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Managing Relationships in the Context of Open Innovation

A Case Study of the Department of Food Science - University of Copenhagen and their Industrial Partners

Håndtering af Relationer i en 'Open Innovation' Kontekst

Et Casestudie af Institut for Fødevarevidenskab – Københavns Universitet og Deres Industrielle Partnere

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Abstract

In the era of the knowledge economy new forms of innovation management, namely open innovation, has been accredited to be especially important for the competitive advantage of firms. It includes opening up the boundaries of the firm to co-create and extract external knowledge.

This thesis explores in an open innovation context how relationships are managed between a Danish University and its industrial partners. Specifically the empirical research uncover how partners experience collaboration in research projects, using interviews, observations and a questionnaire as tools for gathering data. Through literature reviews, exploring absorptive capacity, open innovation and relationship management, factors that impact such University/industry relationships are identified. Bringing together these factors with data from the empirical research, comparing and analysing them, result in some new knowledge about the importance of specific factors, interdependence and causalities and on how relationships should be managed. Some new findings on how to improve relationships are also revealed.

A framework for managing University/industry relationships in an open innovation context sums up the essence of my findings. Conclusions are made, that management of relationships should involve companies and universities on an organizational level, project level and especially on an individual level. Most important factors for successful relationships identified are communication, trust, close collaboration, professional and social competencies and early agreement on IPR, project plan and objectives. Knowledge creation is found to be the main reason for partners to engage in collaborations. Therefore are knowledge capacities of organizations and individuals very important for communication between partners, and in turn the relationship between them.

Main challenges and barriers for collaboration are accounted for as well. The thesis ends by briefly discussing the innovation process and the challenges of following a linear approach of innovation.

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1.0 Introduction

"Because its purpose is to create a customer, the business has two – and only two functions: Marketing and innovation. Marketing and innovation create value. All the rest are cost."
(Drucker, 1977)

1.1 Background

Continually innovating, being it products, services, processes or business models, has become one of the most important strategies to stay ahead of competition. Along with the development of more and more competitive markets it has become increasingly important for companies and their competitive advantage to be able to constantly innovate incrementally and/or radically.

Until a few decades ago, innovation was mainly conducted in internal R&D labs and the knowledge created was kept close, so no competitors would pick it up and threaten the existence of the innovating company. Then the concept of open innovation was developed advocating opening up communication to external partners to search for outside knowledge for better utilisation and application of internal and external knowledge. Quickly open innovation became a buzzword and a new paradigm concerning innovation practices, as it was taken up by industries and researchers alike. The continual development of the concept has spurred many different research directions but the social side of open innovation has been a relatively neglected research area. I found this research gap into the social factor interesting as relationships develops between individuals, and it is these individuals that carry out open innovation activities. Therefore it is valuable to know how best to manage relationships in an open innovation context.

Being successful in the era of globalization and the knowledge economy, firms need to innovate in an open way where focus is on knowledge creation, sharing and learning. Universities are knowledge hubs which holds massive amounts of knowledge. They are providers of both basic research while also being on the forefront of the most recent developments of new knowledge. They have one major advantage over private

R&D labs, which is their mission of disseminating knowledge, not profiting through commercialisation. The lack of competition between universities and companies, regarding commercialisation and the vast amount of knowledge in universities, makes them attractive partners for companies wishing to engage in open innovation activities.
I have chosen Copenhagen University, Department of Food Science (FOOD) and some of their industrial partners as a case study, to investigate the relationship between them and answer the research questions. From a research point of view, a University/industry (UI) relationship seemed interesting as there was some academic interest and literature on the subject, and the kind of relationship was quite popular in open innovation practices, which made it possible to research.

1.2 Purpose and Relevance of the Study

As I found it difficult to find any research which explained thoroughly how to manage relationships in an OI context, my curiosity was triggered to research the subject. Research has been focused on single factors, but nobody has brought these factors together to understand the many influencers in union and determine their relevance. Maybe because of the obvious relationship there must be between open innovation and relationship management, it has been taken for granted that such a relationship exist. The complex nature of relationships and the complexity in managing open innovation, taking into account the different organizational levels and modes of open innovation (Lichtenthaler, 2011) suggest that it might not be so simple to manage anyway. Successful management of relationships in an open innovation context requires one to consider many different factors affecting such relationships. With this thesis I bring together those factors into a better understanding for managing University/industry relationships which happen in an open innovation context. The growing focus among researchers and industry on open innovation and the adoption of this mindset by more and more companies indicates the relevance for such research. Success with open innovation depends to a large extent on successful knowledge management and the underlying relationships between partners. Managing these relationships therefore becomes a major concern.
Finding that actual relationships between universities and industry, rather than generic links, play a stronger role in generating innovations, Perkmann and Walsh (2007)

highlights the need for research into the organization and management of collaborative relationships, supporting the relevance of this study.

With this study I seek to identify and assess the different factors that are important for successful management of UI open innovation collaborations. I will contribute to the existing theoretical landscape bridging relationship management with open innovation theory and map, code and analyse the relevant factors. Understanding what to manage and what to be aware of in OI relationships is a cornerstone in making open innovation successful. Without the development and exchange of knowledge which requires some level of relationship, OI would not be possible, or at least be limited to pure transactions. OI is much more than that. Therefore it is both relevant and important that we understand the foundations for successful relationships in the exchange process that happens in OI interactions. On a higher level of relevance, a successful relationship in an open innovation context is the basis for successful collaborations and therefore a vehicle for the creation of knowledge, innovation and growth.

1.3 Research Question

In an open innovation context of University centres collaborating with industrial partners, how should relationships be managed? In particular, which are the critical issues emerging in the open innovation context concerning relationship management and what factors influence good relationships?

1.3.1 Sub-Questions

- Which are the competencies proper of relationship management that emerge as important in open innovation collaborations?

- What role does knowledge management have in creating good relations in an open innovation context?

- Should industrial partners manage their relationships with universities differently than universities should manage their relationship with industrial partners?

- What are the biggest challenges in establishing and maintaining good relationships?

1.4 Delimitations

Due to the vast amount of data and research that has been done in open innovation and relationship management, it is necessary to limit the literature reviews to concern literature that are specific and related to UI relationships. The purpose of this thesis is not to identify all implications of UI relationships on micro and macro-economic levels, but rather to identify relevant relations and factors that impact those relationships. The research is constrained by resources like time and money available. For example more interviews or even a focus group interview, would have provided even more rich and elaborate data. Also, many of the interviews were conducted by phone as the companies were based in Jylland. Ideally the research would have been conducted with face to face meetings to observe and analyse interviewees' behaviour and body language, and make better personal relations with them. This could have provided me with more rich data as well.

The conclusions from this research is partly based on data from a small sample at one department from one University in Denmark. Therefore it is possible that other researchers would get different results if they should research other universities and industries in Denmark or in other parts of the world. This research aims not to generalize, but to provide rich data to understand the issue in detail.

1.5 Structure of the Thesis

The thesis consists of 7 chapters.

Chapter 1 - is the introduction which explains the background and purpose for the study, the research questions, the scope of the project and limitations, and finally the structure – explaining each chapter and the natural progress from start to finish.

Chapter 2 - is the methodology chapter which explains what methods are used to answer the research questions and more specifically what the purpose of the literature reviews and the case study are. Also my own role in the research is described.

Chapter 3 - is the literature reviews consisting of reviews of absorptive capacity, open innovation and relationship management. All three subjects are affecting relationships

in some way and the aim is to map those factors to get an overview of what affects relationships in the context of open innovation.

Chapter 4 - is the case study which explains shortly each organization or person I have interviewed as well as FOOD's role in UI relationships.

Chapter 5 - is the analysis, where I analyse the data from the empirical research. The data originates mainly from 6 interviews where the coding technique is used to organise the data for a more structured analysis. Other sources of data are a questionnaire that was sent out to 70 industrial partners, where half of them answered the questionnaire. Observations at two project meetings also contributed to the analysis.

Chapter 6 - is the discussion chapter where the analysis and the factors found, are linked to the existing literature from chapter 3. This gives a discussion of how factors relates and depend on each other as well as an understanding of which factors are more important for successful relationships. Finally the conclusions are found which answers the research questions. The chapter ends with suggestions for future research.

Chapter 7 - list the references and *chapter 8* - appendices, include list of figures and tables, interview guide, coding scheme, interview transcripts, questionnaire and questionnaire data.

2.0 Methodology

2.1 Concepts and Approach

Prior research on how to manage relationships in an OI context has been very limited. There was not found any research that broadly accounts for factors affecting UI relationships in an OI context and give a clear understanding of how to manage these relationships. Departing from the broad theoretical pillars that all has been researched extensively, it was necessary to explore the many different factors within each concept that affects relationships. An exploratory approach thus seemed most appropriate for conducting the research. This required a lot of reading to be able to identify what

affects relationships. Existing literature had mainly analyzed factors separately, which is why an exploratory approach, using case studies to investigate and enhance the knowledge of the subject seemed a good fit for that purpose.

As a social science researcher conducting qualitative research I have an interpretive worldview that allows my own involvement in the research. I do not expect to find an objective truth an only one right way to manage UI relationships in an OI context. I believe my data, analysis and findings depend on the actions and characteristics of those cases and persons I research, as well as my own interpretation of those persons communication and data I acquire. I also acknowledge that my communication and interaction with the persons I interview affects their responses and that we together construct our own meanings and reality. I therefore take a social constructivist perspective when conducting research and writing this thesis. This perspective, in relation to reliability and validity understood in the positivist perspective, which are the norm in quantitative research, cannot directly be transffered to a qualitative research paradigm. The concept of reliability and validity in qualitative inquiry can instead of being understood as replicability and accuracy and relevance of the research instrument, be conceptualized as trustworthiness, rigor and quality in research (Golafshani, 2003).

In qualitative research, the researcher can be seen as “the instrument” to make the research credible, thus the researcher has to show ability and effort in doing research (Patton, 2002). Triangulation, the use of several data sources and/or methods, strengthens the quality of the study, making it more trustworthy. I use observation, interviews and a questionnaire as data sources.

It is also important to define the unit of analysis to be able to ask the right questions and have a clear strategy for interpreting the data. The unit of analysis has to be aligned with the purpose of the research and research questions. The context of open innovation is subject to factors that affect relationships on three levels; individual, project and organizational levels. In this paper the focus is mainly on the individuals, the professionals directly engaged in a relationship with a collaborative partner. This focus has been chosen as the interaction between partners, the relationships between professionals, must be recognized for having the highest impact on relationships. This is where interaction happens and where knowledge is created. I say the focus is

mainly on individuals, because it also is relevant to look into the organizational and project level of analysis as they also affect relationships. These units of analysis will be less prioritised when conducting the research and analysing the data, but will to some extent be included in the analysis and conclusions, to reach a more comprehensive result.

2.2 The Literature Review

This thesis consists of a theoretical part that will present the reader with theory on absorptive capacity, open innovation and relationship management. These literature reviews are focused on research that has been done, or can be applied to the context of UI relationships. There are many connected areas of research about open innovation and relationship management, and the purpose is to identify those areas of research or concepts that are influencing the research questions of this paper. Absorptive capacity theory gives an understanding of the prerequisite for successful knowledge exploration, retention and exploitation, which are the different modes of open innovation. The aim is to identify the factors that influence relationships in an open innovation context. The focus of the literature review will be on relations as the research question and problem statement revolves around how to manage relationships in the context of open innovation. This will not be an exhaustive review but will take the perspective on theory concerning University/industry relationships. To understand the open innovation context, a general introduction with the most important literature is necessary. More specifically I have searched for theory using CBS library's databases e.g. EBSCO – databases. All articles with words including open innovation, relationship management, collaboration partners, and University/industry relationships in different combinations were used when searching. New articles were selected when they could offer new theory. A systematic search has been conducted where articles have been selected based on relevance for the study. Selection criteria were based on assessment of relevance when reading headlines and abstracts.

The overall aim of the literature review is twofold; first it is to give me as a researcher a more comprehensive knowledge of the subjects, which I can use in preparing and executing the primary data collection through the case study, and second the review is

held against the data and analysis of the empirical research for comparing and developing new knowledge.

2.3 The Case Study

The case study as a researching method was chosen as it allows to research a contemporary phenomenon within a real life context. Also it is appropriate when research questions are based on “how” and “why” questions. Not least can it be based on a mix of quantitative and qualitative evidence (Yin, 2003). For the design of the case study, I have chosen a mixed method that utilizes the advantages of both qualitative and quantitative research, with a focus on the qualitative data.

The department of Food Science (FOOD) at the faculty of science, University of Copenhagen and in particular their industrial partners will be the focus of the case study. FOOD wants to be the preferred collaboration partner for the food and ingredient industry. The main reason that I got access to FOOD and their partners, was to help them better understand their industrial partners. Specifically FOOD wished to have the following questions answered: 1) what does the industry think about FOOD, 2) what are the main reasons for the industry to join research projects with FOOD, 3) what can FOOD do to improve collaboration, and 4) what are the main barriers for future collaborations, if any? To keep my focus on the subject and research questions I wanted to investigate, I chose to keep FOOD’s marketing and customer focus out of the thesis and do a separate report for them which addresses customer preferences in their collaboration with FOOD employees (question 1 and 2). The questions in the questionnaire therefore concern both my focus on relationships and FOOD’s focus on acquiring knowledge about customers. In the thesis there will be some recommendations for FOOD based on the analysis I make from the data collection and theory used in this thesis. Specifically recommendations will concern question 3: what FOOD can do to improve collaboration, with the focus on relationship management. Question 4 will be answered in the conclusions: if there should be any main challenges or barriers, and what they can do to overcome them.

The case study should provide rich data on the subject of relationship management in open innovation collaborations. All relevant industrial partners of FOOD were sent a

questionnaire, where they were asked about their preferences concerning research collaborations and their relationships with FOOD. Also they were asked about their experience with knowledge exchange. The questionnaire provided its own results, but also worked as a tool to identify further questions for in-depth interviews and as a facilitator to establish contact for those interviews. In addition I participated in two project meetings at two different projects and through observation I gathered data on partners' social interaction including body language, tone of the conversation and also their articulation. This tacit knowledge gave me insight about their feelings and attitudes.

2.4 The Use of Interviews and Coding

The primary goal of using interviews for data collection is to understand what factors affecting relationships are important to participants. Interviews will be semi-structured to capture the participants view on things they find important and guide the conversation in the right direction. So even though questions have some structure, an interview can easily be directed to what the participant finds important. To avoid biased questions and answers that are not following a thoughtful reasoning, the questions will be open, general and only concern major concepts. The major concepts and questions asked will be informed by the literature review. Focus is on the participant to explain what he/she finds important concerning factors that impact relationships, only with minimal guidance from the researcher.

After transcribing the interviews, coding was used as a tool to give a better understanding of the data for later analysis. "A code in qualitative inquiry is most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data." (Saldana, 2013, 3). It is described as the critical link between data collection and their explanation of meaning (Charmaz, 2001). Coding is the process of first decoding; "to reflect on a passage of data to decipher its core meaning" (Saldana, 2013) and encoding; to determine the appropriate code and label it (Saldana, 2013). When grouped together according to similarity, codes can form a pattern which can be developed into categories and the further analysis of their connections (Saldana, 2013). It is an iterative process that often requires two or more attempts of coding, to

make codes more refined. Each sentence or paragraph were thoroughly coded which meant that already at the first attempt, most codes could be assigned a category. Some had to be recoded and grouped into subcategories.
The reason that coding fits well with the objectives of the research, is that codes can be counted and assessed in relation to how important they are for the construct, and new connections, interdependencies and additional information can be revealed. Coding also makes it easier to find the relevant text in a category across all interviews. The findings will form the basis for the analysis, where the map of influencing factors on relationships in an OI context developed from theory, and the factors from the analysis will be compared and discussed.

Six interviews were conducted based on four separate projects (illustrated with the four colours). Table 1 provide an overview of the interviews:

Organization	Position	Name of interviewee	Date	Time in minutes
FOOD (KU)	Post doc.	Marianne Lund Lametch	19/09/2013	50
Novozymes	Senior Department Manager / PhD	Mikael Blom Sørensen	15/10/2013	40
Dantech DK	CEO/Partner	Henrik Jeppesen	04/10/2013	35
ISI Food Protection	CEO	Anne Elsser-Gravesen	09/10/2013	25
FOOD (KU)	Post doc.	Sisse Jongberg	09/09/2013	30
Fertin pharma	Director, Strategic Development & IPR	Stig R. Knudsen	09/10/2013	50

Table 1: Overview of Interviews and Projects

3.0 Literature Reviews

3.1 Absorptive Capacity

Cohen and Levinthal's influential article on Absorptive Capacity (Cohen & Levinthal, 1990) was at that time a new perspective on the importance of knowledge management for innovation purposes. The authors acknowledge that external knowledge is critical to the production of new innovations and suggest that it is important to build prior related knowledge, in order for the company to be able to evaluate, assimilate and apply external knowledge successfully. These abilities altogether compose a firm's absorptive capacity (Cohen & Levinthal, 1990). With the introduction of the term open innovation in 2003, which supports the importance of external knowledge for innovation purposes and further develops on this notion (W. H. Chesbrough, 2003), absorptive capacity has become even more relevant since its inception to understand some of the mechanisms in open innovation relationships. Prior knowledge includes basic skills, shared language and recent technological or scientific developments in a certain field. Building prior knowledge internally is therefore dependant on that the company engage in some level of internal R&D. Managing this knowledge over time develops absorptive capacity over time, and in turn the innovative performance of the company (Cohen & Levinthal, 1990).

The more unrelated the external knowledge is with the company's current activities and research, the more need there is for a gatekeeper or boundary spanner (Allen, 1977); (Tushman, 1977) who can translate the technical knowledge so it easier can be assimilated by the research group (Cohen & Levinthal, 1990). In addition the level of absorptive capacity also depends on how smooth the communication between the gatekeeper and the research group is. This requires the research group to have some level of background knowledge that is both relating to the new knowledge but also diverse, to utilize the new knowledge. In short, the more unrelated the knowledge, the more difficult it is to achieve a satisfying absorptive capacity and the more effort it takes. An organization's absorptive capacity is not just a matter of any individual's capabilities, but depends on the links between individuals and how well they understand and transfer knowledge. Internal R&D becomes important to be able to

build knowledge that can identify, assimilate and exploit new external knowledge. The more knowledge that spill over from competitors, the more necessary it is to invest in internal R&D to exploit those spillovers.

Zahra and George (2002) build on Cohen and Levinthal's work and propose to divide absorptive capacity into two components: Potential and realized absorptive capacity. They believe that firms can be able to acquire and assimilate knowledge (potential) but not necessarily have the capability to transform (new capability added by them) and exploit the knowledge (realized). They also add different contingency factors: activation triggers, social integration mechanisms and regimes of appropriability. Activation triggers (internal or external) e.g. in the form of an organizational crisis or a radical innovation in the industry will make the company invest more heavily in its absorptive capacity through knowledge acquisition. (Zahra & George, 2002)

Todorova and Durisin (2007) disagree on some points with Zahra and George (2002). They also add other components to the absorptive capacity model, still building on the original model by Cohen and Levinthal (1990).

First Todorova and Durisin (2007) re-introduce recognizing the value as a first step before acquire, assimilate/transform and exploit. Without being able to recognize the value in new knowledge there is no foundation to proceed with the next step in the model. Companies have to be open to new knowledge and not let their embedded knowledge base, rigid capabilities and path-dependent managerial cognition decide for them, when recognizing the value (Todorova & Durisin, 2007). Also Zahra and George (2002) highlight (Ahuja & Lampert, 2001) and their observation competence traps: familiarity, maturity and propinquity. They all result in that knowledge is only acquired from known sources, limiting knowledge exploration or seeking knowledge in proximity to existing expertise (Zahra & George, 2002). Naturally there has to be a fit between own capabilities and new knowledge to be valuable for the company, but being able to innovate beyond incremental improvements some level of openness is required.

Todorova and Durisin (2007) also disagree with dividing absorptive capacity into two components: potential and realized. They claim that *"without the effective functioning of realized absorptive capacity, potential capacity cannot have any effect on a firms competitive advantage"* (Todorova & Durisin, 2007), thereby indicating that the two are inseparable.

Todorova and Durisin (2007) add to the absorptive capacity model another contingency factor; Power Relationships. They argue that powerful actors within and outside the organization can influence what knowledge should be used and for what purposes. Customers can be a powerful influencer, and if given too much power, they can stop the company from pursuing and commercialising new innovations.

Social integration mechanisms are either informal or formal ways of exchanging ideas, distributing information within the firm or identifying trends (Zahra & George, 2002). While these authors believe that social integration mechanisms lowers the barriers between assimilation and transformation, Todorova and Durisin (2007) argue that because they affect all components of absorptive capacity either positively or negatively each component of absorptive capacity is a set of social interactions. It is therefore important for the successful development of absorptive capacity to build social relationships both within and between organizations.

Regimes of appropriability (level of knowledge spillover from a company into the public domain) can to some extent be controlled with precautions like IP (intellectual property) protection e.g. patents. According to Levinthal and Cohen (1990) spillovers incentivise more internal R&D and in turn greater absorptive capacity will be built, to be able to exploit the spillover. Zahra and George (2002) contrary believes that when there is a high level of knowledge spillover (low appropriability) investments in absorptive capacity is likely to be low. They believe that firms in this case should build their own innovation capabilities as depending on knowledge spillovers does not allow for breakthrough innovations (Zahra & George, 2002).

Zahra and George (2002) propose a new component, transformation, to the absorptive capacity framework. They see transformation as a continuation after assimilation while Todorova and Durisin (2007) believe that transformation is a separate alternative to assimilation. While assimilated knowledge only requires a small alteration to improve the fit with existing cognitive structures, transformation is needed when knowledge cannot easily be assimilated. Then the cognitive structures of the people that process the knowledge must be changed (Todorova & Durisin, 2007). Basically this means that all individuals involved must not only be open to new knowledge but try to see the possibilities of the application of knowledge in ways that are not the current standard in

the industry. Transformation is directly associated with radical innovations that changes the cognitive structures in entire industries.

3.1.1 Conclusions on Absorptive Capacity

There is clear evidence that managing absorptive capacity leads to better knowledge management and in turn opens the eyes of the organization for knowledge that can lead to innovations. If absorptive capacity is high, prior knowledge helps pushing the company to the border of its comfort zone when absorbing new knowledge. It is important to be open to new knowledge to challenge path dependency and rigid capabilities within the company, especially if radical innovations are needed. Only with a great absorptive capacity can companies process knowledge that can be used for both incremental but also radical innovations. Absorptive capacity on an organizational level is managed by supporting and developing a well functioning R&D unit and a general culture of knowledge diffusion. Ultimately though, it is the individuals in the organizations that have to build their own absorptive capacity and it is their responsibility to evaluate, assimilate / transform and apply new knowledge. Conclusions can be made that internal R&D is still relevant to be able to absorb and utilize external knowledge. Absorptive capacity is critical to open innovation, both inbound and outbound (Newey, 2010) and therefore an important factor in understanding the social forces in open innovation.

3.1.2 The Role of Absorptive Capacity on Open Innovation

Newey (2010) links absorptive capacity with open innovation and integrates the value chain and upstream and downstream actors with the theory. He argues that in an open innovation context a supplier act also as a customer and it is important to integrate the two different ways of managing absorptive capacity. The different roles requires to ask different questions, and having different mindsets and goals, e.g. a customer/industrial partner to a University must first recognise the value or potential value of this upstream partner's work. Then he needs to assimilate or transform the knowledge to find an application for it and then apply it to commercial ends. During this process the overall goal is to create more value from the knowledge and apply it in some form for whom a customer down the value chain will be attracted by the value proposition and use his

absorptive capacity to evaluate, assimilate or transform and apply it to an end customer or another customer down the value chain. Taking the dual role of customer and supplier increases the likelihood that the interactions with upstream and downstream actors enlarge the understanding of their value propositions and needs. Absorptive capacity is needed for all actors and can if applied successfully lead to co-creation of value throughout the value chain. The development of new products or value propositions by a downstream partner depend on a combination of independent and interdependent absorptive capacity processes; both the individual discoveries but also collaborative discoveries and joint development of initial knowledge leads to new products and value propositions. When the open innovation process takes place between a supplier (e.g. a University) and a customer (e.g. an industrial partner), a developed absorptive capacity among both actors, having in mind their partners point of view and their potential customers point of view, is necessary for successful development and application of knowledge. If the University (supplier) does not manage to propose a value proposition that let the industrial partner (customer) to "recognise the value" it will not be picked up by the customer nor co-developed, and the knowledge might not be used and developed into any commercial product. Therefore the responsibility of using knowledge for innovation purposes requires a joint effort between 'supplier' and 'customer' and becomes in addition to managing absorptive capacity also a matter of relationship management.

3.2 Open Innovation

According to (Gassmann, Enkel, & Chesbrough, 2010) there has been a development in research focus on open innovation (OI) from an initial concentration on R&D processes to now include several different research streams. Lichtenthaler (2011) suggest these streams can be categorized into technology transactions, user innovations, business models and innovation markets.

Known as "the father of open innovation", Henry W. Chesbrough, with his first book on open innovation in 2003, argued for a paradigm shift in the way that businesses, researchers and other professionals was using and thinking about innovation and R&D. He explains open innovation as: "*the use of purposive inflows and outflows of*

knowledge to accelerate internal innovation and expand the markets for external use of innovation" (W. H. Chesbrough, 2006). In a similar vein Ulrich Lichtenthaler suggest open innovation is ... "*defined as systematically performing knowledge exploration, retention, and exploitation inside and outside an organization's boundaries throughout the innovation process"* (Lichtenthaler, 2011) and thereby incorporates knowledge management, organizational learning and firm boundaries into the open innovation framework. Sometimes firms transfer own technologies to get access to external knowledge, known as cross-licensing, and thereby combine inbound and outbound open innovation (Lichtenthaler, 2011). Lichtenthaler (2009, 2010/b) identifies two other knowledge capacities developing on the absorptive capacity theory; desorptive and connective capacities. Desorptive capacity is needed in outbound technology transfer, the exploitation mode of open innovation e.g. through licensing. Desorptive capacity happens under two separate processes: first, in identifying technology transfer opportunities, and second, in transferring knowledge and facilitate the technology's application at the recipient (Lichtenthaler & Lichtenthaler, 2010/b). Connective capacity is the competences needed to connect and stay connected with the partner. It is the ability of a firm *"...to retain knowledge in inter firm relationships"* (Lichtenthaler & Lichtenthaler, 2009). It may be valuable to have established connective capacity through relations for future collaboration and knowledge transfer (Lichtenthaler & Lichtenthaler, 2009).

Innovation was before Chesbrough's influential book mainly understood as a process that could only happen behind closed doors, where the best and brightest researchers used their competences to innovate. It was a vertical integrated model of innovation (W. H. Chesbrough, 2003). Innovation (or R&D as it mainly was understood at this point in time) has always been important for companies in order to offer new and optimized solutions and to stay competitive. The level of innovation, whether incremental or of a more radical nature, was limited to what knowledge people inside the company held, and how this knowledge were put together to form new innovations. This way of managing innovation is what we today will call a closed model of innovation. The general belief was that controlling IP through internal R&D was the best way to innovate. The logic was based on the premise that if a company could hire the best and brightest people and develop the best R&D in the industry, it would have

a competitive advantage due to better resources and IP, hence the chance of more innovations that would make it to the marketplace, would be higher (W. H. Chesbrough, 2003). Companies were also concerned with getting new products to the market first and to control the IP so competitors would not profit from those ideas and knowledge that was produced and held inside the company. “Not invented here”, presented an attitude on things which were developed and produced outside the company, could not be trusted to live up to quality and performance. Therefore companies preferred internal control over its innovations and value chain. Opposite, in open innovation “not invented here” has a positive meaning as the use of external knowledge for innovation purposes is necessary to maintain a competitive advantage.

As Chesbrough rightly points out, companies consist of people and when key employees leave to go and work for other companies their knowledge moves with them, making it impossible to protect all of the company’s IP. Because of the knowledge that increasingly left companies, with people often leaving after few years of employment, for many companies it didn’t made sense to invest so heavily in R&D. Of the many ideas generated in R&D labs, many of them were not pursued because of lack of congruence with the current business model or because other alternatives were more promising. Many of the people who left picked up these ideas and formed new successful companies, utilising the knowledge in new ways through new business models. In the open innovation paradigm, companies should be ready to alter or create new business models if new knowledge doesn’t fit in their existing business model. Multiple business models make it possible to utilise knowledge and create different value propositions and capitalise on IP/new innovations, also those that at first sight doesn’t fit with existing business models. IP management, e.g. patent licensing or selling of non-core knowledge, are ways to capitalise on IP.

Four key elements characterise the process of open innovation: developing networks and relationships, exchanging knowledge by exploration, exploitation and retention, managing IP and creating/modifying new/existing business model (Chesbrough and Euchner, 2011; Christiansen, Gasparin and Varnes, 2013). High relational involvement in collaborations are of most interest in an OI context ... *“as they facilitate the building and maintenance of interorganizational relationships over a prolonged period of time”* (Luoma, Paasi, & Valkokari, 2010).

Support is needed from management so the company as a whole supports these new practices by appropriate systems and structures and by letting employees understand the need of external knowledge, creating a culture where efforts taken towards OI is appreciated and backed by incentive systems. One of the biggest challenges in OI is changing the mindset from protecting ideas, knowledge and IP and not let any information slip out to competitors, to an open mindset where information is shared more freely with the benefit of developing knowledge to create new innovations. A change in company culture where all employees embrace the value of OI, especially external competencies and know-how, is important for success (Gassmann et al., 2010). This requires management to comfort researchers that for example knowledge exploration is a supplement to internal development, not a substitute that competes with their work (Giannopoulou, Yström, & Ollila, 2011). An OI culture is also influenced by ... "*concrete artefacts such as incentive systems, management information systems, communication platforms, project decision criteria, supplier evaluation lists and its handling and so on"* (Gassmann et al., 2010). This means that on an organizational level there are a lot of things that need to be in place for successful relationships and innovation to occur.

According to Henry Chesbrough (2003, 2012) OI is about using external as well as internal ideas for innovation purposes. These new innovations can follow an internal path to market, in case of integration into the current business model, or an external path to market, in cases where the innovation is better utilized through different business models. This can happen when employees take an innovation outside the company to commercialise it through a new venture. The company originating the innovation can also choose to license it out or sell it to external corporations. Lastly there is the possibility to fit new knowledge into a new business model developed internally. To succeed with this, the right capabilities and resources are required. Capturing value from false negatives (innovations initially rated worthless, but later proved valuable), require companies to find ways to explore that value. Innovations might have to be altered or combined with other products or commercialised in new markets before value can be derived (W. H. Chesbrough, 2003). Important in this process is the concept of different knowledge capacities (Cohen & Levinthal, 1990;

Newey, 2010). According to Lichtenthaler (2010/a) most innovation activities, both exploration and exploitation, are still carried out inside a firm's boundaries, though there has been an increase in especially knowledge exploration outside firms boundaries in recent years. One study claims that only 10 percent of companies are not cooperating with other organizations and collaborations typically involves only two parties, when the goal is to develop new products or services. When more parties are involved the collaboration most often concerns innovation where partners not directly compete or where they are not on an equal footing (Luoma et al., 2010). This shows that while partners are prepared to share knowledge and IP, some of it, the one that is core to its business is better held secret. When the knowledge is core to an existing business model or a new one which the company has the resources and capabilities to develop, it is wise to be protective of that IP. Some knowledge is worth making public though. In cases where knowledge can benefit firms in the ecosystem and help them make better products, knowledge should be shared freely, to enhance the value of the products by the focal company. When IP provide little value to the focal firm, there might be good reasons to sell it, preferable to someone not considered a close competitor. Therefore there is a need to differentiate to what extent knowledge should be protected and when it can prove more valuable to share it, depending on the value to the focal company and to the market (Luoma et al., 2010). In a situation where competitors collaborate to gather basic knowledge and where they are far from each others markets IP is not a big issue. A pre-competitive collaboration like that will normally focus on preparing the market for a new technology (e.g. when there is none or only one source available) or generating new knowledge to the companies (Luoma et al., 2010).

Kang and Kang (2009) identify three methods of external knowledge exploration: information transfer from informal networks, R&D collaboration, and technology acquisition (Kang & Kang, 2009). While Chesbrough (2012) sees close collaborative partnerships as the most effective way of benefitting from open innovation, Kang and Kang (2009) finds that information transfer from informal networks generate better technology innovation performance and therefore should be used as much as possible. R&D collaboration should be used more moderately and technology acquisition actively. While R&D collaboration often has strong and long term interaction with

strong ties, there are high coordination costs. Positive for repeated collaboration is that confidence level between partners increase and behavioral uncertainty and transaction costs decreases. Negative for repeated collaboration is that there are negative effects on innovation performance, especially if the partnership has been subject to too few or too many collaborative projects (Kang & Kang, 2009).

Managing IP is an important skill in OI. A company should be an active buyer and seller of IP, both to produce better products but also to profit from external use of internally developed ideas, and even ideas made in collaboration with other partners. "*Some ideas, those that are novel, useful, tangible and lawfully managed*" (W. H. Chesbrough, 2003) can be protected by patents which can be sold, licensed or bought. (Chesbrough, 2003). There are several ways to protect IP; the more formal ones include patents or trademarks, the contractual one is a confidentiality agreement, and the informal way is secrecy or through publishing (so nobody else can file a patent on what has been published) (Luoma et al., 2010). How IP is valued depends on how the company can use that IP in its business model. Understanding the value network and the use of IP in a buying company helps pricing the value of IP. (W. H. Chesbrough, 2003). It is important that the desorptive capacity of the selling firm is developed so it can assess how the buying firm values that IP.

More patents in a firm's portfolio are not synonymous with more outward technology transfer in a firm, especially not in large firms. These firms have the internal resources for exploiting the knowledge, opposed to small firms that often do not have the sufficient resources needed to do this, and therefore they more often rely on external technology exploitation. Quality of patents more than amount determines how often the firm makes use of external technology exploitation (Lichtenthaler, 2010/a).

3.2.1 Challenges in Open University/Industry Partnerships

Though primarily positive, some negative effects of partnerships and challenges can be derived. The clash between industry and University interests can lead to disagreements about intellectual property rights and rights to publish research. An example is DuPont's licensing of the Oncomouse technology. DuPont wanted universities to pay a licensing fee in return for using the technology. If the universities did not accept it would affect the basic research mission and make the search for new

cancer therapies more difficult. The acts of DuPont have in this case also ethical concerns as not allowing the environment to use the technology, will have wider social consequences than what concerns DuPont themselves. The goal must be to let as many as possible use the technology to boost the whole industry. That will benefit the whole industry and by the diffusion of knowledge lead to other new innovations. Not least it will benefit the focal company as they will learn more about the use of their technology and connected technologies, making it possible to use that knowledge for new innovations. (Blaug, Chien and Shuster, 2004). There is also the challenge for universities to manage their collaborations and technology transfer without compromising their mission (Blaug, Chien, & Shuster, 2004). A concern is that researchers might be doing too much consultancy service for companies, which can limit their academic freedom of choosing what to research. Some believe it is a problem that companies can influence the research focus at universities. On the other hand is finding applications for ones research important for many researchers. Therefore is collaboration with industry rather an opportunity to see the application for ones research and further co-development of it.

3.2.2 Levels of Open Innovation

So how can one evaluate a company in terms of how good they are at using open innovation? Lichtenthaler (2011) suggest that open innovation can be classified into knowledge exploitation, exploration and retention. He argues that at least larger companies often pursue all three kinds of knowledge management and that both make-or-buy, integrate-or-relate and keep-or-sell strategies all can work simultaneously. The level to which companies utilize these different paths of open innovation could be a good indicator of their use of open innovation (Lichtenthaler, 2011).

The complexity of open innovation is illustrated in Lichtenthaler (2011) figure 1[1] where it can be seen that open innovation is not just a matter of internal R&D, external R&D or a combination between the two. There are also the organizational, project and individual levels of open innovation to take into account in knowledge exploration,

[1] see appendix 8.1.1 – figure 1

retention and exploitation modes of open innovation (Lichtenthaler, 2011). He suggests that to manage open innovation an integrated perspective is needed where the firm need to develop absorptive, connective, and desorptive capacities. Risk is that one level of open innovation will not be in alignment with the other levels, e.g. an individual might not support knowledge exploration even though the company does support it. That will be a problem especially if that individual takes the role of a gatekeeper. Therefore there are great interdependencies between levels of open innovation. If the general attitude among employees differ from management strategies, change management processes might be necessary in order to align objectives and values (Lichtenthaler, 2011).

3.2.3 Reshaping the Business Model

Business model innovation is important to sustain open innovation. (H. Chesbrough & Schwartz, 2007). When new knowledge is built and new products developed it sometimes doesn't fit in the existing business model and new considerations of how to provide value to the customer through the new innovation is necessary. There might be a need to rethink value proposition, who the customers are and how the relationship can be established. Also which channels to use, how to make money (cost structure and revenue stream) and key partners, key resources and key activities must be made clear for successful implementation of a new business model. (Osterwalder & Pigneur, 2010). Desorptive capacity, to be able to understand what customers' value and their customers' value, is important in this work.

False negatives or spillovers from R&D can in the open innovation model be used to expand the business model through alteration to existing ones or through completely new business models. The inside-out approach e.g. by licensing out the technology is another way to make use of the technology in another company. (H. Chesbrough, 2012). Chesbrough also argues that through the inside–out approach the company can strategically control to some extent how, when and on what terms it licenses those technologies (H. Chesbrough, 2012) and therefore profit from other applications of the technology.

3.2.4 Open Innovation Processes at Universities

There are different types of innovation projects at universities. Some projects have clearly defined outcomes, which is the case when companies seek consultancy services or in the case of contract research, where the company want a solution to a specific problem. In these kinds of projects, the relationship needs not to be as close as in collaborative research projects. The collaborative research on the other hand demand close interaction between partners, as it is a joined project where both partners contribute to generating knowledge. A collaborative research project is likely to originate from a discovery made by a scientist at the University that takes the initiative to find a commercial partner that is interested in developing and applying it in his/her own company. Or it could originate from the company's need of being more knowledgeable on a general level or for a more specific purpose. When the outcome is known and the project fits the consultancy or contract type, the project will benefit from following the 'linear perspective of innovation' (Christiansen & Varnes, 2008). The stage gate model applies the linear perspective and is popular by management as focus is to reduce risk, by planning and managing the process. It is different with projects where a company seeks knowledge or a technology that can fit into an existing or new product, where the creative process only starts with the collaboration between partners and where there are no clear expectations of an outcome or a technology. In this case a linear approach will not benefit the creative process and a 'network process perspective' is needed to support the innovative process. Knowledge creation in a network process perspective becomes a learning process and not just a matter of providing the relevant information, as in the linear perspective (Christiansen & Varnes, 2008). In the network process perspective, the basis for action is discovery and innovation happens from co-creation of knowledge. Defining and meeting deliverables and making decision becomes increasingly difficult as the project is characterised by uncertainty and some level of chaos. Critical here is also to actively creating and maintaining relationships and under these conditions that becomes a difficult job. It is suggested that incremental innovation fits in the linear model of innovation while more radical types of innovation belongs under an improvisational model or network process perspective of innovation (Cunha & Gomes, 2003).

3.3 Relationship Management

With less R&D in recent years done internally, companies increasingly turn to universities to form research partnerships. Some are interested in basic research but many companies seek innovative competences to develop specific solutions or products for the company. The benefits they hope to gain is increased sales and cost savings along the more long-term benefits of increased competitiveness and knowledge transfer (Heidrick, Kramers, & Godin, 2005), knowledge transfer being a key concept which I will return to shortly. For the universities, researchers as well as students, it gives them the opportunity to work with real world problems, which is important to be able to offer contemporary and relevant educations. Preparing the ground for new research by establishing contacts with industry is another benefit (Højteknologifonden/a.). Also, UI collaborations are a good opportunity for students to meet companies for later work opportunities. From a company perspective, they get access not only to new research and knowledge, but also to students for recruitment purposes (Heidrick et al., 2005). The positive outcomes of these collaborations are for universities a stronger research profile and for the industry a more effective engine for job and wealth creation. As governments appreciate increased economic activity, employment and technology development, partnerships where government bodies can see positive synergies often lead to funding (Heidrick et al., 2005). 'Højteknologifonden' is an example of a government body that fund research projects between University and industry. For projects that 'Højteknologifonden' find eligible for funding, the agreement is that the public partner i.e. the University pays one-sixth, the industrial partner pays one-third and 'højteknologifonden' pays half of the money needed (Højteknologifonden/b.).

There are many ways of partnering and levels of collaboration between universities and industry. Kleyn and Kitney (2007) identified a continuum of Bio Pharma R&D partnerships, which varied from arm's length licensing to collaborative arrangements and joint ventures.[2] Some open innovation activities are merely a transaction while others are based on deep collaborative and social relationships (Kleyn, Kitney, & Atun, 2007). The varying levels of collaboration indicate a varying need for involvement,

[2] see appendix 8.1.1 – figure 2

influence and social relationships between partners. A company licensing an existing technology from a University does not require a very close relationships and deep knowledge of the partner's business model. On the contrary collaborative research require the joint effort of defining and solving a problem. In this case a much closer relationship and understanding of the goals and needs of the company and University is needed. (Du Chatenier, Verstegen, Biemans, Mulder, & Omta, 2009). Partnerships can emerge among industry-industry, University-industry collaborations or include multiple actors such as multiple companies partnering to form an OIA (open innovation alliance) independently or in collaboration with a University. Even multiple institutions sometimes partner e.g. University and another research institute without direct involvement from a company. For getting an early view of emerging technologies a popular mode of partnering is theme based networks or industry clubs, where basic research are conducted (Kleyn et al., 2007). In this way industry enter the territory of universities to access basic research, information about trends and to invest also in long term innovations. In these various constellations there are different objectives, power distance, degree of involvement and risk at stake among members to mention only some factors, and the challenge lies in balancing these factors of each partner to yield a successful relationship.

3.3.1 Dilemmas and Challenges in University/Industry Partnerships

Different dilemmas exist in UI partnerships. The different cultures that exist in Universities and in companies *..."manifest themselves in divergent goals, time orientations, languages, and assumptions"* (Cyert & Goodman, 1997). While businesses have a commercial focus and strive for creating new products and services in a competitive environment in order to make a profit, universities are concerned with conducting research and disseminate the knowledge they find through publications and teaching. (Cyert & Goodman, 1997). Because of firms commercial focus they prefer initially to keep findings secret, while universities contrary seek to make findings public as soon as possible (Schuler, 1986). Universities and their industrial partners both value Intellectual property rights (IPR), patent ownership and licensing agreements, which can also create tensions between them (Santoro & Betts, 2002). It seems important to find a balance between these legal agreements so the firm will not

need to worry about the consequences of too much disclosure of knowledge and the University will still be able to live up to its mission to freely disseminate knowledge. A normal practice is to delay the publications until the firm has either received approval for a patent application or is ready to take it to market (Santoro & Betts, 2002). This is necessary to protect the company against competitors picking up knowledge and to make it possible to make a patent application in the first place. If the technology is already made public it cannot be patented.

Companies have a much shorter time horizon on most research than do universities, as they need to respond to fierce market competition. Universities do not experience the same kind of urgency and is more concerned with validating and repeating research to be sure findings are correct. Languages can be different and also basic assumptions, e.g. motivation for engaging in research activities are for the University researcher often based on professional reputation and the possibility to do valuable research and share it with the research community, while the company's interests concern making a profit from new products, services or knowledge learned (Cyert & Goodman, 1997). Moreover it can be difficult for the University to completely understand the market forces the firm faces and what they seek and value. Thus, effort should be made to develop desorptive capacities to better understand those needs and be able to help the firm meet their goals. These cultural differences cannot be eliminated but only reduced, e.g. by having strong motivational factors to go through with the partnership. Motivation and a good understanding of the needs of the partner can somewhat offset cultural differences (Cyert & Goodman, 1997).

3.3.2 Influencing Factors in Collaborative Knowledge Creation

Some basic success factors for UI partnerships have been identified by Kleyn et al. (2007): *"Strong leadership, developing two way interaction, improving organizational symmetry (asymmetry in size and resources), partnership contracts and agreements (using deliverables and milestones as an instrument to establish dialog, collaboratively indentify problems with progress and to jointly find solutions to address these)."* (Kleyn et al., 2007). When partners collaborate in OI relationships it seems important that they have a close interaction with each other and work closely together with high commitment, social cohesion, in a safe learning climate, with not too high diversity and

cognitive distances. Also a low level of uncertainty, high resource availability and low difference in power are important for smooth collaboration. These factors for success are however typical problems that partnerships experience which cause frictions in the relationships (Chatenier, Verstegen, Biemans, Mulder, & Omta, 2010a; Du Chatenier et al., 2009).

Though industrial partners prefer highly ranked universities as partners, geographical proximity is also an important parameter, as close physical location for increased interaction makes it easier to develop a close relationship (D'Este & Iammarino, 2010).

3.3.3 Risk in University/Industry Partnerships

Fulop and Couchman (2006) argue that UI collaborations are especially risky to universities. Some of the most critical risks in relation to the management of OI collaborations are relational risks. These include opportunistic behaviour of one of the partners, exploiting the others capabilities and resources to its own advantage. Lack of commitment and spillovers (the leaking of knowledge to competitors) are other risks that are central to such relationships (Fulop & Couchman, 2006). The only way really to overcome these risks is through trust. *"But where two or more parties trust each other, they accept the risk that the others may not behave as expected or agreed; this is the risk that the trust may be misplaced"* (Fulop & Couchman, 2006). Focus on IP protection and confidentiality agreements are features of closed innovation but are very common in UI partnerships. Tijssen (2004) makes and interesting observation that, "*the balance is shifting in favor of knowledge protection and appropriation, rather than production and dissemination"* (Tijssen, 2004), referring to an increase in patenting and a decline in the publication of journal articles. The risk is that the increased commercial focus in knowledge production can impede scientific progress when shared less freely (Fulop & Couchman, 2006). Open innovation promotes opening up organizational borders and increase knowledge production and the flow of knowledge between organizations. Therefore it is important to find a balance and agree on ways to disseminate knowledge while meeting the need for IP protection of the industrial partner, and only protect the knowledge that is core to the corporation and its competitive advantage.

3.3.4 Knowledge Transfer in Open Innovation Relationships

Knowledge is a core concept for both open innovation and relationship management. The goal in OI relationships is really to create new knowledge that can be used for new products, processes or services and for research purposes as well. Therefore important to the concept of knowledge management is the flow and distribution of knowledge. *"To transfer knowledge effectively so that companies can really make use of it, you need a certain amount of creative abrasion and a certain amount of time together working on the problem. Open innovation works best when people are collaborating side by side, with people moving from one organization to another"* (H. Chesbrough, 2012). The closer the University is to its customer (industrial partner), the more knowledge it can obtain about what is valuable to them and the easier it gets to present a value proposition that maximises the partner's perception of value and in turn enhances his ability to offer a value proposition to his customer.

As already discussed, the three different knowledge capacities in inter-organizational collaborations are important for managing knowledge. While knowledge exploration requires absorptive capacity of the company, desorptive capacity is needed for knowledge exploitation. Knowledge retention requires connective capacity from both partners. Grant & Baden-Fuller (2004) argues that accessing knowledge, rather than acquiring it, is the primary motivation for knowledge-based alliances. These authors believe ...*"there is a tendency for firms to concentrate upon a few core competences and to collaborate with other firms in order to access additional capabilities"* (Grant & Baden-Fuller, 2004). The distinction between acquiring and accessing knowledge leads to some contrasting impacts between the two: the most important benefits for accessing knowledge is that firms can expect increased stability of its alliances, engage in multiple alliances simultaneously and not be limited by its absorptive capacity (Grant & Baden-Fuller, 2004).

The relation between knowledge and collaborative partnerships is clear: knowledge is created from the interaction between partners and the bringing together of different competencies and resources. Knowledge is related to experience, concepts, values, beliefs and ways of working (Garrick, Chan, & Lai, 2004). Knowledge is the human capital and an intangible asset to the corporation that is difficult to value and measure, (Kaplan & Norton, 1992) but at the same time the very reason that companies

collaborate with universities: to learn, co-develop and acquire new knowledge, based on the experiences and skills of professionals (Garrick et al., 2004). Transferring knowledge often entails difficulties. Some new knowledge created might be tacit and difficult to transfer between the University and the industrial partner. Therefore using time together to absorb and understand the new knowledge is important for successful knowledge transfer (H. Chesbrough, 2012). The transfer of knowledge can happen through four different methods: socialization (sharing tacit knowledge to one another), externalization (transfer of tacit knowledge to a group of people by codification so it becomes explicit), combination (transfer explicit knowledge as explicit knowledge) and through internalization (absorbing explicit knowledge as tacit) (Nonaka, 1994).

Chatenier et al. (2009) suggest a model of collaborative knowledge creation which consist of four stages: 1) Externalising and sharing the knowledge, 2) interpreting and analyzing the knowledge by absorbing it, linking it to ones existing knowledge base, 3) negotiating and revising of knowledge between professionals to build mutual understandings, and 4) combining and creating different knowledge bases for new ideas. In this model individuals switch between individual and interactive stages of knowledge creation (Du Chatenier et al., 2009). This view can be linked to the one of Lichtenthaler, that each partner needs to have developed all three knowledge capacities for successful knowledge transfer.

Sherwood, Robinson and Butts (2011) suggest four stages for successful knowledge transfer. Focal to the framework is to determine which context will be more critical for knowledge transfer. There are two contexts: The physical context (degree to which physical channels of communication are used for knowledge transfer, e.g. meetings, collaborative research, web-based transfer) and the social context (the relationship between the partners). Also the framework differentiates between tacit knowledge/early project stage and explicit knowledge/late project stage. In stage one where partners are assessed and selected, professionals should determine the degree to which knowledge is tacit or explicit. In collaborations where knowledge is mainly tacit, the transfer process can become difficult. *"The key to acquiring tacit knowledge is experience"* (Nonaka, 1994). Effective tacit-to-tacit knowledge transfer, also termed 'socialization' (Nonaka, 1994) requires a very close relationship and interaction between partners (Sherwood, Robinson, & Butts, 2011). To obtain a close relationship

trust and commitment is one of the most important conditions and therefore it has to be developed. For explicit knowledge transfer, the physical context is more critical as deliverables are tangible and directly usable. The partner doesn't need any additional learning or explanation from the University professional. (Sherwood et al., 2011). Khalozadeh, Kazemi, Movahedi and Jandaghi (2011) identifies absorptive capacity of the technology transferee as a key factor, in establishing an effective technology transfer system so the partners need to make sure they choose a partner with the capability to develop a technology appropriate to their actual capacity (Khalozadeh, Kazemi, Movahedi, & Jandaghi, 2011). Also in stage one, the partner should determine the experience of its partner to see if he is capable and a good fit. This can be done by screening partner's reputation or through meeting potential partners at network meetings. Assessing trustworthiness of the partner e.g. through reputation of previous projects, is important to see if any steps has to be taken to improve trust (Sherwood et al., 2011). In stage two - alliance negotiation and governance, the development of a trusting relationship is needed for increased knowledge flows. Investing in a trustful relationship is in most cases necessary, even in projects where explicit knowledge transfer is dominant; some level of tacitness might be necessary to fully benefit from the knowledge transfer. Also the long-term relationship in possible future projects with the same partner will benefit from such investment (Sherwood et al., 2011). The second step also requires the partners to agree on the transfer process and timeline. This includes agreements on goals and what is considered completion of the transfer, ..."*deepening the relationship and building appropriate exchange channels"* (Sherwood et al., 2011). Such an agreement should be written in a contract in the initial phase of a project (Kleyn et al., 2007). In stage three - alliance management, the focus should be on further developing and building personal relationships to be able to better respond to ideas, questions and misunderstandings. Good exchange channels should be build and exchange of personnel at both organizations helps to transfer the tacit knowledge with the explicit. In stage four – assessment and termination, the relationship is evaluated. This is where the exit strategies are determined, if the project can lead to another future collaboration or if the whole collaboration has to be closed down and discontinued. Maybe there is still a need for ongoing technical assistance to secure a successful transfer (Sherwood et al., 2011).

3.3.5 Organizational Learning Perspective

The learning aspect of UI collaborations is central. The goal should not just be to develop a new product or process: "*Learning can impact the organization's strategic thinking, culture, problem-solving skills, and knowledge base"* (Cyert & Goodman, 1997). Learning should be created at an organizational level for both the University and industrial partners and not just reside among a few individuals. Disseminating the knowledge learned should be a major concern (Cyert & Goodman, 1997). The organizational learning perspective favour team based partnerships with multiple linkages and tasks. The community feeling that will be derived from such a multifaceted partnership will create a better understanding of the other organization and thereby offset conflicts. Also it will stimulate learning (Cyert & Goodman, 1997). Therefore it can be argued that having several people involved with different backgrounds that collaborate closely together and create personal ties, results in a better understanding of their collaborative partner. This means that the partnership will facilitate learning and in turn innovations. Though ideas might flourish, the risk increases that too many people "to steer the pot" will create tensions and discussions about in what direction to go and how to use findings as the team diversity influences the cognitive distances among team members (Du Chatenier et al., 2009). Also it is important to find the right mix of people to balance different backgrounds and skills with a similar cognitive schema to create the best conditions for innovation. Working for a good UI relationship, a champion ensures that each organization contribute in the best way with resources, knowledge and skills.

3.3.6 Competencies Necessary for Successful Partnerships

Being able to proactively search and select for new knowledge is important for both universities and industry for partnering opportunities. (Kleyn et al., 2007). It is not only the right opportunity to occur and the right resources and competencies that must complement those of the focal organization: *"generally companies preferred to partner with people who demonstrated passion and commitment (not only competence and authority) and those with demonstrable communication skills."* (Kleyn et al., 2007). This indicates that the social dimension is equally important to make partnerships work. We

will therefore now look closer at the competencies needed for successful open innovation partnerships.

Mulder (2007) defines competence as the integrated set of knowledge, attitudes, and skills of a person (Chatenier, Verstegen, Biemans, Mulder, & Omta, 2010b). Main activities that professionals should be able to perform to work in OI partnerships include 1) managing the interorganizational collaboration process, 2) managing the overall innovation process and 3) creating new knowledge collaboratively (du Chatenier, Verstegen, Biemans, & Mulder, 2008). To do this most effectively the competencies most important *..."concern brokering solutions and being socially competent"* specifically be able to create a win-win situation, understand social situations and socialize by developing, maintaining and using effective networks (Chatenier et al., 2010b). The same authors argue that *"...the specific competencies a person needs may depend on his or her team role"* (Chatenier et al., 2010b). Relevant roles include championing, boundary spanning, gate keeping and pattern recognition (Belbin, 1993; Reid & de Brentani, 2004). A champion serves as an interorganizational liaison handling the relationship and plays a key role of formulating and negotiating IP, patent and licensing agreements (Santoro & Betts, 2002). Chesbrough (2012) believes that boundary spanning is necessary to be truly successful with open innovation as the connecting of knowledge from different sources is important for the creation of new knowledge.

To be committed and govern oneself are competences necessary for the three overall tasks partners need to perform, as mentioned earlier. The first task of managing the interorganizational collaboration process require competencies to build trust (by being open, honest, benevolent, competent and reliable), to have social astuteness (understand the social situation and the partners' motivation), to have interpersonal influence (influence without instructing, being assertive and extrovert) and to be a social person (approachable and develops friendships easily) (Chatenier et al., 2010b). The second task of managing the overall innovation process require competences to be inventive (by being pro-active, able to pick up signals), to control and coordinate (by establishing goals and learning objectives, coordinate and synchronize activities between team members, and to non-defensively give and take feedback), and cope with chaos and uncertainties (to multitask, improvise, and understand and manage

complexity) (Chatenier et al., 2010b). The third task of creating new knowledge collaboratively require competencies to externalize (to communicate clearly and openly), to Interpret (being reflective and listen actively), to negotiate (be open to other perspectives, competent in divergent thinking and question assumptions) and to combine (employ integrative (win-win) negotiation strategies, consider common goals as most important and to broker solutions and outcomes) (Chatenier et al., 2010b).
One downside of the research of Chantenier et al. (2010) is that it does not indicate how context dependent the competencies are or which is more important. In real life the relevance of many competencies will probably be dependent of where in the process a research project is and under what circumstances the partnership are developing. Attitudes, level of involvement and social relationships with the partner determines what competencies should come in play and which are not so important.

3.4 Reflection of the Literature

What quickly became clear when searching and writing the literature reviews was that there are several important factors affecting relationships rather than a clear understanding in the form of one theory or strategy of how to manage relationships. Links between theories exist, e.g. absorptive capacity and knowledge management, where absorptive capacity is a prerequisite for successful knowledge transfer. Especially in an OI context where firms seek new knowledge through knowledge exploration, a well-developed absorptive capacity seems important to understand and use knowledge effectively. For example when a partner interprets and analyzes knowledge, successful knowledge creation and transfer depends on the absorptive capacity when knowledge is absorbed and linked to that partners existing knowledge base. Many more links exist and these will be discussed in the analysis chapter.
One major gap in the literature is that there is no researcher who has brought the influencing factors together to clarify how factors are connected and what can be done on an organizational, project, and individual level, to create successful relationships. In the analysis and later in the discussion and conclusion i will try to fill this gap.

Another gap in the literature is the focus on universities. Most of the literature takes the perspective of the firm, but in a relationship, the other part is of equal importance. Therefore the focus will be on both industry and University in the following analysis.
The findings from the literature reviews are summarized into the following map, giving a visual representation of theories and factors influencing successful UI relationships.

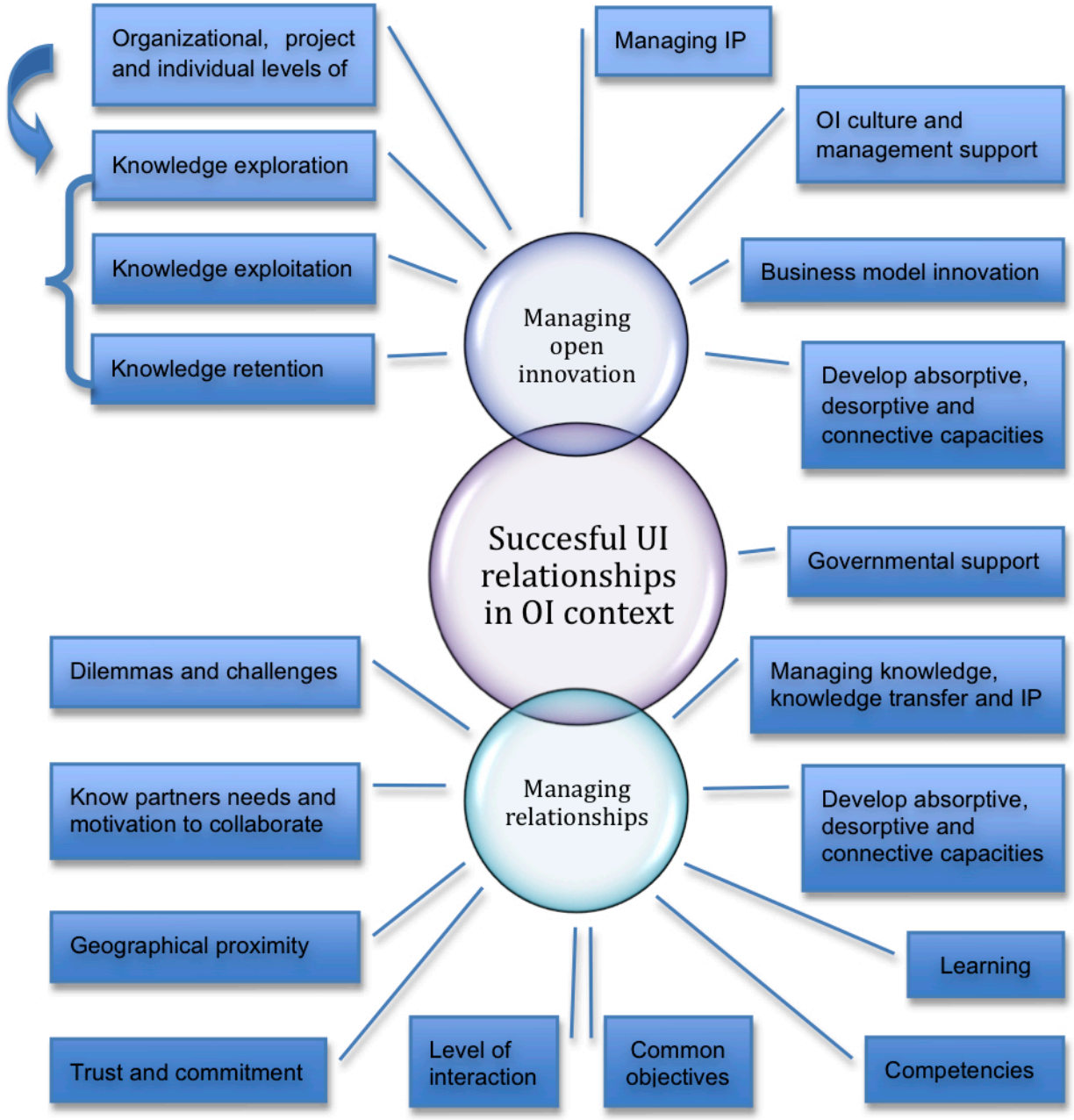

Figure A: *Map of Influencing Factors on Relationships in an Open Innovation Context*

4.0 The Case Study

4.1 Copenhagen University – The Department of Food Science

Department of Food Science at the faculty of life sciences, Copenhagen University (FOOD) consist of six research groups: Food Chemistry, Food Microbiology, Dairy Technology, Sensory Science, Quality & Technology, and Biochemistry and Bio processing. FOOD's mission is to offer University education programmes within food science and technology, based on the research originating from FOOD. Dissemination of knowledge generated from research, aims at benefitting both the Danish and the international society (Hansen, 2013). Approximately 180 employees work at FOOD of whom the majority are employed through externally financed research projects. Around half of its total turnover of 97,5 million DDK in 2010 originated from external grants. Of this, EU financed around 10 percent, 20 percent was privately financed and the last 70 percent was financed by various national programmes (Hansen, 2013). In other words: the department is well established as a preferred collaboration partner within the industry.

Governmental financial support for basic research at universities has decreased but at the same time more financial support has been granted through different governmental bodies. These national programmes/governmental bodies support UI collaborations. From this it can be concluded that applied research has become increasingly important as a driver for innovation, growth and wealth-creation, and collaboration with industry enjoys substantial governmental support. For universities this means that they should be prepared to meet those new challenges collaboration with industry brings forward. Cultural change within the old University institution is necessary to meet the requirements from industry. Not just management professionals must understand the new challenges and opportunities, also research staff, PhD. students, post-doc and professors and project leaders must understand their new role and responsibility. There is a need for having focus on project management and on the commercial interests of the industry they work with, to be able to be good collaborative partners that meet the needs of the industry.

4.2 Introduction to the Participants and their Projects

Following is a short introduction to the participants and their projects. Two post doc. researchers from FOOD and four participants from the industry were interviewed.

4.2.1 Project 1 – FOOD and Novozymes

Marianne Lund Lametsch is collaborating with Novozymes on a project concerning flavour stability in beer production. It is a project that aims at clarifying if Novozymes should adopt it as an internal project with the aim of developing a product they can commercialise. In other words; the project is part of the idea generating phase and will either prove profitable or not when research has been done. The initial contact came from Marianne as she saw an opportunity to do her industrial post doctoral project in collaboration with Novozymes. Marianne's "mentor" at FOOD suggested her to contact his contact at Novozymes. Novozymes got interested because of Marianne's competencies and experience in working with enzymes as those competencies could be used to follow up on a former project. Basically, Marianne offered her competencies and Novozymes came up with an application for a project they were interested in. The project started in 2011 and is partly funded by the Danish National High Technology Foundation.
Interviews were conducted with Marianne from FOOD and Mikael Blom Sørensen, PhD Senior Department Manager at Novozymes.

4.2.2 Project 2 – FOOD, Dantech DK and ISI Food Protection

A research collaboration was formed between Henrik Jeppesen, CEO at Dantech DK, Anne Elsser-Gravesen, CEO at ISI Food Protection, and FOOD. Interviews were conducted with Henrik and Anne. The project concerns reducing bacteria in food products with the aim of increasing shelf life. The outcome will be less discarding of food products in the society. The technology to achieve this is microwaves which can kill bacteria. Briefly exposure of microwaves in food products will therefore increase shelf life. DanTech DK and ISI Food Protection contacted FOOD with an idea for a project. They already had the idea to commercialise a product and a prototype of the product with some theories of how it could work, but needed the expertise of FOOD to

account for the scientific part of the technology they are working with. Specifically, the purpose is to understand and document what happens to different food products when they are exposed to cold microwaves. The companies mainly need FOOD as an authority to corroborate the documentation that the product would work, and to acquire knowledge about underlying cause and effect relationships. They received funding through GUDP (”grønt udviklings og demonstrationsprogram”) at Danish Veterinary and Food Administration. The project started in 2013.

4.2.3 Project 3 – FOOD and DMRI

The project is an ongoing partnership between Sisse Jongberg, post doc at FOOD and Mari Ann Tørngren, senior consultant at Danish Meat Research Institute (DMRI). Continuing on Sisse’s own PhD project, which was even a continuation of another PhD project, DMRI has for a long time been a preferred partner when it comes to research in meat and meat products. The project is about the quality in meat, specifically how the MAP packaging standard influences the proteins in meat. DMRI is a research unit like FOOD, and has no commercial interest for themselves. They are however closely linked to the industry and provide knowledge that companies can use. Though most of the knowledge produced in this project will be accessible through publications, most companies in the industry do not read those papers. Therefore DMRI is an important and effective link to get relevant knowledge into the industry.

4.2.4 Project 4 – FOOD and Fertin Pharma

Fertin Pharma produces nicotine gum and has on several occasions worked with FOOD, mainly though on a consultancy basis where they have bought into FOOD’s knowledge. Currently they are engaged in establishing an innovation consortium where several companies and organizations, including FOOD, work together to develop knowledge on chemical reactions in drier systems, for example used when making milk powder. Fertin Pharma is especially interested in learning more about root causes and general research, which they can use to understand their own products better.
Stig R. Knudsen, director, strategic development & IPR at Fertin Pharma was interviewed.

5.0 Analysis

5.1 Analysis of Questionnaire

When asked to list the three most important factors influencing the choice of research partner answers spanned widely. By coding the answers the most important one is clearly quality in research, competencies and capabilities. In the same category is reference or previous experience of the research partner an important factor. Next is it important that there is a fit between scientific areas of the firm and the company. This makes sense to achieve the best result of the collaboration. Cost is also an issue when a partner is chosen, and related to this, the possibility to get external funding, was for some important. More interesting to this research is that other factors were more difficult to code as they each were different from one another, but many can be recognized from factors identified in the literature review that impact relationships. Some of the more important ones are ease of collaboration and co-operation, be able to deliver results, commitment and interest, access to partner's networks, relationship building, complementary skills and equipment, partner being able to support company goals, and geographical proximity.[3]

Knowledge building is by far the most important reason to engage in research projects with partners: 94% found it to be important (34%) or highly important (60%). Innovations / launching new products was surprisingly not as important where only 35% found it important (26%) or highly important (9%). Thus it seems that many engage in research collaborations not necessarily with the aim of innovating new products, but to build knowledge. Knowledge is a wide concept that can be used to get a deeper understanding of things and connections and in the end maybe lead to some improvements of processes or products. While the long-term goal is innovation, the main reason to engage in research partnerships seems to first and foremost be knowledge building, which can be used for present and future projects alone or in combinations with existing knowledge. Other reasons mentioned are networking and the need to solve specific scientific challenges. One respondent is mentioning that University researchers can do knowledge-oriented work that otherwise would be

[3] To see the whole list please see appendix 8.1.1 table A

difficult to justify in an internal system for project management. So a reason to work with University is also to do with the possibility it gives to research something, that might not be of first priority to the company, but still of interest. As the cost of collaborating with universities is normally smaller than if the company itself has to do the work, some work can be justified if it happens in such collaborations.

Industrial partners are quite successful with knowledge building in relationships with FOOD. 63 % is successful (43%) or highly successful (20%), while 26 % answered somewhat successful. Crossing those answers, where knowledge building is key to engage in partnerships, with success of new knowledge learned (Q4a with Q9), shows a positive relationship between success with knowledge building and where the focus is on knowledge building. Doing the same for success with new innovations and where the innovation was the main driver (Q4b with Q8), did not show the same positive relationship. One reason could be that it is more difficult to achieve the creation of new innovations than knowledge building, so even though innovation for some might be the primary reason to engage in partnerships, it does not always materialise in new innovations.

83% of industrial partners both have experience of partnering with multiple organizations within the same research project and welcome other companies to join projects, which is established with FOOD (Q17 with Q18). This indicates that they have good experiences with multiple partners in research collaborations. Interestingly, of those that welcome multiple partners, only 30% is interested in sharing knowledge with them if they are close competitors. If they are not competitors, then sharing of knowledge is not a problem for 91%. Some conclusions can be made form this; first, some of that knowledge that cannot be shared with competitors seems okay to share with non-competitors, as it does not create a threat for the company. Secondly, even though firms say they are prepared to work with multiple partners in a research project, which is one indicator of open innovation, they are not to fund to share knowledge with competitors. This is a dilemma in open innovation, that firms can benefit from shared collaboration and knowledge exchange, but they are afraid of competitors using that knowledge against them. Another indicator of that open innovation is not used to its full potential by many of the industrial partners are these statements; 35% never sell, license or share knowledge that they cannot use themselves. 52% does sometimes

and only 13% does always, whenever possible. As this concerns knowledge that cannot be used by the focal company it holds a lot of potential for selling, licensing or sharing in other ways, hence there are a lot of unused potential for the majority of those companies for knowledge exploitation.

The ones that acknowledge the need for collaboration with external partners (those who are positive towards open innovation) are generally also positive towards collaborating with multiple partners in the same research project. The fact that respondents are positive towards collaborating with multiple partners could be a result of good experiences with one-to-one collaborations.

55% of respondents have established relationships of an informal nature with their partner, which according to them, can be used for knowledge exchange. There is no real difference between those who have established relationships of a more informal nature in addition to formal relationships, and those who have not, in how they perceive how easy it is to transfer knowledge. This could indicate that though relationships are important for the innovation process, as depicted in the literature review, the informal ones may not have an advantage over informal ones, when it comes to the transfer of knowledge. This being said, collaborative innovation seems to be positively related to close relationships, in which informal relationships might be contributive. For example does some respondents indicate that informal relationships happens through personal contacts in which some become friends, it can stem from former colleagues, a deep knowledge of the department and the people there, and those contacts can lead to informal meetings where ideas are exchanged and developed. That is likely contributive to the innovative process.

Barriers for future collaboration with FOOD that respondents see is mainly disagreements on IPR but also funding, politics at KU or at the industrial partner, lack of student interest, lack of willingness to see them as true partners and geographical proximity (where long distance as one respondent explains it: “makes it difficult to have regular face to face meeting which build long term relationships”).

Ways to improve relationships are as respondents claim: “more working together”, “more involvement, communication, meetings and more listening to us”, “much more contact and build on the relationship, prepare and discuss projects in really good time”,

"more drive from KU", "easier access to small projects where 50% is paid by public funding", and "more focus on delivering results".

5.1.1 Conclusions on the Questionnaire

The overall aim with UI collaboration is according to respondents to build knowledge. They choose partners based on quality in research, competencies and capabilities making sure there is a fit between scientific areas and interest. Industrial partners seek mainly ease of collaboration, commitment, support of company goals, complementary skills and results. Open innovation is not used to its full potential. Companies could use and profit from knowledge more effectively and work with other companies and competitors for increased use of knowledge. Collaborative innovation seems to be positively related to close relationships, indicating that having a close relationship with ones partner is good for the relationship and the innovation output. Lastly, more involvement, communication and working together are ways to improve relationships, indicating that FOOD can be better at making close relationship, which is highly valued by their partners.

5.2 Analysis of Interviews

Coding the 6 interviews led to 240 separate codes that were ordered into 8 categories. The categories were constructed by applying the same categories as found in the theory and in addition some new categories had to be developed to describe the codes. Also, the wording of some of the existing categories was changed to encompass the breadth of the codes.

The 8 categories best describing the codes and the number of codes assigned to each category can be seen in the following table: The first five categories can be described as first tier categories of the relationship. The last three categories are grouped into a second tier. First tier categories are directly affecting the relationship, whereas those in the second tier form the basis for the collaboration and categories in the first tier.

First tier categories	Number of codes
Collaborative factors	68
Knowledge management & IP	42
Personal relations / interaction	37
Dilemmas and challenges	36
Competencies	21

Second tier categories	Number of codes
Basis for collaboration	32
Risk	3
Governmental influence	3

Table 2: Overview of Categories and Number of Codes

Each of these main categories will now be analysed for how it affects relationships. Some of the main categories will contain codes that are further divided into sub-categories. Each category or sub-category will have its own section in the analysis.

5.2.1 Collaborative Factors

The five sub-categories which form 'collaborative factors' belongs in this category because each factor affects the collaboration directly.

5.2.1.1 Relating to the Partner

In a successful collaboration, partners create good relations with each other. Good relations, even liking the partner on a personal level, are helpful to make communication and problem solving go easier. Though partners are assumed to be professional and know they work together to solve a problem, one cannot ignore that

human interaction depends to a large extent of the chemistry between people. Liking another person makes it easier to communicate and when communicating people tend to get more creative, which is important for the innovation process.

To relate to another person, trust first has to be established. Trusting partners make it easier to communicate and for example ask of advice when needed. One situation mentioned by one of the participants concerned the different language that can be between academia and industry. To be able to understand what a researcher has found and what implications it has, one might have to ask to have it explained in a way that is understandable to that person. This will be easier to do when the partners have a trustful relationship and feel comfortable with each other. Trust can also make partners skip formalising agreements regarding IP and project plans, because they feel that issues and direction can always be agreed on face to face, as the project moves forward. Or in the case of Sisse (FOOD) who applied for a patent, without any formal contract. In this case trusting her industrial partner was also the reason why an oral agreement felt sufficient. As great as it might seem to avoid rigid and formal structures, which can slow down and even limit innovation, no or loose contractual structures is more risky. It may make progress difficult and cause confusion and misunderstandings instead of easing collaboration. This I will return to when dealing with 'communication and collaboration' later in the chapter. Partners need to have some level of trust in each other and believe that there are no hidden agendas they need to control for, if the collaboration shall be successful. Chances are that when a trustful relationship grows on a personal level, it will have a positive effect on the innovation process as well, as communication becomes easier and allows creativity to spread.

To reach a trustful relationship, accepting the partner and his/her competencies is an important factor. Without accept it is not possible to trust and be willing to share ideas and communicate in a way contributively to the collaboration. But even though accept of each other might be present, other factors, e.g. prioritizing resources for other projects, might hinder the best utilization of resources, equipment as well as researchers. This was the case when Marianne (FOOD) was using the facilities in Novozymes in a collaborative project, but could have wished for closer collaboration and sharing of tests and screenings, in cases where her research was overlapping with the internal research in Novozymes.

5.2.1.2 Communication and Collaboration

Communication and having a good dialog has been stressed by all participants to be a very important factor, to succeed with collaboration. Bad communication or discontinuous dialog can result in that the project goes off track. One participant explained how the University researcher had been researching irrelevant things, which meant that months and money had been wasted, due to insufficient communication. Besides these immediate costs, bad communication is also problematic for competition, especially if the company is in a hurry to launch a new product. Close communication also includes that partners are good at giving feedback and updates, so they jointly can make decisions and progress. Close communication and sparring with the partner is more likely to lead to innovations. Having close communication with the partner during the whole project is therefore very important. By continuously communicating the partners have the possibility to develop a relationship that goes beyond the current project, which can be valuable for later access to knowledge, forming new projects and develop on the existing one.

Also of utmost importance for participants is, from the very start of a project to establish common goals, or to “find a balance” as one participant describes it. This is often done through a project formulation. Talking together about the different objectives that partners have and from there find common ground is the basis for clear direction throughout the project. Different requirements to meet and different needs between partners makes communication crucial, to reach an understanding of the other partner and agree on common objectives. Setting up very concrete milestones and agreeing on who performs different activities, is necessary to avoid misunderstandings. To be able to understand “where the shoe pinches”, as formulated by one participant, one has to put himself in those shoes and look at the problem or opportunity from the perspective of the partner. That can make it easier to argue for ones own objectives. Communication is also important to clarify what can be published, taking into account both partners interests, the firm making sure not to disclose confidential information while the University tries to spread knowledge and to secure a standard so others can repeat the research. Having a good dialog about what can be disclosed shows goodwill, clarifies concerns, and makes the relationship stronger.

To follow a time schedule also makes it easier for the sometimes impatient firm to put up with, from their perspective, slow University. Following a plan provides structure, which makes it easier to measure progress and stay on track. On the other hand the plan should not be so rigid that it limits the researchers to follow a lead. Having objectives, budgets and time frame in mind when dealing with new research direction is important to arrive at a satisfying result. In one of large projects with multiple partners, a participant found that formal project steering was necessary to keep focus and time schedule. Dedicated persons were responsible for steering the project. A disadvantage in small projects might be that finances are limited, so steering the project is often done by the researchers involved. The many tasks that they have to perform, makes close communication and dialog with the partner and other stakeholders even more important.

5.2.1.3 Interest and Commitment

A good collaborative partnership cannot grow out of nothing. Even though resources and capabilities are important factors there also has to be a minimum level of interest from both partners. Without personal interest, partners will find it hard to have that drive that is so important for creativity and innovation. Having profoundly different interests is a common reason why partnerships fail.

Taking responsibility for the project and for each other helps to overcome obstacles. For example by relating to the others strengths and weaknesses, one can identify how best to deploy own strengths. A close relationship allows investigating such characteristics of the partner and having a good dialog about it, which might reveal new insights. Formulating project objectives and agreeing on budget while putting own agendas aside shows responsibility and give a good foundation for a healthy relationship.

Interest has to go hand in hand with staying committed to the project. Commitment should be supported on a personal, project and organizational level. The researcher has to be committed on a personal level to fulfil the job and its objectives. One researcher mentioned that all she was interested in was to get her name on the research. That is, to be acknowledged for her scientific work, making good research that can be published. Though common objectives and similar interests are important,

having a personal interest and objective, seems to be contributive to staying committed to the project. Equally important is support and commitment from management to allocate sufficient funding and other resources. It is actually one of the main challenges to allocate sufficient resources. An issue for Novozymes is that allocation systems are not optimized to prioritise research projects, before they become an internal development project. That makes commitment (as to work around the allocation system to assign resources anyway) and management support that more important. The formal responsibility of getting results often lies with the University researcher, but as the industrial partner are involved directly and is interested in the best results themselves, they should help whenever possible.

Mutual commitment between research partners helps to keep the project on track. One issue is that researchers might be committed scientifically but lack the skills or motivation to master other tasks such as project steering and gate keeping, which is necessary to see the project through. Acquiring those skills or leave those roles with someone else when possible should be prioritized.

5.2.1.4 Understanding the Relationship

Crucial for the good relationship is agreement on objectives and project plan. To be able to do that collaborators have to understand the needs of ones partner, while also making sure to be clear about ones own needs, when negotiations and agreements are made. Partners have to get close to each other by communicating, so as to understand the others perspective and reasoning, and be able to understand where value can be generated. That includes assessing how the partner tries to create value for its own customers.

The basis for collaborating is that each partner can contribute with something the other value, and that the joined resources and competences create value for both of them. Therefore a good collaboration requires partners to know as much as possible about the reasons why the other is seeking a partnership. The partners should each contribute with relevant resources and it might be helpful to talk about what those are and what resources are needed. In relation to this, partners should be honest and not overpromise on competencies. That will only create frustration later in the project, if those competencies are not real. One has to remember that often the only thing that

bind partners together is the mutual need for the others resources and capabilities. If those are not sufficient or provide the expected value, partnerships can easily be terminated.

5.2.1.5 Physical Presence

Another factor that has been mentioned both in the interviews but also in the questionnaire is the factor of working together on the project in terms of collaborating side by side. It makes it a whole lot easier to be in close proximity of each other when working physically at the same place. Having access to equipment and facilities at one partner is one thing, but when both partners work together physically, it facilitates new possibilities and positive synergies. One participant explained why physically working together, was important for the project: *"The immediate communication that is possible when working in the same space can both create new perspectives and ideas, and facilitate better handling of problems we might face, how to understand some data or agree on how to proceed"* (Mikael B. Sørensen, Novozymes). The risk of loosing the momentum, when one has to wait for a project meeting is higher, than when working physically together. Creativity might also be better utilized in a space where partners are both present.

5.2.2 Knowledge Management and IP

Creating and obtaining new knowledge is the main driver and reason why organizations enter collaborative partnerships, which makes knowledge management important for successful collaboration. As we saw from the questionnaire, building knowledge was even more important than creating new products, mainly because knowledge can be stored in organizations and used in combination e.g. for the development of new and future products. But also by the fact that to be granted funding, the project has to concern development of knowledge that is not specific to a single product innovation. One participant explains that acquiring knowledge for him has two purposes. First is to understand the possibilities for the development of new products, and second is to understand even better and optimize existing products. Another participant explains, *"Knowledge might alter the product slightly, but the new knowledge generated will mainly be used for validating the technology and fine-tuning*

it" (Henrik Jeppesen, Dantech DK). Thus companies also use universities as an authority that can test and validate an existing technology. In this case it is important that the company accept the role of the University and acknowledge their authority by letting them objectively assess the technology using different tests, increasing the products credibility. Developing a veru close relationship, partners, especially FOOD, should be careful not to get biased and uncritically follow the path that the comapny directs. Being aware of what role a partner play and what is ones own role, is crucial to get most out of the partnership.

Participants recognize that some knowledge can be difficult to transfer. Important to succeed with transferring tacit knowledge is close communication, asking questions through face-to-face interaction. "*Often as the knowledge is context specific, people need to come and ask*" (Marianne L. Lametsch, FOOD). Likewise should the knowledge holder be proactive at disseminating knowledge, taking the perspective of the one receiving the knowledge to find out how best to explain or show it. There is agreement that close relationships makes it easier to co-create and transfer tacit knowledge and when partners work in the same locations, knowledge can more easily be adopted by employees and embedded in the organization. However, University researchers often use time alone in the University without much sparring and co-creating with the company. Several University researchers also use more time at company locations than their partners use at University locations. Working closer together will also make it easier to get to learn each other's cultures, values and ways of working, and in turn easier to accept each other, which will improve the relationship. Though project steering group meetings are important to update everyone involved and agree on future direction, much of the creative knowledge creation takes place in locations where people work together on specific issues. Tacit knowledge can both be useful in the current project, for example in later stages of development, but also when researchers engage in future projects. Learning becomes a benefit of knowledge when embedded in the organization.

Publications are useful for embedding explicit knowledge and for making others build on that knowledge. Not only tacit knowledge transfer benefits from close collaboration but so does explicit knowledge transfer. For example is a close relationship and mutual

understanding between partners needed, when partners agree on what to publish and when to publish scientific journals. It is important for the process that partners are open about what to publish and the concerns related. This is better done from the very beginning as to make sure that both scientific quality and protection of certain knowledge is looked after. To avoid frictions, partners (especially the company) should not be too focused on keeping everything secret. Then publication becomes nearly impossible.

Even though a UI partnership should not be competitive, industry do not want to share all knowledge with the University. The knowledge that is core to its operations and products are kept for themselves. That makes it more difficult for the University to know exactly how new knowledge can be applied, leaving the responsibility to the company alone to use that knowledge.

Managing IP is a major concern for both industry and University. Some look at it as a necessary evil that just has to be agreed on so the project can move forward. IP is not the main objective of collaborative research. Because of the uncertain nature of research, results are not given, but it is important to agree on IP so no disputes about who owns what and on what terms becomes a problem. All participants find it important that IPR are agreed on in the very beginning of the project along project formulation, objectives and budget. It can be difficult to agree on something that is not yet invented or knowledge that is not yet produced, but the main point is ofcourse to agree on the major terms of what to do in case IP becomes an issue and not only solving it when it is already an issue. With time, when partnerships develop into good relationships where trust and an understanding between the partners are developed, IP tend to become less of an issue. If the relationship on the other hand is characterised by mistrust and opportunism, IP can easily cause disputes.

Agreeing on when to publish is another issue that relates to IP. In the project with Novozymes, partners agreed to postpone publishing until there was an opportunity for patenting. It is important that they do not reveal information that is later used in a patent application because then it cannot be patented (the rule of prior art). Marianne already had material for three articles, but wanted to wait until a patent could be filed, as she would like to have one. It could also have been the case that Marianne did not want to wait but the company did. To avoid different interests, partners should

therefore include each other in regards to feeling part of the project and be acknowledged for the work, e.g. by putting relevant names on publications or patents.
In another project where Novozymes worked with several partners, IP became an issue from the beginning. "*One of the partners where not willing to contribute, but only wanted to extract knowledge from Novozymes*" (Mikael B. Sørensen, Novozymes). It shows that discussing IP up-front can help partners to clarify objectives and approach of the other partner, so IP is definitely something that should be managed right from the start.
According to Marianne (FOOD) the University increasingly requires IP rights but because the department managing IP issues are mainly lawyers, it can be difficult for them to know the project, possible IP and the history of the partners. Therefore disagreements can easily surface, so involving researchers, the people that is going to work together in the negotiation process, is critical for the continued relationship. Close relationships and trust can make it easier to handle IP where the contractual way of handling IP, in the form of a confidentiality agreement, or the informal way, in the form of secrecy or publishing, fulfil the need for protecting IP. When trusting a partner there is also a risk that he/her will not fulfil the agreement. It must be up to the partners involved in collaboration with the IP department to assess how trustworthy the other is and from there decide on what is the most appropriate way of managing IP. If the relationship is new, a contractual way of managing IP will probably be preferred. Participants seemed very concerned protecting IP, but as the literature on OI advocates, partners should carefully consider if IP should be protected, shared freely or sold. This depends on what value it has to the IP holder, the market and competitors and if it is core to the organization or not.

5.2.3 Personal Relations and Level of Interaction

For participants, building personal relationships are very important. Good personal relationships between partners make collaboration easier and improve communication, and in turn the outcome of the project. People get more motivated to do their job when relationships are good. Partners do not need to be friends on a personal level, but professionally there should be a good personal relationship between them. It gets easier to talk about the project when one trust and respect the partner. Like one

participant explains: “There is a very positive atmosphere, we always start the meeting with a big hug which lowers the barriers and makes it easier to start talking” (Anne Elsser-Gravesen, ISI Food Protection). In the two separate projects where I observed a meeting between FOOD and its partner, also in these cases were there a very friendly tone and it was obvious that partners were comfortable and respected each other. Their desorptive capacity seemed developed as it was made sure that the partner understood what was being said, by asking him directly. The partners had been developing their relationships over many years, from working together on different projects. In the meetings there were also other persons. One was what the researchers called a “mentor”, overlooking the project and giving his opinion when he saw the need. There was also another researcher, not directly involved, but who attended meetings to contribute with her experience and knowledge. Using peers in this way contributing with their knowledge and opinions improves quality in the project.

It is common practice in companies that relationships are highly valued and it is expected that one can build necessary relationships. While not generalizing, researchers at universities might to a less degree be concerned with developing their relationship skills, as what they do best and have an interest in is research. Some is more concerned with developing their scientific knowledge and skills. However to use those skills in collaborations, it is important that researchers make an effort in developing relationships with partners by improving communication and project leader skills.

Several participants agree that projects are often randomly created. In one case it was a business contact at KVL that knew a person at FOOD that he thought could do the job. In another case, the mentor of the researcher at FOOD suggested that she should contact his contact at Novozymes. Novozymes wanted to follow up on a former project and that match was enough to establish research collaboration between the two. Good networks are essential and just like finding a job, partners are often found for research collaborations using ones network. It makes it easier for a partner to choose whom to collaborate with, if someone has recommended that organization/person. Partnering seems to be quite accidental though. One participant believes that more should be done to match personalities. Another participant agrees that successful collaboration requires finding the right persons for the project. Different personalities have different

ways of working and relating to people. Matching only happens from a professional perspective, where skills and resources are matched with the needs of the company. The fact that people have different personalities and would work better with some than with others is completely neglected. It was suggested by participants that FOOD should have a person who matches people at the University with the company and find the right persons to collaborate with. It would give the project a good start if people should not be substituted because of misfit and relationships would evolve easier as well, when personalities fit each other. “Being extrovert is an advantage and makes it easier for oneself” says Marianne from FOOD. Being extrovert would often be expected in collaborative partnerships where close interaction is needed, for example when discussing or validating results, but more important is it that personalities fit each other, so partners will find it easier to work together. Though a personality match should be pursued, the collaboration will also benefit from partners having different backgrounds regarding experience and expertise. It may create new inputs and different perspectives on a subject. In good relationships partners should be able to speak about good things, progress and results but also they should be able to speak about problems and how to move on. Having a good relationship makes it easier to speak together. One participant found it more difficult to establish common objectives when multiple partners were involved in a project. The many different objectives that may be present when many partners work together, makes it more difficult to align interests and find common ground. It might also be related to that building good relationships with multiple partners may be more difficult, than when there is only one partner involved. Thus, engaging in projects with multiple partners seems to require more effort. The level of collaboration also affects success for the partnership. When working closely together and spending time with the partner, it increases the knowledge about the partner’s competencies, strengths and weaknesses. This knowledge can be used to determine when to make use of those competencies and when the partner may need outside competencies and resources to compensate for own weaknesses.

In projects where partners work in separate places it can be difficult to establish a good collaboration because interaction is not optimal. Working at the same location makes little sense though, if the degree of interaction is low. Partners should actually

communicate and use each other to benefit from being together. There is general agreement among participants that partners share the responsibility of developing and maintaining a good relationship, but that the roles they have may be different from one another. As both are responsible for the personal relationship between them, they may contribute to the overall collaboration in different ways, depending on resources and capabilities and how they best can make use of them to support the project.

5.2.4 Dilemmas and Challenges

Industry and universities have different interests and objectives when engaging in research collaborations. It is clear to all participants that dilemmas and challenges arise when University and industry form partnerships. If knowledgeable about these challenges it is easier to deal with them before they seriously damage the relationship. While industry is interested in developing and acquiring knowledge they can use for optimization or development of processes and products, universities are more concerned with developing knowledge that can be published and eventually used for educating students. Acknowledging that each partner have own interests and requirements to meet, by openly communicating about it, makes it easier to agree on objectives. Partners should face the differences and find a solution that works for both of them.

FOOD researchers are less result oriented than the industry. Contrary they like to go in-depth with the research and understand things down to the smallest detail. Depending on the kind of project, that can be frustrating to the industrial partner. For some of the participants, a feeling of that time is wasted suggest priorities might lie somewhere else than to repeat work for purposes of validation and excluding other causes. In one project, it was important to know the details of a technology, so going in depth and using time on potential factors was supported by the company. In another, it was more important to get an overall picture of possible scenarios and in that situation the company just wanted to move on. Therefore it is crucial that partners define the project and agree on what the focus area and time horizon is, so unnecessary research and time wasted can be avoided. Wanting fast answers to difficult questions without wanting to wait for those answers was the experience one researcher at FOOD had with the partner. It was seen as a big challenge to overcome. Being fair, honest

about expectations and not demanding impossible results in a short time is better for a relationship than the opposite. Also in this case, where partners have different expectations of using time in the best way possible, a project plan with deadlines and milestones should be helpful to secure satisfaction. It makes it easier for the researcher to stick to the plan and point to that, if the company gets impatient. The difference in organizational culture was by one participant turned into something positive. She made some basic documentation to steer the researcher from FOOD in the right direction, so time was not wasted on irrelevant research. In that way she saw the weakness of the researcher, not using time most effectively by being too thorough in a too early phase of the project, and complemented with her competence of cutting through to the relevant data.

Having different time orientations also means that companies can get the feeling that the University do not have the urgency and commercial focus that companies have. It is a challenge but the University should balance their focus on general research with a commercial focus. Applied research makes the collaboration more interesting as well as valuable for the company. Generating more value, the partnership will likely be better and more productive.

One participant experienced that in the initial phase of the project, his partner and himself had to “pull out the knowledge” of FOOD. They wished for FOOD to be more pro-active so the burden of getting the project off to a good start was not only on them. It might be hard to know exactly how a partner can contribute to the project, especially when the partners are new to each other, which makes it important to proactively engage and share their interest, ideas and competences.

One dilemma that researchers at FOOD faces when collaborating with industrial partners, is how to balance their responsibilities at FOOD and the basic research they are doing, with the research project. Prioritising work seems to be a success factor for projects. That means researchers should have the time to engage in their specific research project and turn down other work, if necessary. Likewise the industrial partner should set aside sufficient resources so for example laboratory technicians are not prioritised for other projects, like one FOOD researcher experienced. It is also a challenge to manage several projects simultaneously as it drains resources. Prioritizing the project by assigning enough time and resources are fundamental to success.

There is also a challenge in companies focusing on protecting their product development and IP from competitors, even universities. More than one company preferred to use FOOD for basic research so they either could verify a technology or use that knowledge for “a real” internal project. The limited co-creation of knowledge and products, because of needs to be protective means that the potential of the partnership is not utilised to its fullest. The challenge is to make the most out of the open innovation collaboration by using the capabilities of the partner for as long as the collaboration ads value. Though trust might be well developed for a current collaboration where the company does not risk much, a greater level of trust is needed if a company should collaborate with FOOD in later stages of product development.

5.2.5 Competencies

Professional competencies are very important. Without those skills and competencies that a partner is looking for, there is no basis for collaboration. All partners should contribute with something that is valuable to the project. Each partner should also have professional competencies that are complementary to those of his partner, so new knowledge can be created and problems solved. Project leader competencies are also necessary. With small projects where only few people are directly involved, researchers also has to be good project leaders as there often are no dedicated formal project leader. One has to be able to see the needs of the partner to make agreements about objectives and a project plan. Proactive listening is necessary to identify those needs and problems the partner faces, and have a dialog about them. Being good at communicating is an important competence and it is the basis for making agreements. One must be able to clearly explain oneself and the thoughts and concerns he has about the project, but at the same time listen and make sense of that information, discuss the different viewpoints and finally agree in collaboration with the partner. Being able to adapt to the partners culture is also critical. This may include adapting to a different time horizon, way of communicating and reporting etc. Motivation, a personal drive for working, and being curious both personally and professionally, reaching defined objectives and succeeding with the project was also of main importance to participants. Work gets easier done and better results will be made when one is motivated. A positive work environment where partners are interested,

motivated and want to work together is more likely to create a better relationship and better results. One participant had to let a member of his project leave, because the scientific skills needed and motivation could not be found with that member. Being good at collaborating were also mentioned as critical, but is likely to cover some of the competencies already mentioned. Especially important for University staff is to be goal and industry oriented, a highly sought competence by industry.

5.2.6 Basis for Collaboration

During the interviews, participants revealed what make them seek collaboration, what is the basis for collaborating. While not directly being factors influencing the partnerships, this information can be helpful in understanding their different roles. Clarifying roles will give partners a better opportunity to communicate and act on their interests towards partners, which in turn will result in a better understanding between partners and a better relationship.

Universities can by collaborating with industry get insights into the application of knowledge, that is, how knowledge can be valuable in product development. This can give them an idea where future research is needed and relevant for the industry. For the industry, getting new perspectives and inspiration are important drivers for collaboration. For some companies, acquiring general knowledge in a field can explain root causes and effects on their technology, even validation of assumptions, which is important to achieve a better production or a better product. Better understanding a product makes it easier to innovate on it and if needed, find a solution to a problem. Focus should be on that all partners should benefit from the collaboration. As mentioned earlier, participants from the industry mention two main reasons why to engage in research collaborations. First, to expand ones own horizon and understand new possibilities for product development by acquiring knowledge. Second, to understand better what they already do (existing products). Contract research is also used by participants but is only used for specific applications and is more expensive than research that can be partly funded by government bodies.

Saving on cost is also a benefit of collaborating with universities. “It is more expensive to use own resources than using a University partner” (Mikael B. Sørensen, Novozymes).

Universities should also accept their responsibility of collaborating with industry, in line with teaching and doing general research. One participant claimed that it was quite a challenge to make them acknowledge their responsibility. If he is right it suggests that collaboration is still not a main priority at universities, or at least is the culture not embedded with all employees.

The Novozymes project with FOOD is for Novozymes an inexpensive way of testing something that might have the potential to become a real product. If successful they will adopt it as an internal project. University researchers only seems to be involved in the early stage of product development and one conclusion could be that Novozymes does not want external collaborators to get too close at their end product development. In this way they exclude what might prove a valuable knowledge source and resource for later stage product development. It might decrease motivation and dedication for the FOOD researcher, by not having the chance to follow the project through. Mikael from Novozymes explains how FOOD is part of a cyclical process; “The best product development projects involve customers so the product can meet their demands. But it is a cyclical process that also involves universities, to acquire that background knowledge which is important to make a better product”. For Novozymes it should be valuable to maintain the relationship and let the researcher still be part of the later stage product development, at least with some involvement, as the capabilities of the researcher might prove valuable in a later cycle of collaboration. To help the researcher stay motivated and maintain the good relationship the company should consider allowing some involvement.

Both of the FOOD researchers interviewed gets satisfaction from doing useful research – research that can be used by companies. It is important for their motivation, which suggests that companies should let them follow projects through. The fear of sharing knowledge with external partners should be questioned to be reasonable or not, especially when partners are University researchers. They do not have the commercial interest to the same degree as they have in the industry.

5.2.7 Risk

Participants did not talk much about risk. Maybe because, when agreements have been made, trust is needed to believe that the partner will also work for the objectives that are agreed on. However, one participant explained that the largest risk for universities are that an industrial partner will change its focus and give up on the project. For that to happen, either something else will have to take priority, or the project will not produce the expected value. In the prior case, any partner cannot control for what happens in the external environment. In the latter, partners has some responsibility in creating value for oneself and his partner. Again, having a close relationship, where one know the needs of the partner, concerns and ways of accessing value, will help to reduce the risk that the partner withdraws from the collaboration. A partner exiting a collaboration is more likely to be the company as they have a commercial interest, meaning they are the ones who have to make the strategic choices regarding which projects and products to pursue. The risk they face mainly concern the collaboration, if objectives will be met and if the partnership will turn out valuable or not.

Marianne (FOOD) explained how companies should make up with themselves if the project would still be valuable after three years. Some tend to forget that a research project normally runs for that amount of time. Market needs may change during the time of the collaboration and so the need for research into that area. The risk of changing needs makes it important to be on top of not only what happens with the research and needs between partners but also in the environment, to follow trends and new knowledge. The objective has to be, always to create value for partners and their customers.

Another risk identified by Mikael (Novozymes) is that resources needed for the project cannot be found. It often happens when other projects take priority and therefore claim those resources. Resources and time are sometimes found outside what has been allocated to a specific project. Still, commitment and prioritization of a project, for example to cut down on the amount of projects that they are engaged in, from the company's side, is necessary to secure adequate resources.

5.2.8 Governmental Influence

Many research collaborations only gets established when they can obtain funding by for example a government body. It is not allowed to directly finance specific companies in research collaborations, so the research subjects has to some extent be general, to be eligible for public funding. One requirement can be that the general society has to gain from the research for example by less environmental impact or more jobs. Like one participant explained: “To get a project funded, it has to be translated from what the companies want to what the funding body want to support”. (Anne Elsser-Gravesen. ISI Food Protection). Therefore do the funding body have a considerable amount of power. Not having a very specific purpose and application of knowledge, a research collaboration which is partly funded, is easier to justify engaging in, than contract research which is much more costly. A company may feel the need to acquire more knowledge on a subject, understand a product better or investigate future possibilities, and for that purpose a University/industry collaboration is well suited. It is important to remember that research collaboration between University and industrial partner is not a project owned by the industrial partner alone. The University should understand clearly what the partner wants when they negotiate the project plan and objectives with the partner, so they can be the best possible partner, but they should also benefit from the collaboration themselves, fulfilling both their own and common objectives.

6.0 Discussion

6.1 Aligning Theory and Empirical Data

In this chapter the literature review and analysis will be compared to see how the data relates to each other. I will also try to find which factors are more important to impact relationships. Several things have to be considered to assess which factors are most important. The number of codes in a category depicts how often participants mentioned something that relates to that category, and one could argue, how important a category is. On the other hand the importance of a category or factor also depends

on how it is related to the other factors. From the interviews, the highest amount of codes subscribed to a category is collaborative factors, but it consists of five sub codes. Therefore it would be unfair to say collaborative factors are more important than knowledge management & IP or any of the other categories. It is not enough to look only at which factors are mentioned the most, but also to assess the relations and dependency between factors and from that make an overall assessment of which is more important.

6.1.1 Dependency Between Factors

First it is necessary to explain the dependency between the different factors that impact relationships between partners as outlined in the analysis. There are some major factors that directly affect relationships. These are vital to obtain and maintain a good relationship: Communication, trust and close relationships. Communication affects every aspect of relationships, and close relationships make it easier to communicate. Trust changes the way of communicating and relating to the partner. These three major factors are not only separately important to relationships, but also interdependent. Communication connects partners and facilitates understanding of needs, UI interests, strengths and weaknesses, personal interest and motivation. Continuous and close communication throughout the collaboration helps keeping the project on track. Communication becomes crucial when partners need to agree on the terms of the project; IPR, what and when scientific papers can be published, the project plan and common objectives. Openly communicating about own interests makes it easier for the partner to understand the differences, which makes it easier to negotiate and make common agreements. The terms should all be agreed on in the initial phase of the project, but other factors need to be present to make that happen; Trust, proactive listening, interest, honesty and setting the project before own objectives is needed to come to such agreements. Motivation and proactivity help the project to get a good start, but is also needed during the project. Personal competences are important for both the professional and social aspect of the relationship. Being extrovert is also an advantage. Partners should be able to adapt to the others culture and understand how the culture impacts his/her decision-making and ways of working. Managing the project as well as the partnership requires

competencies in project management along with other professional and social competencies. Having these competencies makes it easier to communicate and get a close relationship with the partner.

Sufficient time and resources also has to be allocated to the project, which means that support and prioritizing the project from management is crucial. For the partners to stay motivated there is a need for accepting each other as true partners involving each other in the work and progress. Especially the company should let the University researcher stay involved for as long as possible, both for present and future benefits of accessing and creating knowledge. Trust is needed for the company to let the University partner get more involved. Closer relationships and experience with the partner contribute building trust.

Trust is needed to get close to each other, but to earn the trust of a partner, one has first to build a relationship based on experiences with the partner. Decisions about trusting a partner, is weighted against the cost if that partner breaks the trust of the focal company and the benefits if trust is not broken. As the benefits are uncertain, but the costs are easier to calculate, it is easier not to trust, as there is no risk associated. If a partner does not have any experiences with the other, which is the case in new partnerships, the partners should trust each other until proven otherwise. Meaning, that as long as the partner is keeping his promises, act in ways that are agreed on and follow the project plan, there is no rational reason not to trust him. During the progression of the project, trust will be underpinned by the good experiences with the partner, which will facilitate even more trust between them. The main reason partners work with each other over and over again is because of good experiences, where trust has been build.

Sticking to the plan when possible and meeting deadlines and deliverables is important for a good relationship as it not only shows that both partners can adhere to the common agreements but it also increases strust. Using time together in the same workplace can lead to a better understanding and accept of the partner. It can also increase co-creation, creativity and quick decision making, which will contribute to better results. The more successful the course of the project and the end results, the better the partnership is likely to get. Growing and nurturing relationships increase trust between partners. Communication, close collaboration and interaction are also

important for the creation and transfer of knowledge. Smooth collaboration depends on close relationships. Matching personalities can create better teams and partnerships, and make it easier for partners to trust one another. Liking the partner as a result of matching personalities influence how communication flows and how partners interact. Thereby a closer relationship will be created. As can be seen, there is great interdependence between these factors.

6.1.2 The Most Important Factors

It is more difficult to see if there is any one factor that is more important than others, because of the interaction and interdependence between factors. Not only does the individual factors impact relationships, but they also impact each other. For example can trust facilitate that agreements can be made. When agreements are made it is easier to be committed and motivated as the project is defined and objectives clear and relevant to both partners. Being committed and motivated may increase creativity and make partners work closer together. This will lead to better communication and collaboration, improving the relationship. While this is only one example, many other cause and effect relationships exist. Some of the most important factors for good relationships are those that form the basis for others. It is those factors that not only on its own impact relationships but impact other factors as well. This is the case with trust. Without trust it becomes very difficult to communicate constructively, make agreements, jointly develop and share knowledge and generally succeed with the collaboration. Also very important is an early agreement of IPR, project plan and objectives as such agreements affects the later collaboration by reducing dilemmas and challenges, and it affects the relationship and success of the project positively by creating structure and common objectives that both partners work for. Communication is probably the most important factor of all. Without communication there would not be any collaboration. The level of communication, how often and with what level of interaction, affects how close partners work together. Therefore communication also affects the level of co-creation, involvement, how knowledge is transferred and the general understanding of the other partner and the project. Close collaboration is very important for collaborative partnerships, but not so much for contract research, which is based on pure transaction and minimal involvement. How close partners work

together has an impact on how they communicate and use each other for knowledge creation. It also gets easier to get to know the partner when they collaborate closely, which are important for a successful relationship. If these factors should be acknowledged as the most important factors for creating good relationships it is still important to remember that there are other underlying factors that have to be met as well. For example those mentioned in “basis for collaboration” which mainly explains the roles partners play, why they collaborate with each other, are important to know. Partners should know the basis that all industrial and University partners should contribute and benefit from the relationship. Finding the balance by being knowledgeable about the partner’s motivation and interests and act on that knowledge while still fulfilling own needs are key to a good relationship.

6.1.3 Differences Between Empirical Data and Literature

When looking at the theory many of the factors that are identified through the literature review, are also recognized by participants. Differences and conclusions from comparing the literature and the analysis will now be accounted for. Not to repeat myself, not all factors will be discussed here, but only the relevant ones where differences or gaps between literature and empirical research are present.

6.1.3.1 Knowledge Capacities

First it is worth noting that the participants, both those answering the questionnaire and interviewees did not talk much about what is in the theory termed absorptive capacity. Absorptive capacity is synonymous with recognizing, acquiring, assimilating and applying external knowledge. In UI exploration modes of open innovation, the ‘customer’ would normally be the industrial partner and the ‘supplier’ would be the University. Approaching a potential partner for collaborative research is based on ones competencies in identifying needs and application of knowledge with that potential partner. The initiative of finding a partner, as it was seen with the interviewees, can originate both from the University and from companies. The University will need its desorptive capacity, as reaching out to the industry can be compared to the exploitation mode of open innovation, and companies need their absorptive capacity for their knowledge exploration. When partners transfer knowledge and technologies,

the success of the transfer depends on the recipient's absorptive capacity as well as on the knowledge source's desorptive capacity. In collaborative partnerships knowledge flows both ways, even though there is a tendency that most knowledge and research originates from the University. While absorptive capacity is more important to the industrial partner and desorptive capacity is more important for the University, both knowledge capacities are needed with both partners. In the interviews participants made clear how important it is to be aware of the partners needs. This requires a well-developed desorptive capacity that considers the application of knowledge with the partner and the partners' needs. Absorptive capacity was not discussed among participants. A reason could be that it is seen as a basis for engaging in UI collaborations. Having prior related knowledge about a technology that in collaboration is further co-developed and later transferred, might be seen as a necessary capability to collaborate at all. Therefore the missing response on absorptive capacity is likely not a matter of not finding it important, but more likely because of not thinking about it as a factor that impacts relationships. However, absorptive capacity does impact relationships as it affects both the creation of knowledge as well as the transfer of knowledge. Collaborating with FOOD does not only provide new knowledge and relationships but enhances their absorptive capacity as well. Industrial partners' desorptive capacity on the other hand is often less developed. Most of the companies did not at all license out a technology to other companies, in the same or in other industries. Therefore they do not develop their desorptive capacity much, which has implications for their relationships with partners like FOOD. With a limited desorptive capacity their understanding of how their knowledge and resources, and application of it, can help their research collaboration with FOOD is also limited. The implications are reflected in difficulties of communicating and the need for structure and plans. Aligning interests and explore opportunities require partners to communicate based on an understanding of the needs and resources of each partner. Both desorptive and absorptive capacity is needed to be able to achieve such an understanding. The success of the partnership and the identification and transfer processes depend to a large extent on the partners' simultaneous use of desorptive and absorptive capacities. A limited desorptive capacity from the industrial partners' side seems to affect relationships in the knowledge application process as well as in the transfer process.

When looking at the desorptive capacity of FOOD, they are likely more trained than their partners, as they are more experienced in transferring knowledge to their partners. On the other hand, are the industrial partners' absorptive capacities from a commercial focus of recognizing, absorbing knowledge and seeing the application for it, more trained than at FOOD. This is good for the transfer process, as the companies' absorptive capacity and the University's desorptive capacity complement each other. The identification process will benefit from companies growing their desorptive capacity and universities their absorptive capacity. That could happen if companies got more involved in exploitation activities, licensing out their technologies, and if universities used their network for learning from external knowledge. Partners, each having their forces in different knowledge capacities, make it possible to learn from each other as well.

Connective capacity is also an important capability. It is the capability needed to retain knowledge, the alternative to immediate knowledge transfer. Connective capacity focuses on externally maintaining knowledge for future privileged access. To be able to do that, relationships with the knowledge holder, e.g. FOOD will have to be maintained, even when research projects have ended.

6.1.3.2 Knowledge Exploration, Exploitation and Retention

In the theory of open innovation, knowledge exploration, exploitation and retention describe the different modes of open innovation. The case studies in this paper all concern collaborative partnerships between industry and University. From the industry's point of view they engage in knowledge exploration with the University, and in some cases also commercial partners. In these collaborative partnerships knowledge retention is also relevant for later access to knowledge. Participants suggest that developing a personal relationship is crucial to ease later access to knowledge. The better the relationship, the easier knowledge can be transferred. The connective capacity needed when transferring and receiving knowledge develops along the relationship, making close relationships very valuable. Both organizational, project and individual levels of knowledge exploration, exploitation and retention affect the success of the knowledge transfer. In retention the organizations managers must support the need for using resources on the relationship. At the project level,

relationship building and keeping the interest of the partner should be prioritized. The individuals need connective capacity, which is best developed through close relationships, where ones social capabilities are especially important. In knowledge exploration the participants all emphasized that on an organizational level, management support and adequate resources was important. At a project level, the relationship building by closely communicating and interacting, understanding the partner and agreeing on common objectives, are key to develop the project and prepare knowledge transfer. The individuals must be concerned with building absorptive and desorptive capacities and they do that best by co-creation, learning and relationship building.

Companies exploiting knowledge by licensing out technologies are not very common among participants in the survey. Universities could be more engaged in developing knowledge that the companies can use for exploitation purposes, but it requires companies to allow closer involvement and insight into its business model and the possibilities to create new ones. It can be argued that it is not the task of universities, to help them create new business models, especially not when collaboration are partly financed by government bodies. On the other hand would it be possible if the companies solely financed the development project. The synergies from having already established relationships and increased knowledge collaboratively should be valuable. As concluded from the analysis, closer involvement requires more trust between partners and for many this is still problematic, especially among companies, as concerns of IP protection has high priority.

6.1.3.3 Approach of Innovation

When looking at how partners create knowledge and innovate, they seem to follow a linear approach of innovation, a stage gate model. This model advocates structure and planning, using deliverables and deadlines to lead the project through stages and eventually gates. In a collaboration between FOOD and an industrial partner where the objective and end result is far from being clearly defined and where close collaboration is necessary to co-create knowledge, a network process perspective would according to theory be a better fit (Christiansen & Varnes, 2008). However, the partners interviewed have all made clear the importance of planning and agreeing on

objectives, as it increase direction and trust and makes research and knowledge creation easier by following a plan. It is human nature to plan and organise, though in collaborations such as those between FOOD and their industrial partners where innovation and the process of reaching the objective can be quite uncertain and chaotic, partners might benefit from a looser structure and less planning, to allow for a more iterative process of innovation.

6.1.3.4 Personal Relations

As the level of collaboration between partners can span from transaction oriented to deep collaborative arrangements, there are also varying needs for involvement, influence and social relationships. In the cases researched, participants all favoured close collaborative partnerships, due to the kinds of projects they were involved in. Good personal relations can motivate partners to be more creative, work better and more efficiently. It was found that the matching of partners and personalities is often quite accidental and more structure is needed for better utilization of human resources. As we have seen, personal relations are important for good relationships and the chance of “bonding” or relating with the partner is higher if partners are matched on their personality along professional skills.

6.1.3.5 Competencies

Competencies most important for relationships identified in the literature, is being socially competent and able to broker solutions. The literature emphasize being able to create win-win situations, understand social situations and socialize by developing, maintaining and using effective networks. While the literature and empirical data identifies many of the same competencies necessary for creating good relationships, some competencies differ in importance. From the analysis of participant data, professional competencies that are complementary to those of the partner(s) are most important for establishing collaboration. For maintaining the relationship, competencies in communication and being motivated and curious was most important to participants. Communication covers several competencies including, proactive listening to identify partner’s needs, negotiating and agreeing on objectives and project plan, and timely communication with the partner to support closer collaboration. A dedicated champion

should be especially important in larger projects where many people come together to collaborate. In small teams and partnerships where there are no resources to assign dedicated persons to specific roles, all responsibilities lies on those few persons to handle all parts of the collaboration. Researchers at FOOD must take on many different roles, e.g. championing and boundary spanning, to manage the relationship well. This also means that the individual becomes increasingly important in smaller projects, both for the success of the project and for the relationship with the partner. In larger projects it gets more complicated to manage the relationship, increasing the need for more structure and clear definitions of roles.

The social dimension, as also identified in the literature is especially important for developing and maintaining a personal and close relationship. For the University, being attentive to the needs of the industrial partner as well as being oriented, and motivated towards objectives rather than only publications, are of main importance to industrial partners.

6.1.3.6 Trust and Communication

As identified in the literature, a researcher's reputation can indicate the level of trustworthiness. Trust is needed for increased knowledge flows and also for long-term relationships. Competencies to build trust include being open, honest, benevolent, competent and reliable. The analysis shows that trust ease communication and can have a direct effect on managing knowledge and IP. Trust can also lead to less need for formal structures, which can be good to avoid rigidity and bureaucracy, allowing following leads, but at the same time it is important to maintain some direction and purpose, e.g. enforced by project plan, deliverables and deadlines. Accept of the partner and his role in the collaboration is important in reaching a trustful relationship. Trust seems to grow during relationships as partners by experience see that the other can be trusted. More trust is needed for later stages of product development as the company includes the researcher in core activities.

The analysis shows that communnication is one of the most important factors for a successful relationship. The better the communication between partners, the more likely is it that mistakes can be avoided and that there will be a common understanding of agreements. Communication should therefore be frequent and personal.

The framework (Figure B) sums up the main points I have gone through so far visually and roughly. The details will not be tried summarised in the model, the complexity considered. A model should after all give a clear visual understanding of what it describe.

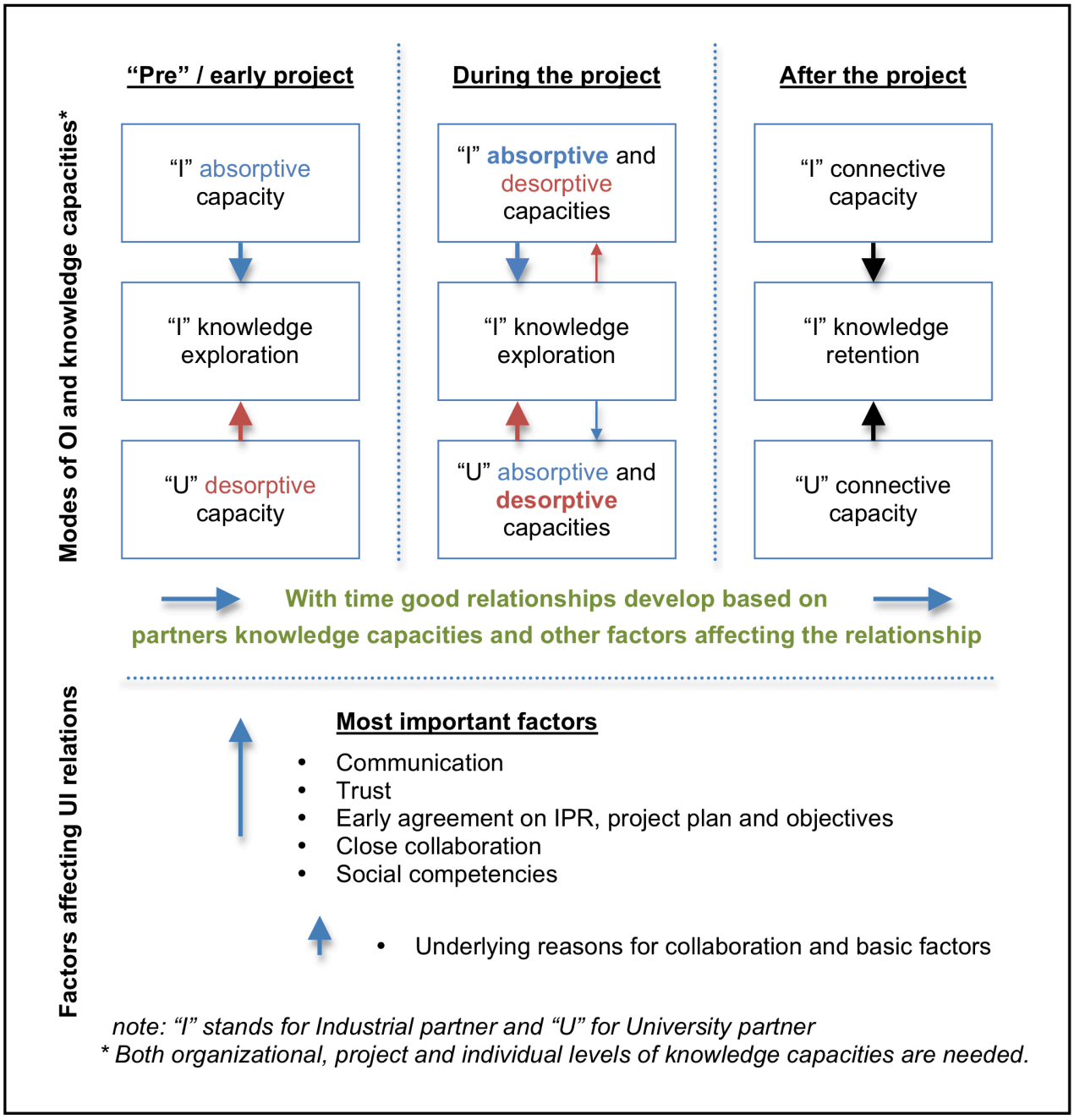

Figure B: A Framework for Managing University/Industry Relationships in an OI Context

6.2 Implications and Recommendations for FOOD - Understanding Relationships in an Open Innovation Context

In this chapter it will be discussed what FOOD can do to improve collaboration.
To be successful in collaborative partnerships, FOOD should consider several things. As identified both in the literature reviews and in the analysis there are many benefits of collaborating with industry. To really benefit from collaboration it is crucial that FOOD engage with commitment and with the will to succeed. This requires a unified commitment on both organizational, project and individual levels. Therefore is the first step to support and develop a culture that embraces such collaboration. It has to be prioritised by management and communicated to all employees to make them take ownership and support collaborative partnerships. One-way communication is not enough to make employees engage actively in supporting collaborations. There must be a conversation between management and employees about what collaborations can do for the University as a whole, how they can benefit from 'learning', and how the individual employee and students as well will benefit from new relationships and knowledge creation. An open innovation culture should be developed and entails not only "openness" towards direct partners but also "openness" with other organizations, where knowledge can be absorbed and created for the benefit of specific UI projects. The challenges have to be made clear so employees will be better equipped at collaborating. They should be aware of why they want to collaborate, what the benefits, sacrifices and challenges are. Being well prepared when meeting the partner, increases the chance that partners will understand each other, which will provide a good foundation for the partnership. Instead of every researcher / project manager will have to make their own experiences, FOOD could use the experiences from their employees and conclusions from this paper and embed this knowledge in their organization. Support systems should be established to promote organizational learning. Organizational learning will benefit the individual as knowledge can be acquired and shared by its employees. Individuals should be able to not only extract knowledge from the organization but also codify their knowledge into systems that others can access. Sharing knowledge and experiences will be beneficial for those persons involved as well as for the success of projects.

Ultimately the success of collaborations depends on the relationships between partners. Of course there are external factors and organizational decisions (not least from the partners side) that can jeopardize the project, but when it comes to things that can be done to improve chances of success, individuals and their relationship with partners are most important. An increased focus from FOOD's side on industry partners needs would be valued by the industry. To see those needs desorptive capacity will have to be developed by FOOD employees. It will not be acquired from one day to another, but through experience in working with project partners and other organisations as well, desorptive capacity will be developed. On the individual level, several learning points should be taken from this study to obtain successful relationships. The three different knowledge capacities; absorptive, desorptive and connective capacities, should be mastered by the individuals. Individuals will differ in how developed their knowledge capacities are and therefore they will differ in which ones that needs to be developed. These are critical capacities to acquire as knowledge creation, knowledge transfer and the continued relationship and contact with the partner, depends on their abilities having these knowledge capacities. Individuals will also differ in relation to how well they support those other factors, which have an impact on relationships. Therefore employees should individually assess their strengths and weaknesses concerning these factors. Most important is that employees become aware of the factors and are able to acknowledge them so they can improve and build their capabilities.

On a project level, relationship building through communication and close collaboration, understanding and agreeing on plans and objectives are important. On an organizational level, management support and adequate resources is important. It is vital that all levels are in alignment and that there is support on all levels.

FOOD has the option of taking advantage of their knowledge on how to manage relationships by educating their industrial partners. Managing relationships and being aware of factors that are discussed in this paper, has the purpose of improving relationships and the chance of success both in the project and between partners. Passing this knowledge to partners and let them acquire key learning points will benefit the relationship as well as the project.

6.3 Conclusions

With this research I wanted to find out how relationships should be managed in University/ industry open innovation collaborations. Several factors from different theoretical pillars were identified to have an impact on these relationships. Interestingly, the literature reviews showed that these factors never had been assessed in relation to importance, interdependence and causalities. Indeed there was a gap in understanding the complexity of managing relationships in an OI context. By empirically researching how partners experience collaboration in research projects and analysing the factors impacting relationships, knowledge on the subject has been enhanced with this thesis.

So how should collaborative partnerships be managed? The findings support the fact that effective management of partnerships should happen on both an organizational level, project level and individual level. The support from management on an organizational level through embracing an open innovation culture, having appropriate incentive systems and communication platforms for organizational learning to occur, is crucial for the project and its partners. On the project level, resources should be adequate to support the project and relationship building by closely communicating and interacting, should be prioritized. On the individual level we have seen the importance of having the right professional and not least social competencies, being able to communicate, create and maintain close relationships, build trust and to agree early on IPR, project plan and objectives. These factors, together with the three knowledge capacities; absorptive, desorptive and connective capacities, are the most important factors identified in the research to impact relationships. Competencies needed by individuals are in addition to social competencies professional competencies that are complementary to those of the partner, competencies in communication including proactive listening, negotiating and timely communication with the partner and networks. Individuals have to perform many roles in addition to researching, especially in smaller projects. These include project leader, boundary spanning, gate keeping and champion roles. Capabilities should be developed according to the roles one need to perform.

The cases that were researched all had the focus on knowledge exploration from an industry point of view. Partnerships were characterized by collaborations rather than 'arms-length' transactions, where all partners were working together to jointly research and create knowledge. According to participants of both the questionnaire and interviews, knowledge creation is the main purpose of collaborating. Therefore is the concept of knowledge management very important to collaborative projects in how to create knowledge, transfer knowledge and retain knowledge. For companies, absorptive capacity helps them to evaluate, assimilate and apply external knowledge. For universities, their desorptive capacity helps identifying opportunities in the industry as well as in transferring knowledge. Though knowledge flows mainly from FOOD to the industrial partner, some knowledge flows in both directions, which increase the need for partners to develop both absorptive and desorptive capacities. Connective capacity is the competences needed to connect and stay connected with the partner, which is needed by both partners. These capacities should be developed and embedded in the organization as well as with the individual. With developed knowledge capacities, the identification of opportunities and needs, the generation of knowledge, the knowledge transfer itself and the value of the partnership, will be better understood. A consequence of high levels of knowledge capacities, is that communication between partners will improve. As concluded, communication is one of the most important factors for a successful relationship, thus partners' knowledge capacities, through the impact of communication, is an important factor for creating a successful relationship.

The data collection provided some additional findings on how to improve relationships. It was found that matching partners for collaborative projects was often quite accidental and often based on recommendations from one's network. Based on professional competencies mostly, the matching process completely neglects the personality of partners, which is alarming, keeping in mind how important close collaboration, communication and interaction are for successful relationships. Communicating and working closely together, developing a relationship, should be much easier when partners accept, connect to and like each other. Therefore, matching personalities would be an effective management tool, to support the best

utilization of human resources. It was also found that more communication and working together, more involvement and drive and more focus on the company, its needs and results, from the University's side are factors that improves relationships. Partners should work at both University and company locations together some of the time to benefit from increased co-creation, transfer of knowledge (especially tacit) and to get to know each other's cultures and values. It was also found that not only tacit knowledge transfer benefits from close collaboration but so does explicit knowledge transfer. In a collaborative partnership, both partners are responsible for establishing and maintaining a good relationship. Roles may be different from one another, so partners contribute to the collaboration in different ways, depending on how they best can make use of their resources and capabilities. Though factors affecting relationships are applicable for universities as well as companies it can be argued that partners do manage their relationship differently from one another, depending on their specific roles in the relationship.

One of the biggest challenges for companies in open innovation relationships is to change their mindset from protecting ideas, IP and knowledge, to an open mindset that allows external use and generation of knowledge. In order to foster a creative environment where partners can co-create knowledge, it is crucial that partners trust each other and share their knowledge with their partner. Roots of frustration that can challenge relationships are often based on lack of the factors affecting relationships mentioned earlier. If disagreements on IPR, different objectives and different cultures, time orientations etc. are not managed, they impose big challenges as well. Also politics at KU or at the industrial partner, lack of willingness to see each other as true partners, and geographical proximity are potential challenges and barriers to relationships. Not prioritizing the project and set aside adequate resources will also create challenges. Lack of knowledge capacities with the organizations and individuals involved will mean that projects and relationships will be more difficult to establish and maintain. Not being fair and honest about ones expectations concerning time and results can challenge the relationship as well.

The use of project plans, deliverables and deadlines in the case studies indicate that projects follow a linear approach of innovation instead of a network process perspective, which according to theory seems to fit better with the explorative characteristics of projects. Collaborations are a learning process where research can lead in many directions, other than what was originally planned for. Therefore it is important to avoid too much structure and rigid plans, limiting creativity and innovation. Contrary, it seems like a linear approach increase communication about specific plans and objectives, which build structure, reduce risk and increase trust. This helps building relationships and direction for the project. While this is positive, it can be difficult to explore other opportunities than the ones that initially was agreed on, so the 'stages' and 'gates' of the model can end up limiting innovation. A better option might be to adopt a network process perspective though this will mean a more uncertain innovation process for the partners involved, which can endanger the relationship between them. Deploying a linear approach initially and then later adopting the network process perspective could be a suggestion, but more research is needed to understand how the benefits of the linear approach, can be combined with the network process perspective.

Conclusively, management of relationships in the University/industry OI context cannot be done effectively by only focusing on single factors. It requires a deeper understanding of the links between factors, interdependencies and the modes(s) of OI that relationships operate in.

6.4 Suggestions for Future Research

It has been concluded that the three knowledge capacities, absorptive, desorptive and connective capacities, are important factors for acquiring, transferring and retaining knowledge. As the most important reason for collaboration is knowledge creation and transfer, it is important to learn more about exactly how these knowledge capacities should be developed with organizations, in project teams and with individuals. Researching best practises could be one way to develop the knowledge in this field.

The literature is also scarce on managing business-to-business relationships in an open innovation context, thus this research could be repeated in business-to-business collaborations and networks of collaborative partnerships, to see if there are differences in the way to manage relationships. It is likely that business to business collaborations is more troubled by the OI framework than UI collaborations, and therefore has to take other steps or put more emphasis on specific factors to secure successful open innovation relationships. It would be interesting to research if knowledge capacities are needed in the same way as with UI collaborations or if there are differences in which capacities are more important.

One of the dilemmas that were recognized during this research was the need for control and structure, even though collaboration happens in a space where creativity and innovation is needed to be successful. It would be interesting to know more about the mechanisms and contradictions that exist between control and structure on one side and creativity and innovation on the other, and how best to balance them. The differences have been widely accounted for in the literature, but the dependencies between these two ‘opposites’ in open innovation contexts has been under researched.

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