) describe how Procter & Gamble was able to significantly decrease the time-to-market of a new Pringles product as a result of a close collaboration with one of their suppliers of packaging materials. In parallel, Sarkar & Costa (2008) describe how Calgene was able to speed up the commercialization of a genetically modified tomato by setting up an effective OI value network. That network consisted of inter-relationships with farmers, consumers, seed companies and packers. Aside from harnessing external resources, this value network was aimed at achieving critical support to avoid resistance and increase the adoption rate of the new tomato, thereby also lowering the commercialization- or market risk (Sarkar & Costa, 2008).

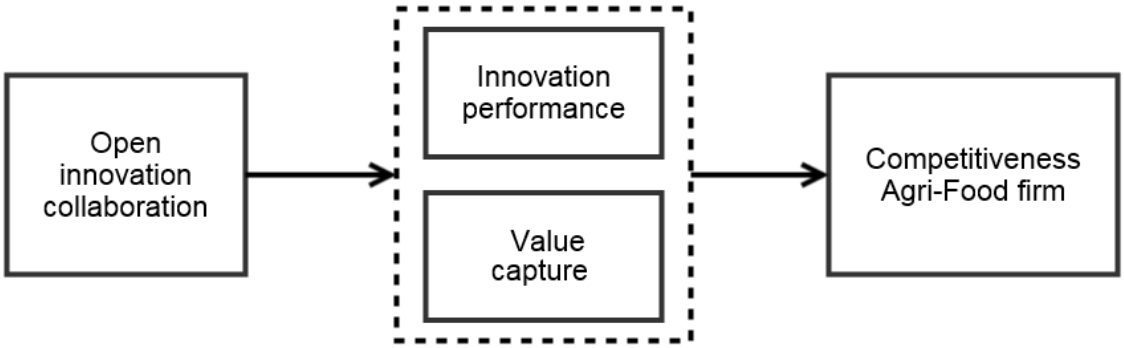
4.2.1.2 Value capture

Next to increased innovation performance, whereby value is created, value capture is an important mechanism that mediates the relation between OI and competitiveness (Oughton et al., 2013; Vanhaverbeke et al., 2007). A mechanism for sharing the value between the collaboration partners is an essential ingredient of the innovation exploitation, and thus of strengthening the firm's competitive position. To get there, market knowledge, exclusivity and routes to market are examples of value that can be shared as opposed to simply monetary value. At the same time, discussing that mechanism should not overshadow the actual value creation (Oughton et al., 2013). Likewise, Vanhaverbeke et al. (2007) explain how 'capturing part of the jointly created value' increases the overall value of the firm and thereby strengthens the firm's competitive position. One a final note, it is clear that innovation performance and value capture are tied, such that one cannot exist without the other.

4.1.2.3 Conceptualization of mediating factors

Figure 4.2 presents the relation between OI and the competitiveness of Agri-Food firms as described in the sections above.

Figure 4.2 Mediation effects on relation between OI and competitiveness in Agri-Food



Source: Authors elaboration

4.2.2 Moderating factors

Unlike mediating factors, moderating factors '(…) affect the direction and/or strength of the relation between an independent predictor variable and a dependent or criterion variable'

(Baron & Kenny, 1986: p.1174). They explain when the relation between two events holds. The literature review revealed three groups of factors moderating the relation between OI activities and competitiveness (through innovation performance): type of innovation (section 4.2.2.1), internal factors (section 4.2.2.2) and external factors (section 4.2.2.3). Each group will be described and broken up below, after which they will be conceptualized (section 4.2.2.4) as part of the theoretical framework.

4.2.2.1 Type of innovation

Bayona-Sáez et al. (2013) extensively describe how the type of innovation influences significantly the relation between OI and the innovation performance. A higher number of external sources of knowledge as well as a broader scope of the collaboration agreement, or JDA, have a significantly high impact on radical innovations. This effect was not found for incremental innovations in Agri-Food, unlike in non-Agri-Food industries (Bayona-Sáez et al., 2013). Another dimension of the type of innovation is the technology readiness. Oughton et al. (2013) found that differences in expectations between partners about the technology readiness level at which the collaboration is pursued form a significant barrier to turning OI into increased innovation performance. Therefore, the TRL can be considered an important factor moderating the effect of the collaboration. Oughton et al. (2013) describe, for example, a mismatch in expectations of the time and money required to get the technology from a demonstrator stage to a fully supported product.

4.2.2.2 Internal factors

Four internal moderating factors were found in the literature review: strategy, organizational structure, organizational culture, and communication and management. These four factors will be explained below.

Strategy

The first internal moderating factor that was found is the strategy deployed in the OI process. Kumar et al. (2012) highlight how startups can overcome their 'liability of smallness' through innovation collaborations, when startups adopt a long-term strategy in which an active open search strategy is embedded. Once innovation partnerships are entered, a mutual understanding of the common strategy and the business models will determine the effectiveness of the collaboration (Oughton et al., 2013). There can, for example, be different strategic ambitions for the OI partners. In the case of CSCs Oughton et al. (2013) describe how startups are likely to look for multiple areas of application for their technology, whereas the corporate could have an incentive to restrict applications outside those in its own operations. Additionally, Vanhaverbeke et al. (2007) report that in the case of WIB, a research institute of WUR looking to commercialize Calypto oil, the parties involved could not find an agreeable value distribution model and business model, due to differing strategic interests. The OI network for Calypto included technology partners, production companies, an investor and a large potential customer.

Vanhaverbeke et al. (2007) report that it can become difficult to organize innovation networks that are purely technology driven. This focus purely on technological capability is what Bonney et al. (2007) found to be a poor choice of focus. Sustainable competitive advantage can be achieved only when, first, there is a strategic orientation that is purely aimed at consumer value and second, when the value chain is coordinated in such a way that it

'responsive and dynamic to the needs and wants of the final consumer' (Bonney et al., 2007: p.395). Both those requirements were lacking in the Calypto case, despite efforts of an external and objective outsider to set up the appropriate value chain (Vanhaverbeke et al., 2007).

Organizational structure

Next to strategic alignment, the organizational structure exerts significant influence on the relation between OI activities and performance- and market outcomes (Enzing et al., 2011; Garcia Martinez et al., 2014; Vanhaverbeke et al., 2007). First, Vanhaverbeke et al. (2007) explain that formal and informal procedures are required to get to an effective governance mode. Formal procedures include selection criteria for collaboration criteria. Informal procedures include trust and commitment. Second, Garcia Martinez et al. (2014), based on a quantitative analysis, found that OI network exhibiting a higher degree of openness, were more likely to pursue radical innovation and achieved a higher innovation performance. The degree of openness includes both the collaboration breadth (the number of partners) and the collaboration depth (intensity of interaction) (Garcia Martinez et al., 2014; Pellegrini et al., 2014). Enzing et al. (2011) too, found that a larger number of partners influenced innovation performance. Pellegrini et al. (2014) also found that a higher openness degree relates positively to innovation performance, although, the authors state, the evidence on that relation is not complete.

Pellegrini et al. (2014) describe that the type of collaboration partners can influence the outcome as well. The authors state that generally in the food- and drink industry customers, consumers and suppliers are less appropriate partners. For small companies, universities could also be unsuitable. This surprising effect might be explained because of the difficulty of appropriating academic research results. Another possible explanation Pellegrini et al. (2014) found is that the bureaucracy and ineffective management of university's technology transfer offices could lessen the effectiveness of the collaboration with a university. Technology partners, especially when access to advanced technology is a driver of OI, were found to be the most fruitful partner type and to lack the disadvantages found for universities (Pellegrini et al., 2014).

Organizational culture

Parallel to the strategic orientation, a moderator Kumar et al. (2012) found was the willingness to adapt to changing environments, and thereby spotting promising new innovation opportunities. Bayona-Sáez et al. (2013) highlight that such a 'culture of innovation' is necessary to catalyze the effect of OI activities on innovation performance. This relates to the absorptive capacity that is necessary for firms in a mature industry (Pellegrini et al., 2014), such as the Agri-Food sector. Only with sufficient absorptive capacity are corporates able to spot external knowledge and apply it for innovation success (Pellegrini et al., 2014).

Oughton et al. (2013), researching CSCs in the food industry, highlight another way in which culture affects the innovation process. Startups, with their distinct agile, innovative cultures can experience hindrances as a result of cultural differences with their corporate counterparts. Corporates can be considered by startups as slow, and engaging in 'paralysis by analysis' (Oughton et al., 2013). These hindrances can be exacerbated by the perceived

power imbalance between the startup and corporate (Oughton et al., 2013), i.e. the fear of startups that corporates will abuse their power to win negotiations and make adverse decisions for the startup.

Communication and management

As Garcia Martinez et al. (2014: p.229) noted: '[o]penness must be managed in order to effectively provide value'. This starts with communicating clearly the objectives and expectations (Outghton et al., 2013), which is a vital step in preventing any inter-partner issues. Next, the level of on-going relationship management will determine the long-term vitality of the collaboration. The use of a common technology- or innovation roadmaps is herein an important management tool towards this end (Bonney et al., 2007; Oughton et al., 2013; Traitler et al., 2011), just like the JDA in which such issues as IP handling are addressed (Bayone-Sáez et al., 2013). The original 'key players' need to stay involved, as a source of trust. Traitler et al. (2011) in fact distinguish trust as one of the four separate stages in an innovation collaboration, towards value creation.

4.2.2.3 External factors

Garcia Martinez et al. (2014) found that innovation collaboration is not simply an individual firm's choice. Rather, the relationship with partners is to some extent determined by external factors. Two primary external factor was found in the literature review, which will be described below: external stakeholders and the external business environment.

External stakeholders

Oughton et al. (2013) describe how innovation partners do not operate in isolation, but are embedded in a 'complex web of stakeholders'. For the startup, these stakeholders include company founders, family members, VCs and business angels, universities and governmental organizations, and external consultants; all with interests that are rarely aligned (Oughton et al., 2013). For example, the startup may have formal ties that involve IPR, with a university or a startup program initiated by the government. For the corporate this poses a threat, and those ties might well first need to be broken before an effective CSC is possible. Also, the external backing of startups from VC firms can create tensions with the corporate partner when the VCs motives are not directed in the same way as the corporate's motives (Oughton et al., 2013). The collaboration needs to hold stand within this complexity.

Likewise, the corporate has relations with existing partners, subsidiaries and other stakeholders to take into account and with whom friction needs to be prevented. Also, it is possible that parallel to the focal startup in the CSC, the corporate is scouting for startups developing similar technologies and products to keep their options open (Oughton et al., 2013).

External business environment

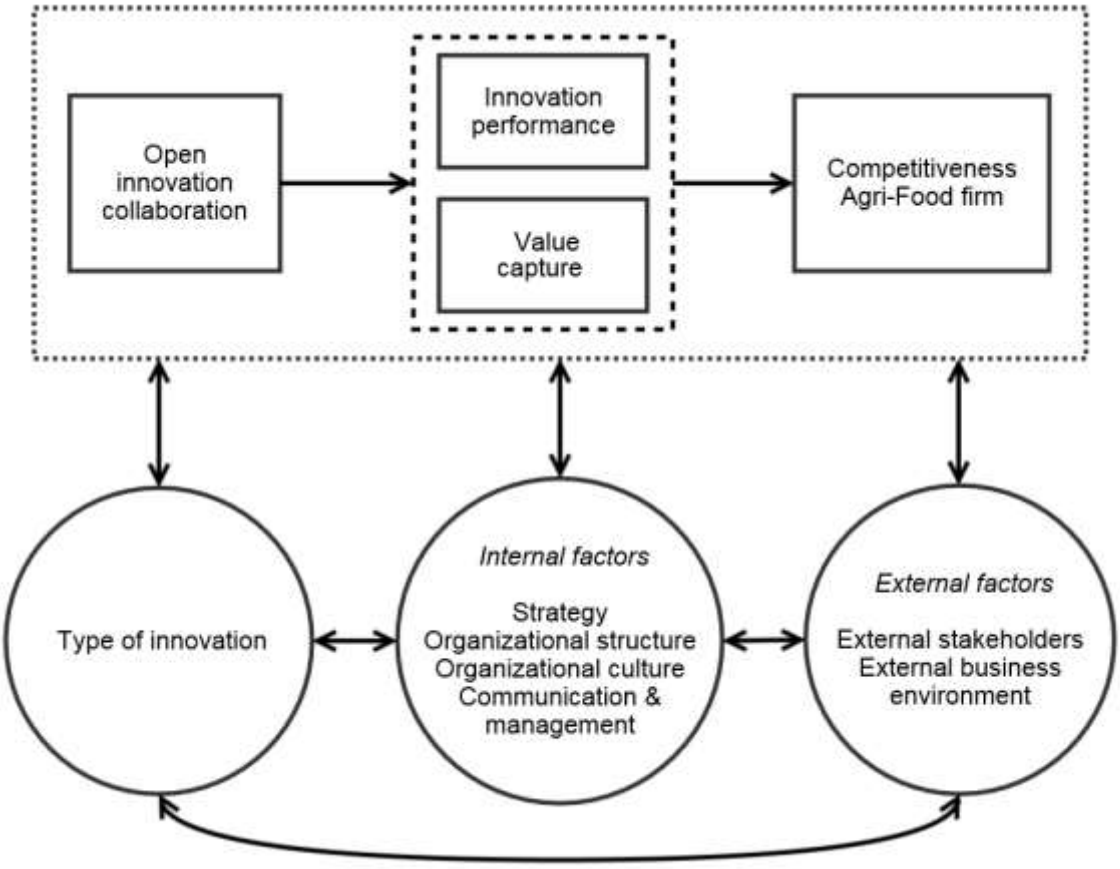
Next to external stakeholders who are involved in the innovation collaboration, the wider external business environment is the second moderating factor to influence the innovation outcome. Consumer and customer demands are changing rapidly in the Agri-Food sector (Sarkar & Costa, 2008). As a result, in many sub-sectors technological pressure to develop differentiated products increases rapidly (Garcia Martinez et al., 2014). This imposes a direct pressure on firms' ability to innovate, and changes the global competitive landscape (Garcia

Marinez et al., 2014). In conclusion, forming and sustaining collaborations do not occur in still waters, but are embedded in an external environment that experiences rapid transformations. Consequently, the external business environment not only drives and supports open innovation in Agri-Food, but also makes it in many cases inevitable. This significantly moderates the effect of open innovation efforts (Garcia Martinez et al., 2014).

4.2.2.4 Conceptualization of moderating factors

From the literature review it has become clear that the relation between OI and the competitiveness of Agri-Food firms is influenced by three groups of factors (type of innovation, internal- and external factors). Additionally, it has become clear that these three groups interact. For example, the external environment also impacts internal factors, and together this can influence the relation between OI and the resulting competitive position. Figure 4.3 conceptualizes these results.

Figure 4.3. Moderation effects on relation between OI and competitiveness in Agri-Food

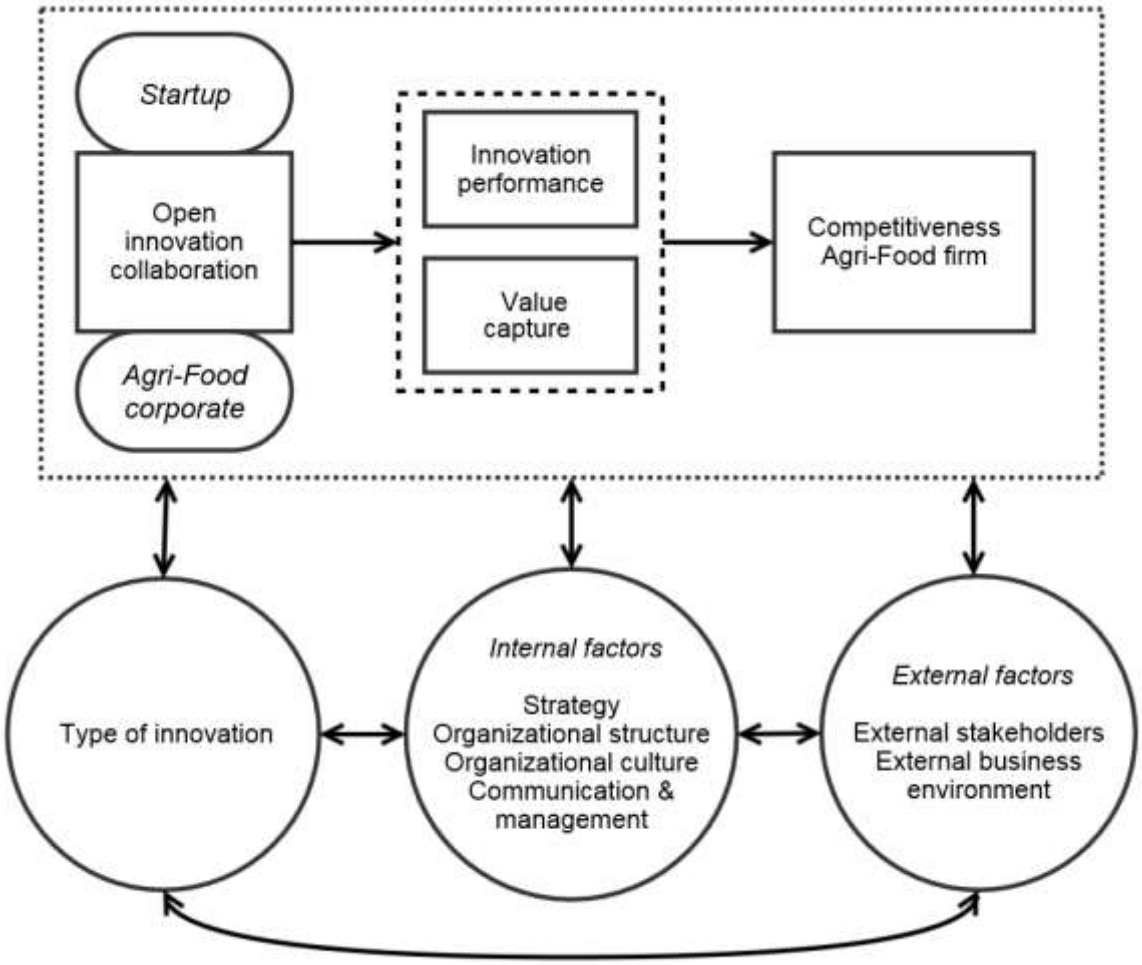


Source: Author's elaboration

4.3 Theoretical framework

The results of the first and second literature review were used to establish the theoretical framework presented in figure 4.4.

Figure 4.4. Theoretical framework



Source: Author's elaboration

5. Results Case Study

This chapter presents the results of the retrospective case study performed on StartLife. First, StartLife's open innovation practice is outlined. Second, the exemplary case of Foodcase is analyzed.

5.1 StartLife: the facilitator

In 2010 StartLife was founded as collaboration between Wageningen UR, development agency Oost NV, the Food Valley foundation, the province of Gelderland and other relevant societal stakeholders (StartLife, 2010b). StartLife aims to transfer knowledge created within Wageningen UR into societal and economic utility, through competitive products and services, and new ventures. Thus, valorization is StartLife's key objective. StartLife specifically focuses on the agriculture, food and bio-based economy sectors. Practically, StartLife facilitates startups in the following ways:

1. Offer (R&D) facilities such as laboratories, office space and meeting spaces;
2. Offer educational programs aimed at teaching an entrepreneurial attitude and developing entrepreneurial competencies;
3. Coaching startups throughout their development to prevent pitfalls and help create and execute a strategy;
4. Offer funding at different stages of the startup, from pre-seed to up-scaling;
5. Connect startups to research institutes, preferred suppliers, potential customers and collaboration partners, to assist startups in all phases of their development.

From the beginning StartLife has deployed an open innovation perspective in its approach and activities (Schober, 2015). Part of the reason is that StartLife was positioned to offer alternative valorization routes than Wageningen UR's standard contract research and licensing deals. Additionally, especially in agriculture open forms of collaboration have always been common. Farmer cooperatives in the livestock and dairy sectors are a prime example of this. By incorporating open innovation in its key activities, StartLife aligned with the 'traditional' practice in agriculture. Increasingly recognizing the open innovation benefits cross-sectorally StartLife is also deploying the OI approach in its other two domains: bio-based economy and food.

In doing so, StartLife contributes to the ambitions of the Food Valley Foundation (StartLife, 2010a; StartLife, 2010b). Food Valley is aimed at improving 'innovation performance [in the Agri-Food sector] by fostering collaboration between businesses, knowledge institutions and government' (FoodValley NL, 2015). Their Food Valley Ambition 2020 has the goal to become the number 1 location 1 Europe for Agri-Food innovation. This goal should be achieved by improving the business climate for Agri-Food organizations, promoting entrepreneurship in Agri-Food and strengthening the knowledge infrastructure in the Food Valley region, i.e. creating an open innovation culture (StartLife, 2010a). Within this ambition, StartLife is positioned to foster entrepreneurship among Wageningen UR students and staff (StartLife, 2010a).

In order to facilitate startups as effectively as possible, StartLife has orchestrated a network of preferred suppliers, who can supports starters with a broad range of domain and business expertise, legal services etc. (StartLife, 2010b). Regional business and academic institutions are involved, to complement startups' knowledge on all levels. To foster entrepreneurship, StartLife was involved in the development of an open innovation park on the campus of Norse Skog Parenco (NSP), a paper-manufacturing corporation. There, startups operating in the bio-energy and bio-based economy sector were able to use NSP's resources and infrastructure (Koene, 2012). One example is the startup Valleivis that used one of NSP's basins to sustainably grow trout. The example of Valleivis falls into quadrant D of figure 1, as the corporate reveals internal resources to external startups without equity being involved in the relationship.

More recently, in November 2014, StartLife has realized a student incubator on the campus of Wageningen UR (StartHub Wageningen, 2015). The student incubator offers students and recent graduates of Wagenigen UR the possibility to translate their business ideas into a first business plan, concept and/or prototype (ER&I & FB-V&H, 2014). Workshops, a network of

experts (e.g. in finance) and a large peer network offer the starters an inspiring workplace. Openness and sharing ideas are fundamental. After the startups went successfully through this first stage, StartLife can facilitate them in moving to the next stage. One possibility is for the startup to move to the high-tech incubator.

Currently, StartLife is one of the key stakeholders in the development of Plus Ultra, a high-tech incubator on the Wageningen UR campus (Wageningen UR, 2015). Unlike StartHub Wageningen, Plus Ultra is specifically targeted towards techno-starters (RVO, 2015) in the domains of Agri-Food and bio-based economy. A proposal was written to develop a Food Solution Centre (FSC) in the Plus Ultra building (StartLife, 2014). With the motto 'One solution, shared facilities, shared access to market' the FSC connects corporates and large SMEs in the food industry to startups, and also to the academic support system from Wageningen UR. Next to being a 'traditional incubator', the FSC would allow corporates and large SMEs to offer dedicated research assignments for the startups to work on. In essence, technology acquisition takes place as the corporate purchases an 'innovation arrangement' from the FSC (StartLife, 2014). Therefore, the FSC ecosystem fits with quadrant A of table 1. Startups are facilitated to work on disruptive innovations within different subsectors of the Agri-Food sector. The TRLs of the innovations developed at the FSC would be 4 and over. Through shared facilities and services, startups can lower their time to market, launch their technology faster. In other words, the innovation efficiency and commercialization efficiency are increased and overall innovation performance for the startups is improved. Through the 'innovation arrangements' (StartLife, 2014) value capture is also facilitated and improved. As a result of these effects, the FSC, through StartLife's facilitating role, would have the potential to improve the competitive position of the startups. At the same time, through risk sharing and increased innovation efficiency, the corporate client's innovation performance would also be increased. Importantly, however, the FSC has not been given a green light yet so its effects remain hypothetical.

Nevertheless, it has become clear that through various types of OI StartLife promotes startups to innovate more successfully. Next, two concrete examples are discussed in which the OI practices are looked at in more detail.

5.2 Foodcase: the advancer

Foodcase is one of the earliest startups that were supported by StartLife as an independent company. It produces ready-to-eat meals that have a longer shelf life in ambient temperature. Their current market is the airline industry, where through its products Foodcase helps reduce waste, increase on-plane revenue, and simplifies the supply chain (Foodcase, 2013a, Wageningen UR, 2013). It entered a long-term partnership with StartLife, as science partner (Foodcase, 2012). First an overview of the development of Foodcase is presented. Second, this development is analyzed based on the theoretical framework. Third, the main learnings of the Foodcase case study are presented.

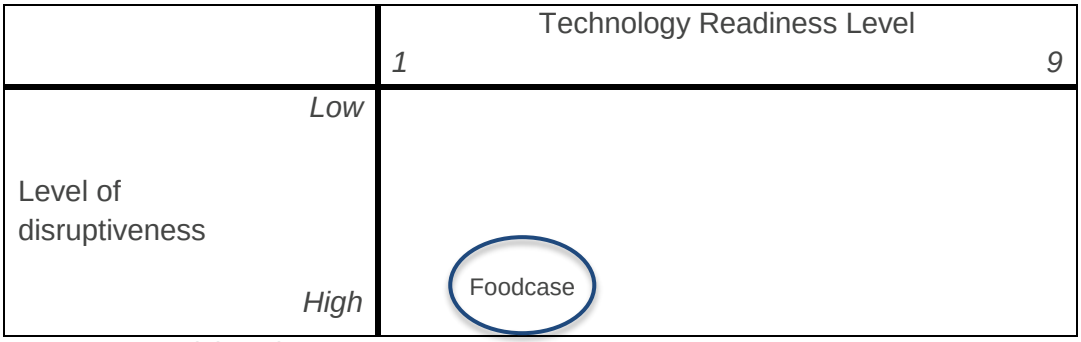
5.2.1 Case overview

As outlined in section 2.1, startups are categorized into four stages: customer discovery, customer validation, customer creation, and company building (Blank & Dorf, 2012). Those stages provide the guiding framework to describe the development of Foodcase.

Customer discovery

Foodcase started out with the idea to commercialize meals in self-heating cans with a long shelf life (Schober, 2014a). Foodcase realized it could not do all its R&D by itself and involved therefore a network of partners (Schober, 2014a). Foodcase was brought in contact with Gitte Schober of StartLife by a mutual acquaintance who advised the current CEO of Foodcase to make use of Wageningen UR's expertise (Schober, 2014b). Together with StartLife, Foodcase had the technological capacity to further develop their product in order to make their meals healthier, and to increase the added value (Schober, 2014b). After a meeting between the CEO of Foodcase and a representative from an airline executive it was determined the long shelf life was particularly interesting for the airline industry (Schober, 2014c). In that industry, meals that can be stored outside temperature-controlled environments for a long period of time mean that the entire value chain of airplane catering is disrupted (Schober, 2015). As such, Foodcase was truly working with radical innovation. Thus, Foodcase in this stage occupied the bottom-left position in figure 5.1.

Figure 5.1. Foodcase's early-stage level of disruptiveness and TRL



Source: Own elaboration.

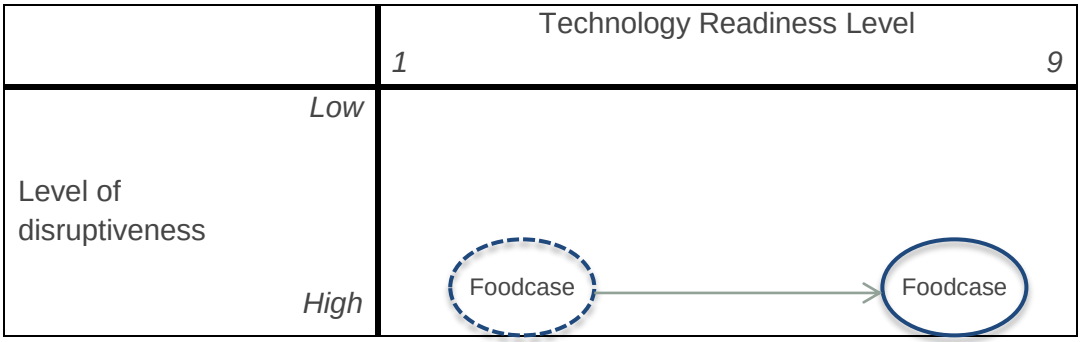
Foodcase had transitioned from being primarily a sales-driven organization (Foodcase, 2012), in which it would commercialize the self-heating canned meals, to becoming much more R&D focused with in-house product development (Schober, 2014a). In the product development, StartLife soon became invaluable as a knowledge and network partner (Schober, 2014c), initiating contract research with Wageningen UR, other scientific partners as well as commercial partners in the industry. Via StartLife, Foodcase combined expertise from Wageningen UR about food production, startups and caterers. Also, laboratories and production facilities were acquired and food technologists were hired, in the facility of one of StartLife's partner incubators. Foodcase now really turned from an organization focused on sales to an R&D driven organization, aimed at developing and commercializing new food concepts (Foodcase, 2012).

Customer validation

In early 2012, it started to become clear that the airline industry was going to be Foodcase's main focus, so a repeatable sales model for that market was established (Blank & Dorf, 2012; Foodcase, 2013). Early on, Foodcase started engaging with Gate Group, the dominant player in the field of catering and provisioning airplanes headquartered in Zurich, Switzerland (Gate Gourmet, 2015), because Foodcase saw the potential of Gate Group as a potential sales channel partner (Foodcase, 2012). In order to develop innovative food solutions for the airline industry, a successful R&D strategy was necessary. Later in 2012, Foodcase

launched the Foodcase Imagination Lab (FIL), where most R&D activity was housed (Foodcase, 2012). The FIL has two goals. First, through the expertise of StartLife and Wageningen UR, Foodcase could perform in-house research and experiment with small-scale production. Second, Foodcase invited other startups to use the facility to develop technologies that Foodcase itself could use in its operations (Foodcase, 2012). Thus, Foodcase created its own open innovation ecosystem. With Gate Group as a potential partner, the airline industry as primary market was solidified. As such, it was important to develop the meals further to meat all quality, taste and regulatory criteria that are unique to the airline industry (Foodcase, 2012; Foodcase, 2013b) and increase the overall TRL as represented in figure 5.2.

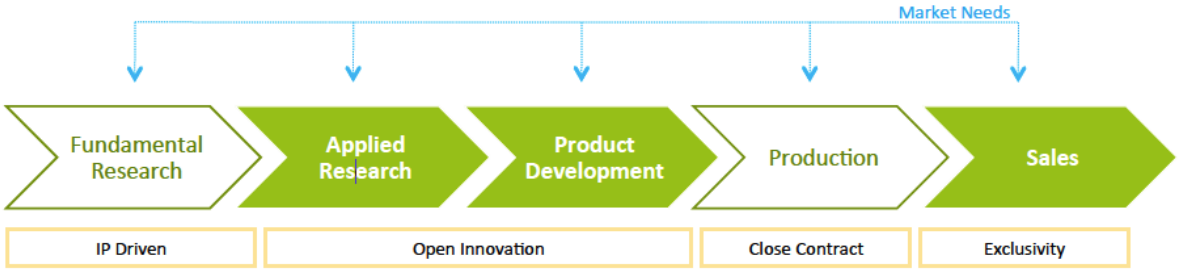
Figure 5.2. The R&D outcome of Foodcase



Source: Own elaboration.

With funding coming from the top sector Agri&Food (EVMI, 2013), investment firm PPM Oost (PPM Oost, 2013), Innovation and Investment Fund IIG (PPM Oost, 2013) and StartLife (Schober, 2015), accelerating this development was made possible. A 'research to sales' funnel was established in this way, starting with fundamental research into new technologies and concepts, leading through dedicated R&D to manufacturing and sales to the airlines. Figure 5.3 presents this process.

Figure 5.3. Research-to-Sales funnel of Foodcase



Source: Foodcase (2013a).

The collaboration between Gate Group, the dominant corporation in airplane catering, and Foodcase helps Gate Group develop new food concepts and technologies to improve their supply chain and logistics in the long-term. One research project, financed by the top sector Food & Agri was focused specifically on the transition from a frozen supply chain to a shelf-stable chain using Foodcase's technology, while maintaining the quality aspects of the food (Wageningen UR, 2013). Consequently, the open innovation Gate Group and Foodcase engage in can be classified as inbound. Because there is a clear long-term strategic benefit

of Foodcase's technology, Gate Group invested financially in Foodcase as well. As a result, there is equity involved in the collaboration. In the typography that was presented in figure 2 the Foodcase-Gate Group collaboration matches with quadrant A, as represented in figure 5.4.

Figure 5.4. Position of Foodcase in open innovation typography.

	Inbound innovation	Outbound innovation
Equity involved	Foodcase	
Equity not involved		

Source: Own elaboration.

First, Gate Group has an active supporting role in the applied research and product development phases of the Foodcase funnel presented in figure 5.3 (e.g. Wageningen UR, 2013). Gate Group's role herein is to supply the data for- and help with computing the effects of technologies that are developed in the FIL on the operations of Gate Group and the airline industry (Schober, 2015). For example, when working on a storage technology, Gate Group's contribution helps determine the reduction in CO2 emission as a result of the simplified supply chain (Foodcase, 2013a; Schober, 2015). Also, Gate Group is able to perform quality tests and other measurements on the products that are developed. The information exchange between Foodcase and Gate Group regarding R&D is protected with strict trade secrets (Schober, 2015). Alongside Gate Group, a number of external stakeholders are involved in the open R&D process (Foodcase, 2013a). Wageningen UR is continuously involved in the applied research, by supplying industry scientific know-how under the supervision of StartLife. One of Foodcase's manufacturing partners – a co-packer – is involved in the product development. Whereas Foodcase develops the packaging technology and sources the ingredients, the co-packer assembles and packages the meals (Schober, 2015). Together with this co-packer, the production process is improved. The collaboration between Foodcase, and the co-packer and Wageningen UR is protected through trade secrets. Also, Foodcase has an exclusive relation with a specific manufacturer of the packaging foil. Licensing IPR from the manufacturer protects this exclusivity. This exclusivity applies regionally and for specific markets. Foodcase does not hold patents, because their product is based on existing technologies recombined specifically for the airline industry (Trappenburg, 2015). Instead, their products are protected through trade secrets (Foodcase, 2013a), but other organizations could in theory replicate Foodcase's products (Trappenburg, 2015).

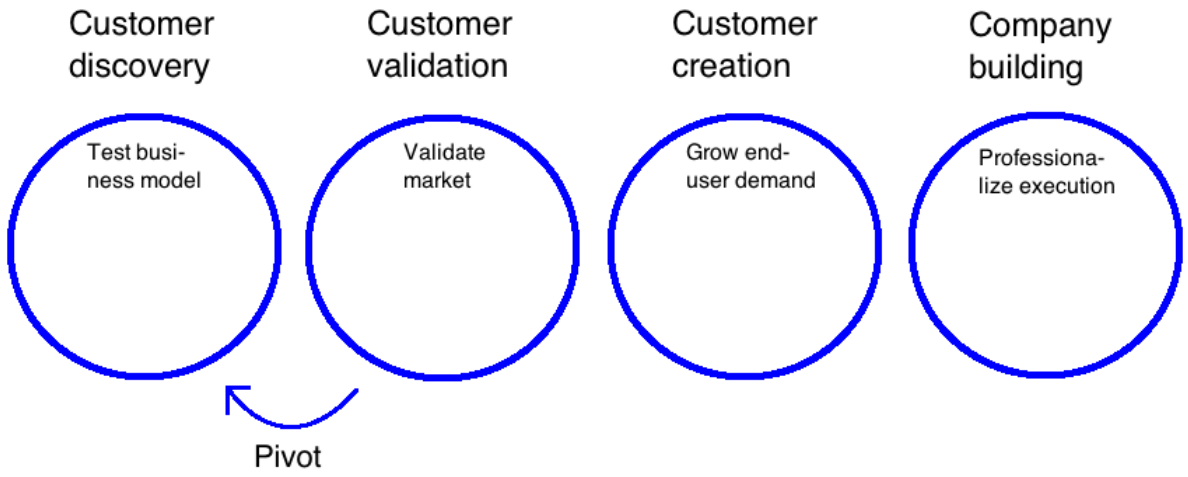
Second, Gate Group is a sales channel partner to Foodcase (Foodcase, 2013a). Gate Group is the worldwide market leader in airplane catering and provisioning (Gate Gourmet, 2015). As such, it controls the supply of meals to most of the airline companies. For Foodcase, the collaboration therefore provides unique market access by using the corporate's infrastructure. Foodcase itself also determined the relation with Gate Group to be risk factor however, as Foodcase is highly dependent on Gate Group to realize sales (Foodcase,

2013c). Two other factors prevent Foodcase from entering the airline industry as fast as they would want (Schober, 2015). First, Gate Group needs fully developed meal solutions that are up to their quality standard and required volumes (Foodcase, 2013c). The TRL of Foodcase's products therefore first needs to be increased, as presented above, to making a scaled-up production possible. In the year report of 2013 of Foodcase a development planning was therefore outlined to get the meals up to the right standard (Foodcase, 2013c). In 2014, the FIL was dedicated entirely to optimizing the meal concepts for the airline industry (Schober, 2015), as outlined in the year report (Foodcase, 2013c). The product range also was downsized to focus on improving the product quality for the airline industry. Second, Gate Gourmet executives have a fear of cannibalization (Schober, 2015). Gate Gourmet is heavily invested in a supply chain that is dedicated to frozen meals. When meals no longer need to be frozen, this means that the supply chain needs to be drastically changed. Gate Gourmet will not engage in that before the technology and market potential of Foodcase's products are fully proven and investments made in frozen food supply chains are fully depreciated (Schober, 2015). In 2014, anticipating potential internal sales losses caused by an alternative supply chain of shelf-stable meal solutions, Gate Group decided to implement Foodcase's products only for smaller airlines, in smaller (European) markets. This approach also offered a prolonged testing stage of the products in a commercial setting (i.e. the testing required to move from TRL 8 to 9). In doing so, Gate Group also forwent the global exclusivity claim on Foodcase after Gate Group decided not to purchase the volumes that were contractually agreed upon (Schober, 2015).

Customer creation

Immediately after the Gate Group's decision to reschedule the full launch of ambient meals in the airline industry, Foodcase started to focus on a number of smaller airlines (Schober, 2015). In 2014, Foodcase contracted nine airline companies in Europe that start supplying Foodcase meals (Schober, 2015, Trappenburg, 2015). Even though these are relatively small European players (Schober, 2015) it is evidence of the growth phase Foodcase is currently in. This growth did not happen without roadblocks. In 2014 Foodcase's production partner, on whom Foodcase was dependent, suddenly went bankrupt and had to seize operations (Schober, 2015). Because Foodcase had outsourced all of its manufacturing to that company, a quick solution was crucial. Foodcase succeeded, by investing in its own production facility in The Netherlands (Schober, 2015). Foodcase is en route to reaching a sales of 5 million meals a year and to break even as a result (Trappenburg, 2015). Next to these sales targets, the R&D efforts (aided by the before mentioned investments) have let to successfully increasing the TRL. The current TRL of Foodcase is 8 (Schober, 2015). Additionally, new food concepts are being launched that are a result of OI efforts. One such example is salmon crisps, a snack product to complement Foodcase's core business range of products (SeafoodSource.com, 2015).In summary, Foodcase went successfully through the customer discovery and customer validation stages as a startup and is now in the customer creation stage, as represented in figure 9.

Figure 5.6. Position of Foodcase in customer development process



Source: own elaboration of Blank & Dorf (2012).

5.2.2 Case analysis

As a next step, the information gathered in the case study and presented in section 5.2.1 is analyzed based on the theoretical framework as presented in figure 4.4 and explained in chapter 4. Applying the theoretical framework to the Foodcase case made it possible to compare current practice of OI in the Agri-Food sector with theoretical foundations. First, table 5.1 presents the best practices and success factors that were found in the Foodcase case.

Table 5.1. Overview of CSC practices in the Foodcase case

Best practices literature	**Practices Foodcase case**
Strategic fit	Foodcase and Gate Group partnered strategically (e.g. Engel, 2011). Foodcase wants to scale up fast in the airline industry. Gate Group enables that, and in turn benefits from increased efficiency by using Foodcase's meal solutions. The strategic interests are continuously aligned, by setting and re-examining product development objectives (Napp & Minshall, 2011), but it is unlikely that a Gate Group executive takes place in the board of Foodcase to stay focused on this alignment, although this is not verified.
Governance	Gate Group, who leads the CSC, set clear objectives with regard to the collaboration, in line with Gregory Henley (2007). The Foodcase meals had to be upgraded to meat the stringent airline quality levels, and the overall TRL had to increase. The collaboration has a long-term focus and the equity-stake of Gate Group ensures lasting commitment on both sides (Keil et al., 2008). Also, the equity stake gives Gate Group deep understanding of the emerging technology (Weiblen & Chesbrough, 2015). Agility and speed (Hess & Siegwart, 2013) seem difficult, due to Gate Group's fear of cannibalization of their own logistics branch. Multiple other partners are involved (Keil et al., 2008), at distinct parts of the 'research to sales' funnel. Although

	research (Kim, 2012) described that network composition should be governed dynamically, Foodcase appears to be successful at identifying which partners to include (other than their primary corporate partner Gate Group) at what stages of their 'research-to-sales' funnel. This transcends and adds to current theory.
Access to resources	In the R&D collaboration, Gate Group and Foodcase allowed unrestricted access (Clark, Evald & Munksgaard, 2012) to necessary resources, such as the technologies and intermediary products (of Foodcase) and market- and other data (of Gate Group). For the sales collaboration, Gate Group has a clear directive role and (for now) cooperates with Foodcase in only those channels where the strategic importance to Gate Group is lower than other channels. Thus an exemplary internationalization strategy to avoid fear of cannibalization (Mahdjour & Fischer, 2014) is deployed. Financial resources of Gate Group towards Foodcase are dedicated in tranches, following the stage-gate process. This is in line with Engel's (2011) recommendation.
Relationships and trust	A financial investment from Gate Group set a two-way commitment. Whether Gate Group allows Foodcase adequate freedom to operate is unclear. It was found that Gate Group directs Foodcase, in line with Michl, Gold & Picot's (2013) recommendation. From the documentation used in this retrospective case study little more information could be derived regarding the nature of the relationship and trust.
IP protection	Foodcase holds no patents. Cross-contamination of IP (Markham et al., 2005) is thus unlikely. Still, Foodcase's IP management is stringent. Trade secrets are enforced between Foodcase and Gate Group, as well as with its other partners. A licensing scheme (Hess & Siegwart, 2013) is in place to allow partners unrestricted yet protected access to Foodcase's technologies and products. Manufacturers packing the meals, for example, have such access and are bound to trade secrets. A formal JDA was established between Gate Group and Foodcase, as well as Wageningen UR, covering a broad range of themes including IP handling, as suggested by Weiblen & Chesbrough (2015).
Other factors	From the start, StartLife has been an external network facilitator (Minshall et al., 2008) to establish R&D partnerships for Foodcase and give ad-hoc advice. Foodcase is financially supported by well-known financiers in the Agri-Food industry, such as PPM Oost as well as StartLife, which can give credibility and smooth partnership formation (Colombo, Grilli & Piva, 2006).

Source: Author's elaboration

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Foodcase is financially supported by well-known financiers in the Agri-Food industry, such as PPM Oost as well as StartLife, which can give credibility and smooth partnership formation (Colombo, Grilli & Piva, 2006).

Second, using this case study it was possible to get a look into real-life OI practice and competitive outcomes. The outcome that is known is that through the CSC Foodcase is enabled to find, access and dominate a specific market and avoid fierce competition (Trappenburg, 2015). Gate Group's competitive outcome remains unclear, as Foodcase's products have not yet been implemented on a large scale yet (Schober, 2015; Trappenburg, 2015). Because Gate Group is already the market leader in the industry of airplane catering; the competitive gains of the CSC could be insignificant. Gains could, however, be substantial in Gate Group's operational efficiency and overall financial performance (Foodcase, 2013a). Tables 5.2 and 5.3 present the factors that were found to contribute to the relation between the CSC activity and the competitive outcomes.

Table 5.2. Overview of mediators in the Foodcase case

Mediators literature	**Mediators Foodcase case**
Innovation performance	From the case study it became clear that contributing largely to Foodcase's increased success, is an increased innovation performance (e.g. Bayona-Sáez, 2013; Vanhaverbeke et al., 2007) as a result of the CSC. Innovation performance was increased in multiple ways. First, the innovation efficiency and speed (Enzing et al., 2011) are increased because Gate Group's specific product requirements allowed a more efficient idea screening (Pellegrini, Lazzarotti & Manzini, 2014) and financial R&D contributions help share the development costs (Pellegrini et al., 2014; Schober, 2015). Second, the added value (Bonney et al., 2007) of the innovation is increased, because Gate Group's market knowledge helps the development of valuable, differentiated (Garcia Martinez, 2014) food concepts. These don't occupy a larger part of the value chain (Vanhaverbeke et al., 2007) but reduce the value chain altogether (Foodcase, 2013a). Third, and most importantly, the CSC with Gate Group allowed Foodcase to increase the commercialization efficiency (Garcia Martinez et al., 2014) by a speedier introduction of their products into the market place. Thus, the time-to-market was reduced, and first mover advantage (Engel, 2011) can (and needs to) be established (Trappenburg, 2015).
Value capture	Foodcase and Gate Group have a clear value sharing arrangement, whereby the marginal profit made from each meal that is sold is shared between Foodcase and Gate Group. Next to this financial arrangement, value capture encompasses more than monetary value (Oughton et al., 2013). Foodcase reaps value as well in the form of exclusivity with the market leader in airplane catering (Gate Gourmet, 2015), and is consequently awarded unique market access.

Source: Author's elaboration

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Table 5.3. Overview of moderators in Foodcase case

Moderators literature	**Moderators Foodcase case**
Type of innovation	Bayona-Sáez et al. (2013) described how a higher degree of openness improves OI outcomes in Agri-Food for radical innovations, and not for incremental innovations. The case study showed that the degree of openness in this case is high (both the breadth and depth of the collaborations). Thus, the degree of openness is clearly a moderating factor at play in Foodcase's OI system. Second, the TRL was identified as a moderator. Oughton et al. (2013) showed that different expectations with regard to the necessary resources to get the TRL up to market standard could influence that OI effectiveness. It was indeed found that Foodcase's TRL was not nearly up to standard when they partnered with Gate Group. Foodcase's technology was only validated in their FIL, required too much handling steps to scale up production feasibly, and wasn't ready for the quality requirements inherent to large-scale production processes. (Schober, 2015). Foodcase then did underestimate what was required for full-scale production.
Internal factors	
Strategy	Both Foodcase and Gate Group have entered the CSC with a long-term strategic focus (Foodcase, 2013a). As a result, it was found that

	Foodcase is able to overcome the liability of smallness' (Kumar et al., 2012) and be competitive in a market (food) that is normally dominated by multinational corporates (Trappenburg, 2015). Second, Oughton et al. (2013) found that multiple application areas for the startup's technology can positively influence the CSC's outcome. Yet, in the Foodcase case the application with the CSC is rather narrow. In fact, Foodcase themselves noted that this narrow focus and dependence on Gate Group are important weaknesses (Foodcase, 2013c). Third, the literature highlighted that sustainable competitive advantage can only be achieved when there is a continuous focus on the consumer and when the CSC is responsive to dynamic market needs (Bonney et al., 2007). Foodcase (2013c) mentioned a 'slow responsiveness to market' as another weakness. In summary, there are both positive and negative moderation effects of strategy on the success of the CSC between Foodcase and Gate Group.
Organizational structure	Pellegrini et al. (2014) stated that for advanced technology startups (which characteristics apply to Foodcase) having a technology partner is an important driver of OI performance. Now, Gate Group is not a technology partner. But this is compensated by the fact that Foodcase has set up an elaborate multi-partner R&D collaboration that includes Wageningen UR and StartLife as science and technology partners (Foodcase, 2013a). Also, Foodcase het set-up both downstream- (with a manufacturer) and upstream (with Gate Group and its airline customers) collaborations, which was found by Traitler et al. (2011) to be an important moderator of innovation performance. As Vanhaverbeke et al. (2007) suggested, two-way commitment is safeguarded. In the case of Foodcase commitment is formally defined and arranged, through letters of intent and effort obligations, similar to Napp & Minshall's (2011) recommendations. From the retrospective document analysis the level of informal trust could not be found. Lastly, the Foodcase case contradicts the finding from the literature review that a university could be an ineffective partner to a startup. StartLife, the vaorization center of Wageningen UR, is the facilitator that likely prevented the drawbacks associated with a university partnership (Pellegrini et al., 2014).
Organizational culture	As previously indicated, Gate Group is slower to adopt the up-scale Foodcase's products than Foodcase would want, due to additional interests of Gate Group who are invested in a frozen meals-oriented supply chain. In other words, their 'willingness to adapt to changing environments' (Kumar et al., 2012) is not as high as Foodcase's; Gate Group is not as agile (Oughton et al., 2013) as Foodcase.
Communication and management	The JDA provides the guiding management tool (Bayona-Sáez et al., 2013) in the ongoing CSC. This collaboration is formally monitored

	yearly by reviewing the year-plans. In those year-plans the milestones for the CSC between Gate Group and Foodcase are also included (Schober, 2015). If and how, in practical terms, the CSC is managed and monitored continuously is unclear. According to Oughton et al. (2011) continuous monitoring will positively influence long-term vitality of the CSC.
External factors	
External stakeholders	From the case study it became clear that Foodcase is embedded in a well-established open innovation network, that next to its main corporate partner also includes other R&D partners. But there are also three formal investors that participated in Foodcase to fund the technological development. This, according to Oughton et al. (2011), could cause tensions between the corporate and the startup. One explicit way in which this almost occurred in the Foodcase case was when Foodcase was confronted with the sudden bankruptcy of its manufacturer, and wanted to move quickly to get approval to acquire the manufacturer itself (Schober, 2015), fearing that its investors would not be able to move that quickly. But in the end, Foodcase's main investors also urged Foodcase to focus on growth and increased sales in the airline industry, to meet the strategic goals of Gate Group. Thus, the situation was resolved effectively.
External business environment	It has become clear that the current nature of the food industry landscape makes it difficult for startups to enter the market and be competitive (Trappenburg, 2015). In Foodcase's case, this made collaboration inevitable (Garcia Martinez, 2014). At the same time, consumer preferences in the airline industry were indeed found to have changed and changing (Sarkar & Costa, 2008). To deal with this external effect, Foodcase applies the customer development process (Blank & Dorf, 2012) to continuously involve its airline customers in product development through feedback mechanisms on the products Foodcase supplies (Schober, 2015).

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5.2.3 Main learnings

From this case, a number of learnings can be derived.

1. First, the importance of being open to ideas from the outside (Chesbrough, 2003) was found on multiple occasions. Pro-actively pursuing ideas from an airline executive proved to be a pivotal moment in finding a scalable business model. The Foodcase case study confirmed evidently that open innovation makes it possible to innovate and differentiate successfully in a market that is generally considered to be slow and to have a low degree of innovation, yet is highly competitive. It confirmed that only through collaboration and being open to external ideas and resources is it possible to be competitive in a market otherwise dominated by incumbent corporates.

2. Being able to adapt quickly to change (Kumar et al., 2012) is essential in sustaining multi-stakeholder partnerships. After finding out that it was far from up to the task of performing R&D itself, Foodcase succeeded in building an ecosystem of R&D collaboration partners around itself. When dealing with the requirements from its corporate partner, Foodcase dedicated all its energy on increasing the TRL of its products. Also, acknowledging Gate Group's hesitation in implementing Foodcase's technology worldwide from the start, Foodcase was quick to focus on smaller-scale airline companies in Europe, instead of being stifled (Oughton et al., 2013).

3. Although the literature provided some information on dynamic network building (Kim, 2012), Foodcase went further than this in establishing a clear framework (the research-to-sales funnel) and knowing what partners to involve in what stages, and how to involve them. Innovation consists of invention ánd commercialization parts (Freeman & Soete, 1997), and Foodcase realized that different types of external expertise were necessary for each of those parts. That's how Foodcase realized superior innovation performance. This is an important learning for other startups connecting with collaboration partners.

4. Without exception, the best practices and success factors that were found through the literature study into high-tech sectors were also explicitly recognized in Foodcase's innovation partnerships. Further case studies and cross-sectional analyses are necessary for confirmation, but based on the Foodcase case study those best practices and factors appear to apply cross-industry which provides clear learnings for future CSCs in the Agri-Food sector.

5. One factor that was underexposed in the literature of CSCs is the role of a facilitator. The early involvement of StartLife, embedded in the Wageningen UR ecosystem, was a critical success factor in establishing an open R&D system that allowed Foodcase to move on from the 'idea' stage. CSCs and other partnerships don't come forth automatically. A facilitator can act both as the 'ignition spark' to get CSCs off the ground as well as the oil to keep them going.

6. Yet, such competitive advantage as a result of CSCs does not come automatically. This was made possible because Foodcase acknowledged the weakness of the corporate partner (as explained above) and leveraged the strengths of the partner, with unique market access. Foodcase's products have clear strategic benefits for its partner Gate Group, so the potential benefits of the CSC were clear. But only by being very conscientious about the CSC was Foodcase able to make it a success.

6. Conclusion

The goal of this research is to explore the potential for startups in open innovation strategies of EU food firms to increase the competitiveness of EU Agri-Food firms and tried to answer the question 'How can open innovation systems involving startups in the Agri-Food contribute to the competitiveness of EU food firms?'

This study, first of all, established a typography of open innovation and presented four different OI types, each serving different goals and requiring different activities. It was found that OI can be categorized by an inbound-outbound dimension and by whether equity is involved in the relationship. For this research, the three most relevant categories are 'inbound with equity involved', inbound without equity involved' and 'outbound without equity involved'. A literature review was conducted to find best practices for those categories. In Agri-Food, the practice of open innovation involving startups is not very well documented yet so the focus of the review was on high-tech sector. Here, CSCs are much more established. It was found that six best practices can be used to increase the effectiveness of the CSC:

1. Alliance formation: to succeed, startups are well-served to find sponsorship from investors or academia;

2. Strategic fit: throughout the CSC the common interest of the corporate and the startup should be kept in sight;
3. Governance: the goals of the CSC should determine the right governance mode;
4. Access to resources: various policies should guarantee that the CSC partners have adequate access to vital resources;
5. IP protection: transparent IP guidelines and processes should be set up;
6. Relationships and trust: formal and informal processes should elicit mutual trust between the CSC partners.

The case study of Foodcase (inbound and equity involved) confirmed that all of these factors are essential for an effective CSC.

The second step was to investigate how OI initiatives can improve the competitiveness of the Agri-Food firms involved. A literature review into this question highlighted that both mediating- and mediator factors are involved. Mediating the relationship are innovation performance and value capture. This indicates that the CSC should not only be effective in its own right, but actually provide tangible innovation benefits. Moreover, a system should be in place to capture and distribute those benefits. Three groups of factors were found that moderate the relation between OI in Agri-Food and competitive outcomes: the type of innovation, internal factors (strategy, organizational structure, organizational culture, and communication & management) and external factors (external stakeholders and external business environment). Again, these processes were evident in the Foodcase case study. Foodcase was able to enter the highly competitive food market successfully only through its collaboration with Gate Group. Yet, extending the literature, the Foodcase case study also shed light on the potentially defining role of intermediaries (StartLife in this case) and made clear that the CSC should not exclude other partnerships. In fact, Foodcase proved successful at orchestrating an innovation network adapted to the different stages of its 'research-to-sales' funnel. Gate Group, although with some reservations, sees tangible long-term strategic benefits of the CSC as well, mainly through more efficient operations.

In conclusion, the literature and case study both showed that startups hold the potential to enrich innovation of established companies, as well as themselves. CSCs are therefore an important element of sustaining competitive advantage in the Agri-Food sector, where massive challenges require organizations to move away from closed innovation to open innovation. A framework has been developed which can be used by corporates and startups in Agri- to make CSCs effective innovation instruments and to be able to understand the forces at play in translating the CSC into increased competitive advantage.

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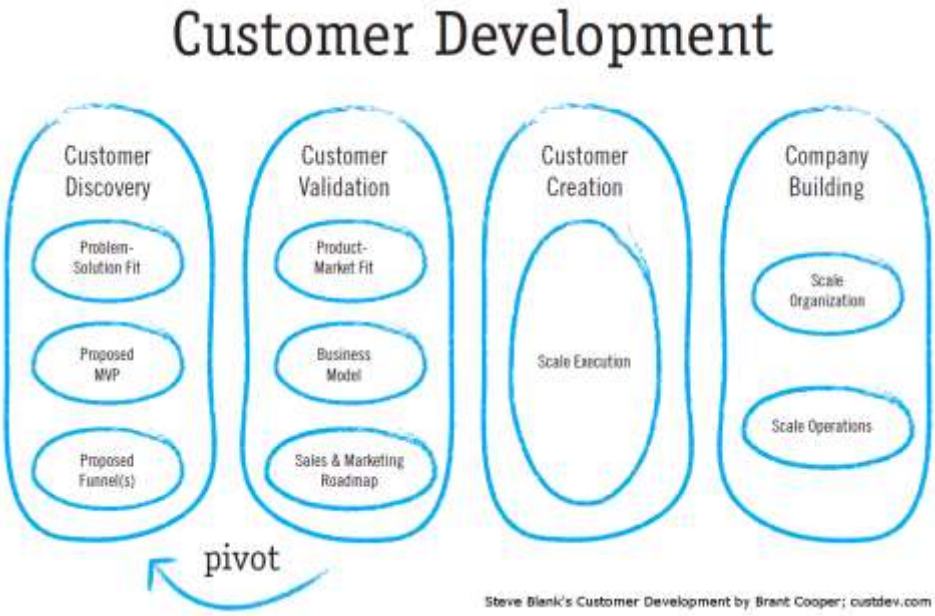
Appendices

APPENDIX I. Startup models

Figure A.1. The Lean Startup's build-measure-learn feedback loop

Source: adapted from Ries (2011)

Figure A.2. Steve Blank's Customer Development model



Source: Blank & Dorf (2012)

APPENDIX II. Overview of main results literature review 1

Publication	Approach and OI focus	Industry focus	Main findings	Best practices / critical success factors for corporate-startup collaboration
Weiblen & Chesbrough (2015)	Multiple case study (A,B,C,D)	IT, high-tech	Companies evolving more lightweight models to engage with startups. Typology of 4 (non-mutually exclusive) models: corporate venturing, corporate incubation, startup program (outside-in), startup program (platform). Non-equity models most suitable for OI purposes.	Strategic fit of model; Core business embedding (NEA)*; Stage-gate process (NEA)*; Adequate IP management; Accurate tracking of startups; Buffering startup from bureaucracy; Credibility of corporate as partner; Collaboration with startup support ecosystem; Standardization (NEA); Clear UVP to startup world; Clarity about strategic mission.
Marion & Fixson (2014)	Case study	Consumer electronics	Skilled project management is essential in intermittent use of outside resources. Robustness of communication is more important than IT tools, which are most relevant for quantitative data than qualitative knowledge.	Experienced project managers; PC able to acquire right resources; Breadth, type and quality of communication; Bolstering resources up-front.
Mahdjour & Fischer (2014)	Multiple case study	ICT, telecommunications	Early internationalization helps startups overcome barriers in open innovation systems that occur when entering the domestic market.	Continuous endorsement of parent to ensure support; Internationalization of startup to avoid (fear of) cannibalization, do business with competitors, have access to parental assets, have access to international markets.
Hess & Siegwart (2013)	Multiple case study	Energy	In energy sector, with long development lead times and high technology introduction risks, R&D venturing can speed up R&D of new technologies and lower R&D costs and risks. It exploits synergies between industry, academia and entrepreneurs. It applies to	Commitment of both management teams crucial for R&D venture; Define non-compete, IP licensing, use of brands, external communication; Keep agility and speed of venture by setting target; Keep efficient position between industry and academia; Assess technology and time to demonstrator stage;

			technology discovery and validation stages.	Increase technology acceptance & absorption capability of corporate; Develop market approach: application range, industrialized products, professional behavior of venture, credibility of venture.
Michl, Gold & Picot (2013)	Case study (A,B)	High-tech, biotechnology	Perspectives of corporate and spin-along must be merged to create organizational ambidexterity and higher overall innovative performance. Compatibility of organizational goals is more important than compatibility of individual goals. Corporate senior management's involvement is of utmost importance.	Corporate management should be ambidextrous; Corporate management should be sensitive to startup's wide needs; Corporate management should control collaboration process; Trust the spin-along venture, give enough freedom, yet direct venture; Increase exchange of resources, mainly knowledge; Focus on shared organizational goals.
Clark, Evald & Munksgaard (2012)	Multiple-case study (A,B)	Mainly high-tech	Combining inbound, coupled and outbound processes in BU- and incubator OI can facilitate both incremental and radical innovation.	Put corporate knowledge & technology at startups' disposal; Get strategic fit through right screening criteria; Create channels for *intra*-BU processes/sourcing next to *inter*-OI; Combine inbound and outbound processes; Use coupled OI by combining inbound & outbound processes over time.
Idelchik & Kogan (2012)	Case study	Clean tech, healthcare	Open innovation helped General Electric exploit growth opportunities in adjacent markets and transformed GE's internal innovation processes.	Set up transparent non-disclosure procedures; Set up transparent IP guidelines; Create mutual trust.
Kim (2012)	Cross-sectional data analysis, quantitative	Biotechnology, medical technology	For startups, more corporate partners led to increased innovation success. For established firms it did not. Repeat-partnerships don't change the effect.	Access complementary knowledge, capabilities and resources; Network composition should be dynamic to be competence building through different stages of firm;

				Attention to network diversity; Public policy could facilitate these collaborations using eligibility criteria.
Ferrary (2011)	Comparative case study (A)	High-tech, telecommunications	Acquisition & development (A&D) strategy supports dynamics of OI by motivating agents (corporates, startups, VCs) to participate more in the interorganizational process of innovation. Specialising in exploitation (A&D), thus gaining access to exploration can give sustainable competitive advantage.	Focus on disruptive innovations; Nurture informal social ties in network of innovation organizations (universities, labs, VCs); Apply an embedding strategy in business environment; Contracts, joint ventures and partnerships help embedding in innovation clusters; Use technology life cycle as inter-organizational concept, not as intra-organizational concept.
Engel (2011)	Scientific paper (A,B)	IT, other	Disruptive innovations combine technical and business model innovations. The venture capital model, with agile and customer development methods, can be adapted to accelerate corporate innovation. Open innovation practices can contribute to this model.	Look for strategic fit with existing or future business lines of corporate; Look for experienced teams; Look for growing and robust market that aligns with corporate strategy; Look to solve customer pains; Pursue customer development; Dedicate resources in stages; Integrate technology- and customer risk framework for failing fast; Adopt quick & agile development; After validation, invest heavily for first-mover advantage; Stay focused on common goal by setting the right incentives; Always present venture positively for valuation purposes; Let CTO manage the collaboration.
Dushnitsky & Shaver (2009)	Cross-sectional data analysis, quantitative (A,B)	IT	Both CVCs and startups have incentives to collaborate. In weak IPP regime, CVC backing for startups in same industry as corporate is less likely as startups fear imitation.	Strategic decisions take all parties' interests into account; Corporate managers should be cognizant of startups' actions when structuring CVC program. Create right governance structure for appropriability issues;

				Corporates should look outside own industry for harnessing startups.
Keil, Maula, Schildt & Zahra (2008)	Cross-sectional data analysis, quantitative (A,C)	ICT	CVC, alliances, JVs and acquisitions boost innovation performance, depending on degree of relatedness of the partner. More partnerships generally deliver incrementally higher innovation performance.	For CVC, alliances and JVs seek more partnerships with moderately related startups; For acquisitions, seek ventures targets in the same industry.
Gregory Henley (2007)	Cross-sectional data analysis, quantitative (A)	IT	CVC boosts (mainly radical) innovation and competitiveness. CVC helps manage risk and uncertainty, technology learning and increases bargaining power for corporate. Yet, CVC has clear benefits for startup too.	Set clear CVC objectives; Guarantee strategic fit between corporate and startup; Use minority investments (equity) for optimal 2-way commitment; Seek moderately related startups.
Colombo, Grilli & Piva (2006)	Cross-sectional data analysis, quantitative (A,C)	High-tech	Startups have big incentives but also face big obstacles in forming alliances with large firms. Smaller size, previous innovative output (patent) and sponsoring (VC, academic) supports alliances.	As startup get (VC, academic or CVC) support to lower transaction costs of alliance formation; Be careful of sponsor identity and type of sponsorship; Public policy subsidies should support alliance formation (indirect benefits), not the startup itself (direct benefits).
Michalski, Näfe & Usein (2006)	Cross-sectional data analysis, quantitative (A)	*Various technology related industries*	CV activities can overcome obstacles for corporates to innovate successfully, by using the agility of startups, as long as there is strategic fit and CV activities receive enough (top) management attention.112	Fit between CV activity and business strategy + resource development strategy; Explicit consent and support from top managers; Sufficient financial resources, especially for early stages; Allow unrestricted access of CV to specific human- and other resources (e.g. patents, channels); Hire external CV managers; Give enough scope for independent decision-making of CV managers and single startups;

				Let CV department cooperate with VC companies;
Markham, Gentry, Hume, Ramachandran & Kingon (2005)	Cross-sectional participatory research (A)	Engineering	CVC promotes innovation, through window on new technologies, market opportunities, new channels and can exploiting expertise of VCs. Both direct (in startup) and indirect (fund) routes can be valuable.	Set coherent corporate strategy (create, capture and deliver value); Have right corporate staffing (internal talent or entrepreneurs of outside with corporate experience); Set staff incentives and rewards; Set right governance structure; Set right CV metrics to decide when to abandon; Select right accounting practice; Plan on long-term payback; Insulate startup and corporate from cross-contamination of IP by using corporate (not business specific) technologists to deal with startups. Use only commercial personnel for due diligence; Expect no single right answer to all above issues; Invest time in relations with VCs; Invest time in contact with startups.
Napp & Minshall (2011)	Multiple case-study (A)	*Various technology related industries*	CVC investments can boost innovation opportunities, both for corporate and startup, but to reap benefits of CV activities corporates should match practice to strategic goals. Key question is to focus on exploration or exploitation. Findings can be applied to other OI activities as well.	Direct engagement between startup and corporate, not via CVC unit; Effectively match startups to BU: technical input to due diligence, corporate member in startup board; Use wide metrics system (synergy, qualitative, quantitative, explorational, exploitational); Put people with right (interpersonal) skills in place for CVC internal match making).
Vanhaverbeke, Van De Vrande & Chesbrough (2008)	Scientific paper (A)	*Unspecified*	Real options approach explains OI benefits: new technologies, later financial commitment, early exits or delayed exit. OI promotes	Corporates must learn to recognize and absorb externally developed technologies; Corporates must learn to build relationships and trust;

			interorganizational absorptive capacity of multiple technologies simultaneously.	
Minshall et al. (2008)	Multiple-case study, mixed method (A,C,D)	High-tech	Asymmetric partnerships present many management issues for startups and corporates. Practices are applied to overcome those and ongoing engagement from a facilitator can transfer practices-research to stakeholders to assists these partnerships. Both corporate and startup perspective need to be incorporated.	*Specific approaches to overcome issues from stakeholders**; Ongoing engagement of facilitator with corporates & startups; Workbook & checklist with frequent issues and solutions; Workshops for corporates & startups to transfer knowledge; Online database with resources useful for partnership/collaboration; Community of practice with case examples; One-on-one advice for partnership formation.
Michalski (2006)	Scientific paper (A)	High-tech, ICT, electronics	In hypercompetitive markets resources & competencies are essential to develop radical innovations quickly and achieve sustainable competitive advantage. CV startups help this process. CVs typically operate in emerging market environments.	Fill company-specific resource gaps for CV, e.g. by exploring externally; Integrate & activate external resources in portfolio; Develop (external) competences; Transfer competences between corporate, startup and CV-portfolio; If no friction BU friction with CV for radical innovation, then autonomy for some years before integration; Incentivize bottom-up strategy; Give CV startups autonomy; Use real-options approach.

*The article summarizes results from earlier work by the same author. The resulting large list of best practices (Minshall et al., 2008: p.18) is not listed in this overview

APPENDIX III. Overview of main results literature review 2

Publication	Approach	Main findings	Mediation factors	Moderation factors
Bayona-Sáez, García-Marco & Sanchez-García (2013)	Quantitave analysis of large data set of Spanish Agri Food innovation practices.	External source breadth, and JDA breadth help achieve more radical innovation performance than incremental innovation performance. No effect of external R&D expenditure on radical innovation.	Innovation performance.	Culture of innovation; Radical versus incremental innovation.
Bonney, Clark, Collins & Fearne (2007)	Case study: value chain analysis	Serendipity is not sustainable in competitive and complex landscape. Strategizing OI potential helps, with structured processes and consumer insight.	Differentiation; Increased product quality; Value added.	Consumer-value driven strategic focus; Consumer-oriented responsive value chains.
Enzing, Pascucci, Janszen & Omta (2011)	Quantitative analysis of 129 product innovations	Building innovation networks leads to increased innovation- and product performance. Technology- and market actor involvement had impact on performance of new products, not improved products.	Innovation performance: speedier innovation process, innovativeness[1], product quality; Cooperative competences.	Ability to apply internal and external resources; Number of partnerships; Market knowledge; Using technology partners; Using suppliers as innovation partners (-).
Garcia Martinez (2014)	Explorative case study with brewing company, into consumer value creation	Collaborating and involving consumers in innovation process leads to superior value propositions.	Better value propositions; Differentiation, increased consumer value.	Continuous focus on WANTs; Following execution timeline.
Garcia Martinez, Lazzarotti, Manzini & Sánchez García	Quantitative analysis of 284 F&D firms	Higher openness degree (breadth and depth) leads to higher innovation performance. Firms showing higher	Innovation performance: creativity, risks, cost, time to market; new	Degree of openness; Pursuing radical innovation; Assuming leadership roles;

(2014)		openness degree pursue more radical innovation.	products, new processes.	Level of R&D investment; Management architecture for OI.
Kumar, Boesso, Favotto & Menini (2012)	Multiple-case study into 592 new products	Analyzer SMEs use OI to overcome liability of smallness, innovate successfully and compete with larger companies.	Innovation performance.	Long-term strategy; Willingness to adapt.
Oughton, Mortara & Minshall (2013)	Multiple-case study focused on corporate-startup collaborations in Agri-Food.	In Agri-Food, a difficult entrepreneurial field, corporate-startup collaboration have much potential, when cultural, complexity and communication issues are resolved.	Innovation speed; Innovation performance; Value capture.	Culture; Technology readiness; Communication & relation management; Strategy.
Pellegrini, Lazzarotti & Manzini (2014)	Quantitative analysis of 284 F&D firms	FDI has urgent drivers for openness. OI occurs mainly in early stages of NPD funnel. OI improves innovation performance (lower NPD costs). Technological and scientific service firms make better collaboration partners than customers, supplies or universities.	More efficient idea screening.	Resource protection; Type of collaboration partner; Degree of openness: collaboration intensity.
Sarkar & Costa (2008)	Review of reports of OI models in food processing	OI increases innovation efficiency. Higher innovativeness and differentiation lead to better market outcomes, but with diminishing returns after some point.	Degree of differentiation/innovation; Efficiency of commercialization through value network.	Strategic orientation, dependent on market type.
Traitler, Watzke & Saguy (2011)	Case study into Nestlé's Innovation Partnerships and Sharing-	Downstream & upstream partnerships can increase the scope and speed of	Innovation risk reduction; Innovation performance	Absorptive capacity; Trust; Sustaining the innovation

	is-Winning model	innovation.	(scope and speed of innovation).	roadmap/process flow.
Vanhaverbeke, de Rochemont, Meijer & Roijakkers (2007)	Multiple-case study into OI factors leading to higher competitiveness of Dutch Agri-Food sector	Cross-industry OI can raise competitiveness of Agri-Food sector. OI enables innovation-based added value creation. Network management is crucial, as is partner diversity. Cooperation along value chain isn't yet optimized.	Innovation performance (creation & capture of added value via new knowledge, scale and scope effects and total solutions).	Continuous network management; Network design; Governance mode: formal (control) versus informal (trust); Knowledge management (tacit, explicit, IP).

[1]The literature on whether degree of innovation linearly relates to performance, or shows a U-shaped relation, is inconclusive (Enzing et al., 2011).

APPENDIX IV. List of documents for StartLife case study

The documents below were used during the document analysis of the StartLife case study. Documents for both the Foodcase- and Solynta example case are included.

- ER&I & FB-V&H. (2014). *Nota studenten-ontwikkelwerkplaats in Triton. Schakel naar Innovatie, spin-off en/of incubator.*
- EVMI. (2013, March). Maaltijden Foodcase nemen hoge vlucht. *eisma voedingsmiddelenindustrie*.
- Foodcase (2012). *Businessplan.*
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- Foodcase (2013c). *Bijlage 1: Insights Airline Industrie*
- Gate Group. (2015). *Annual report 2014.* Zurich: Gate Group Holding AG
- Kleyngeld, A. (2014a) *Synopsis-hfst1.* Autobiography Gitte Schober & Wilbert ter Louw [unpublished].
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- Kleyngeld, A. (2014c) *Synopsis-hfst3.* Autobiography Gitte Schober & Wilbert ter Louw [unpublished].
- StartLife (2010a). *Bijlage 3: Samenhang activiteiten Startlife en De Food Valley Ambitie 2020*.
- StartLife (2010b). *StartLife. Kennisvalorisatie voor agro, food en leefomgeving.*
- StartLife (2014). *Food Solution Center positionering.*
- Koene, J. (2012). *Parenco biorefinery campus voor StartLife 2012.*
- Schober, G. (2015). *[Personal communication]*
- Trappenburg, N. (2015, January 19). Minder verspilling door beter houdbare vliegtuighap. *Financieel Dagblad*, pp. 12-13.
- Wageningen UR. (2013). *Concept onderzoeksprogramma Topsectoren WUR-DLO 2014.*

Project information

Title:	International comparisons of product supply chains in the agri-food sectors: determinants of their competitiveness and performance on EU and international markets (COMPETE)
Funding:	Collaborative research project (small or medium-scale focused research project), FP-7-KBBE.2012.1.4-09, total EU contribution is 2,422,725 €
Duration:	01/10/2013-30/09/2015 (36 months)
Objective:	The objective of the COMPETE project is to gain a more comprehensive view on the different elements which contribute to the competitiveness of the European agri-food supply chain in order to provide better targeted and evidence based policies on the EU as well as on the domestic level. The project investigates selected determinants of competitiveness like policy interventions and the business environment, productivity in agriculture and food processing, the functioning of domestic and international markets, the choice of governance structures, and innovative activities in food processing. The research results will enable a congruent, coherent and consistent set of policy recommendations aiming at improving competitiveness of European product supply chain.
Coordinator:	IAMO, Germany, Prof. Heinrich Hockmann
Consortium:	16 Partners from 10 European countries. COMPETE brings together academics, trade bodies, NGOs, agricultural co-operative, industry representative advisory services. In addition, the project is supported by the group of societal actors, incorporating farmer, food processing and consumer associations, providing in-depth knowledge on the agri-food sector and speeding up the achievement of the project goals.
Contact:	compete@iamo.de
Website	www.compete-project.eu

COMPETE
International comparison of product supply chains in the agro-food sector

SEVENTH FRAMEWORK PROGRAMME

COMPETE Project Coordination:
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