



Paper to be presented at

DRUID15, Rome, June 15-17, 2015

(Coorganized with LUISS)

Development of immature technologies in long-term research centres: The role of proximity dimensions in converging institutional logics in university-industry collaboration

Thomas Lauvås

University of Nordland
Bodø Graduate School of Business
thomas.lauvas@uin.no

Marianne Steinmo

University of Nordland
Bodø Graduate School of Business
marianne.steinmo@uin.no

Abstract

Universities are considered as a key resource for firms development of technological innovations, and one of the predominant policy responses to increase university-industry collaboration is academic research centres. The research centres purpose is to produce academic research and simultaneously contribute to the advancement of innovations. Although research centres are recognized as important for innovation development, it is a challenging task to meet these two different demands. A main challenge is to converge different institutional logics were firms and universities have distinct goals, interests and time horizons for conducting R&D. Based on a multiple case study of six research centres we find that different dimensions of proximity contributes to reconcile firms and universities institutional logics. As social proximity increases, it enable higher cognitive proximity, leading to a clearer understanding of the partners different logics and time-perspectives. As a result, the collaboration process becomes more valuable for both parties through increased technological proximity, generating academic research and publications with increased potential for innovation development.

Development of immature technologies in long-term research centres: The role of proximity dimensions in converging institutional logics in university-industry collaboration.

Abstract

Universities are considered as a key resource for firms' development of technological innovations, and one of the predominant policy responses to increase university-industry collaboration is academic research centres. The research centres' purpose is to produce academic research and simultaneously contribute to the advancement of innovations. Although research centres are recognized as important for innovation development, it is a challenging task to meet these two different demands. A main challenge is to converge different institutional logics were firms and universities have distinct goals, interests and time horizons for conducting R&D. Based on a multiple case study of six research centres we find that different dimensions of proximity contributes to reconcile firms and universities institutional logics. As social proximity increases, it enable higher cognitive proximity, leading to a clearer understanding of the partners' different logics and time-perspectives. As a result, the collaboration process becomes more valuable for both parties through increased technological proximity, generating academic research and publications with increased potential for innovation development.

1. Introduction

Today, firms in a wide range of industries are involved in some form of external collaboration (Powell et al., 1996) searching to complement their in-house knowledge in innovation development (Chesbrough, 2003; Hagedoorn, 2002; Lane & Lubatkin, 1998; Sampson, 2007). Universities¹ is considered as one of the key sources for innovation (Laursen & Salter, 2004; Raesfeld et al., 2012), which gives firms the possibility to access fundamental knowledge and the possibility of conducting high quality research (Hussler et al., 2010; Laursen & Salter, 2004; Raesfeld et al., 2012). As a consequence numerous policymakers have since the 1970s supported a more proactive and increased interaction between universities and industry (Cohen

¹ As Perkmann and Walsh (2007), we use the term 'university' to include all types of 'public research organizations' (PROs). These are research organizations that are predominantly government-funded, i.e. universities, public research laboratories, research institutes, etc.

et al., 2002; Mowery & Sampat, 2005) and academic research centres are one policy response to increase innovation in university-industry collaboration (Ponomariov & Boardman, 2010).

Research centres has two main goals; to produce academic research, i.e. academic journal papers and research monographs, and contribute to industrial competitiveness through innovation development (Styhre & Lind, 2010). Although research centres are recognized as important for innovation development, it is a challenging task to meet these different demands (Ahuja et al., 2008; Smith, 2012), mainly linked to different institutional logics, where firms and universities are acknowledged to have different interests, goals and time horizons for conducting research and development (R&D) (Bjerregaard, 2010). Firms tend to be short-time oriented and want applied results with commercial potential from R&D collaborations, whereas university partners tends to be long-term oriented and want to leverage academic articles. This is considered to harm the collaboration processes and the innovation development (Bjerregaard, 2010).

Although a range of literature has highlighted the importance of university-industry collaboration for innovation development (Cohen et al., 2002; Laursen & Salter, 2004; Mueller, 2006) the understanding of the process on how different logics between university researchers and firms converge over time is rather limited, and further research is called for (Bjerregaard, 2010). In addition, calls for further research on the microfoundations of institutional logics have been made (Thornton & Ocasio, 2008). In this paper, we address these gaps by relying on the proximity perspective showing how firms and universities are able to enhance a valuable collaboration despite their different institutional logics. The proximity dimensions focuses on the role of common understanding and trust, as well as common norms and physical closeness between collaborative partners for effective collaboration (Boschma, 2005). As a consequence, the proximity perspective plays an important role in explaining innovation development in university-industry collaborations, suggesting that different dimensions of proximity can facilitate successful collaboration between firms and universities (Knoben & Oerlemans, 2006).

In this paper, we focus on the collaboration process by using the dimensions of geographic, social, cognitive and technological proximity. By doing this we also contribute to the proximity literature as most studies so far have focused on only one dimension of proximity (Heringa et al., 2014) and analysed a short time period with a static approach (Balland et al., 2014). Responding to calls from previous research on proximity, this study focus on several dimensions of proximity and how they interact and enable each other over time. We thus propose the following research question: *“How do different proximity dimensions facilitate*

valuable university-industry collaboration in research centres over time, despite of different institutional logics?”

Our research question is addressed through a qualitative case study of six ongoing technological research centres developing environment-friendly energy research in Norway, where firms from different parts of the value chain and universities collaborate for long-term research and innovation development. The research centres were established in 2009 as a part of the Norwegian public CEER scheme that encourages interactions between universities and industry. The aim of the CEER scheme is to encourage long-term research-driven technology development in renewable energy sectors, and to contribute to industrial development through innovations. The research centres are selected as cases as universities and industry generally is acknowledged to represent two different institutional logics (Becker & Trowler, 1989; Perkmann & Walsh, 2007), and especially, that research centres are supposed to bridge these different logics through academic research and innovation development (Styhre & Lind, 2010).

This paper extends prior research on university-industry collaboration. Through a study of six research centres, we find that different proximity dimensions are crucial for the achievement of a valuable collaboration despite of different institutional logics. Through an increase in various types of proximity and the converging of universities and firms' institutional logics, the collaboration process becomes more valuable for the firms and creates potential for innovation development. Different logics between university researchers and private firms are found to be converged over time within research alliances (Bjerregaard, 2010). As social proximity increases, it enables a higher cognitive proximity leading to a clearer understanding of the partners' different logics and time-perspective. Further our findings show that a common understanding and cognitive proximity can increase the technological proximity through mutual learning between firm- and university partners (Knoben & Oerlemans, 2006). This enhances our knowledge of the interrelation between different dimensions of proximity dimensions (Balland et al., 2014), and shows how different institutional logics of universities and firms may converge over time (Bjerregaard, 2010).

This paper is structured as follows. Section 2 provides a literature review. Next, section 3 explains the research method applied. Section 4 presents the empirical findings. Finally, section 5 provides conclusions and implications.

2. Literature review

2.1 Challenges with different institutional logics in university-industry collaboration

Although university-industry collaboration could be highly rewarding for firms (Cohen et al., 2002; Mansfield, 1991; Mueller, 2006), it is a complex process. Paradoxically, partners likely to provide firms with the most complementary knowledge are the most challenging collaborative partners. Universities are valuable collaboration partners as they add technological expertise in innovation development, and firms collaborating with universities are more likely to develop innovations (Howells et al., 2012). However, most firms find it difficult to collaborate with universities (ibid.), often ascribed to a dichotomy between the opposing logics between the long-term research and academic publication system, and industrial commercialization (Perkmann & Walsh, 2007). Accordingly, scientists are claimed to be oriented toward the publication system, while industry face the commercial imperative to apply exploitable results through short-term applied research (Becker & Trowler, 1989; Perkmann & Walsh, 2007), also known as Merton (1973) descriptions of “academic logic” and “commercial logic”. Hence, individuals and organisations may face institutional complexity by confronting multiple logics that may be-or may not-be mutually incompatible (Greenwood et al., 2011).

Following, a growing body of literature is based on the premise that industry and academia are characterized by conflicting institutional logics (Perkmann & Walsh, 2007; Sauermann & Stephan, 2013). Accordingly, a fundamental assumption of the institutional logics perspective is difference, and an important area for institutional research is to theorize and empirically show these overarching differences (Greenwood et al., 2014). Institutional logics are both material and symbolic, and provide formal and informal rules of action, interaction, and interpretation that guide and constrain organisational members (Ocasio, 1997). These rules are usually implicit assumptions and values concerning how to interpret organizational reality, what constitutes appropriate behaviour, and how to succeed (Thornton & Ocasio, 1999). In other words, institutional logics are the overarching set of principles that prescribe “how to interpret organizational reality, what constitutes appropriate behaviour, and how to succeed” (Thornton, 2004, p. 70), where the “logics” provide guidelines on how to interpret and function in social situations (Greenwood et al., 2011).

Institutional logic has its origins in institutional theory and provides a link between macro institutions and micro level actions (Sauermann & Stephan, 2013). Where the focus earlier was more on a macro level in systems or organizations, asking why organisations tended

to look alike (Greenwood et al., 2014) (e.g DiMaggio & Powell, 1983; Meyer & Rowan, 1977), the focus has shifted the effects of differentiated institutional logics on individuals' and organisations' in a variety of contexts. By this, it provides a link between institutions and action, and bridges the macro and the micro approaches and perspectives (Thornton & Ocasio, 2008).

A core assumption in the institutional logics approach is that individuals and organizations interests, identities, values, and assumptions are embedded within the established institutional logics. There is an interplay between the individual and the institutional logics as the individuals decisions and its outcomes are enabled and constrained by the individual itself, and the prevailing institutional logics (Thornton & Ocasio, 2008). Institutional logics are difficult to observe directly, but they manifest themselves in particular organizational forms, managerial practices, and individual decisions (Sauermann & Stephan, 2013; Thornton & Ocasio, 2008). The primary focus in the institutional logics perspective is to describe features of science and the consequences of institutional differences across sectors (Sauermann & Stephan, 2013).

In this paper we use of the proximity perspective to show how different dimensions of proximity contributes to converge firms and universities institutional logics contributing to a more valuable university-industry collaboration. We build on earlier proximity studies showing that more proximate actors will collaborate and interact more easily (Balland et al., 2014; Knobon & Oerlemans, 2006). We also take a dynamic approach, showing the development of proximity over time (Balland et al., 2014).

2.2 The proximity perspective

The proximity concept has gained a prominent position in the inter-organizational collaboration literature over the last 20 years (Balland et al., 2014; Knobon & Oerlemans, 2006). The different dimensions of proximity have in common that they all can improve coordination and reduce uncertainty, thus enable interactive learning and innovation (Boschma, 2005). The proximity concept refers to “being close to something measured on a certain dimension” (Knobon & Oerlemans, 2006, pp. 71-72). The proximity concept is often related to geographical proximity, though other forms of proximity are present as well. In this paper, we apply the dimensions of geographical, social, cognitive and technological proximity which is found to be particular important in inter-organizational collaboration (Knobon & Oerlemans, 2006)

Geographical proximity relates to territorial, spatial, local or physical proximity (Broekel & Boschma, 2012). Literature has shown that collaborative partners can be geographically spread as long as they share a common knowledge base on a specific practice in the beginning of the collaboration. For collaborative partners with different goals and knowledge bases geographical proximity is required. Hence, cognitive proximity allows spatial distant collaboration (Hussler & Ronde, 2007).

Social proximity are embedded in agents relations at the micro-level and refers to personal relationships between actors that are social when they involve trust, friendship and common experiences (Boschma, 2005).

Cognitive proximity refers to the similarities between the ways actors perceive, interpret, understand and evaluate the world (Wuyts et al., 2005). For effective collaboration, there is a need for a minimum level of similarities in the knowledge bases to make the actors have the capacity to absorb new knowledge (Cohen & Levinthal, 1990), which requires cognitive proximity (Boschma, 2005). In practice, this means that collaborates cognitive bases should be close enough in order to communicate, understand and process it successfully (Boschma & Lambooy, 1999), which may contribute to learning and knowledge building (Nooteboom, 2000).

Finally, *technological proximity* refers not only to technologies themselves, but also to the knowledge actors possess about these technologies. Technological proximity is therefore based on shared knowledge bases and experiences between collaborative related to technology development. It refers to the knowledge that actors gain from the process of developing technologies, rather than knowledge on the technologies it selves. This proximity may seem similar to the concept of cognitive proximity, but cognitive proximity is much broader referring to the extent that actors can communicate efficiently, whereas technological proximity denotes the extent to which actors can actually learn from each other (Knoben & Oerlemans, 2006).

We aim to study whether and how different combinations of proximity are contributing to mitigate the collaborative partners' institutional logics over time for the potential achievement of innovation development in research centres. It is likely that different dimensions of proximity may reconcile firms and universities different institutional logics. Creating social relations and common understanding, for instance, may positively influence the collaborators consciousness of considering each other's requirements in a way that benefits all the collaborators and contributes to innovation development.

3. Methodology

3.1 Research design

A qualitative research method was deemed appropriate to understand and interpret human interactions, meanings and processes (Gephart, 2004) in university-industry collaborations. The research process was guided by the research question: “How do different proximity dimensions facilitate valuable university-industry collaboration in research centres over time, despite of different institutional logics?”. A multiple case-study is used to build theory on whether and how proximity dimensions facilitates valuable collaboration between firms and universities in research centres (Yin, 2009). A qualitative design was chosen as it is suitable for addressing the “how” questions, for understanding the informants perspective and for examining and elucidating processes (Pratt, 2009). To obtain a precise account of the specific collaborations, the research centres is the unit of analysis, relying on viewpoints from both the firm- and university partners.

3.2 Case selection

Our research question is addressed through a dataset of six ongoing technological research centres developing environment-friendly energy research in Norway. The six centres focus on CO₂ storage, bioenergy, zero emission buildings, offshore wind energy (two centres) and solar cell technology. All research centres are mainly based on new, immature industries. Therefore, the high need for the development of new knowledge in each centre, along with immature technologies makes the collaboration extremely challenging. The research centres was established in 2009 as a part of the Norwegian public program Centres for Environment-friendly Energy Research (CEER) that encourages interactions between universities and industry. The aim of the CEER program is to encourage long-term research-driven technology development in renewable energy sectors, and to contribute to industrial development through innovations. The CEER scheme will operate until year 2016, were the funding for the last three years are depending on a favourable midterm evaluation. The centres financing are split, where the Research Council of Norway contribute up to 50 percent of the annual budget, and industry and university partners contribute approximately 25 percent each. In sum, each research centre has a funding of NOK 14-40 million each year (Research Council of Norway, 2008).

3.3 Data collection

We conducted a comprehensive secondary data collection for each research centre consisting of various reports, newsletters, web sites and news articles. In addition, we have interviewed in average eight key persons in each research centre in the period from September to November 2013 representing both firms and universities. We started out by contacting the centre director or the centre manager and asked for an interview and permission to study their CEER. After this interview, we conducted snowball sampling where we asked for potential informants from universities and industry (Tjora, 2012). This has especially been necessary for getting in touch with industry partners representatives, as they often only are known by their company name in secondary data, with their representative unnamed.

The interviews were semi-structured covering six main themes, starting in chronological order with the respondent's background and work relation, following with the initial stages of planning of the centre activities and the rate of involvement and the respondent's expectations at that stage. Further, the interview covered their experiences of the collaboration processes, innovation activities, and suggestions for improvements, and finally their views on future collaboration. By this we got the people's narrative view of the reality (Gephart, 2004). Taking into account the different perspectives of our informants we designed and relied upon two separate interview protocols, one for industrial partners and one for university employees. The questions were designed to provide insights regarding the collaboration processes from the point of view of industry and university representatives. With an emphasis on situational details unfolding over time, we got in-depth description of the collaboration processes (Gephart, 2004). The interviews were always conducted with two or more persons from the research team present as to minimize interviewer bias. During the research process, the interview questions were more "fine-tuned", and additional questions added to the interview protocol. This allowed us to follow emerging themes (Eisenhardt, 1989).

3.4 Data analysis

The data analysis is based on cross-case comparisons searching for cross-case patterns across the research centres' (Yin, 2009).

4. Findings and discussion

First, the overall findings are presented in relation to the establishment of the research centres. Then key findings regarding opposing institutional logics and divergent understandings between firm and university partners in the research centres are discussed. Further, the midterm evaluation is discussed, and finally, a discussion of the collaborative process after the midterm evaluation is presented. The findings and discussion below integrate the case findings with the scholarly literature on university-industry collaboration, institutional logics and proximity dimensions.

4.1 Establishing the research centres

Based on a call for applications from the Research Council, the different universities wrote a thorough application with plans and goals for the next five-eight years. An important part in the application process was to recruit university and industry partners. The recruitment process of industry partners was challenging for most of the universities. As one sub-project leader experienced it: *“It is a challenge, and the bigger cash-share from the industry, the harder it is to recruit industry partners”*. However, what characterised all of the research centres was that most of their potential industry partners were obvious. One Centre Director stated that *“we talked with the ones we knew first... so it was through acquaintances... we have worked with many of the industry partners before, some for ages, but some relatively new partners”*. Another aspect is that the range of possible firms was limited as they all operate in new industries with immature technologies with few active firms. Additionally, most of the industry partners’ representatives had a Ph.D. from the university. Hence, the most of universities and industry had seemingly quite high social, cognitive and technological proximity through shared knowledge bases and experiences (Knoben & Oerlemans, 2006).

Moreover, social proximity was present in some research centres from early phases through friendship and common experiences (Boschma, 2005) as some also had worked in the university before. As one industry partner told us: *“I have worked there [in the university] for around 15 years, so I know all the researchers very well, even though the university has changed since I quit... and I also know how the university-world works”*. Further, both industry and university partners consider the CEER scheme as important in the effort to maintain and develop the research competence in Norway. Based on the above, it would be reasonable to assume that the cognitive proximity (Knoben & Oerlemans, 2006) was quite high as both

universities and industry operated in the same industry, with the same perceptions of the need for technology development.

4.2 Opposing institutional logics and divergent understandings

Following the establishment of the research centres, the activities was essentially researcher-driven, with the industry partners as more passive observers who did not spend much time on the centre activities on a daily basis. Although the research undertaken was judged as relevant for publication by both sides, the presumptions taken in research models did not always match possibilities for implementation and the relevance was more or less lost for the firms, illustrated by a quote from one university researcher: *“I think the clue is different expectations. The industry in general, or many of them, have an expectation to turn research into commercialised products in a short time-horizon.”*

The research centres has up to 25 industrial partners, all with different expectations and requests. If the university cannot put the request on the annual plan for this year, or the following, the firms has to wait some years to get their problem or challenge addressed. Some industry representatives got a bit astonished to this, and this indicates that the time horizon and goals between university and industry representatives permeates the collaboration processes, and may hinder innovation development (Bjerregaard, 2010).

The underlying different institutional logics for university versus industry is evident from one quote from an industry representative: *“When we join the research centre, we go into it with an intention to look where it is possible to gain most money. Either in terms of improved internal operations or more profits”*. The informant is clearly influenced by the “commercial logic” (Merton, 1973), and the commercial imperative to apply exploitable results through short-term applied research (Becker & Trowler, 1989; Perkmann & Walsh, 2007). By this, the cognitive proximity (Wuyts et al., 2005) is divergent with the academics who states the importance of long-term research in these immature technological fields. This is also related to the dilemma of exploration versus exploitation framed by March (1991).

Still, other industry representatives are aware of this dilemma, but work in an operative organization. To quote one industry representative: *“I am not located in a research department, we [the firm] are very operative, and we are measured to a large extent on our effort to make a surplus from year to year... and that’s a struggle”*. This implies that even though some of the industry representatives have cognitive proximity similar to the university partners, which

could possibly bridge the institutional logics, they still need to cope with commercial short-term perspectives (Becker & Trowler, 1989; Perkmann & Walsh, 2007).

The university informants often experience that the firms' short-term focus affect their ability to absorb the explicit knowledge (Nonaka & Takeuchi, 1995) produced. The first two-three years, the university partners wondered if and how the industry partners have the capacity to be involved. A quote elaborates this:

“The challenge is if and how the industry partners have the capacity to be integrated [in the research centre]. It is a matter of how we communicate together. We can write rather detailed works and publications, but they do not read these, obviously! They need to absorb the knowledge in another way”.

Even though it is clear that the industry largely do not read published works, little is done to mend this gap in the first three-four years. All documents and publications are available for all parties on an intranet page for each research centre. However, to a high extent, the industry partners do not navigate on this page, and do not read the published materials. This indicates that the collaborators' cognitive bases are not close enough in order to communicate, understand and process the explicit knowledge (Boschma & Lambooy, 1999), which hinder learning and knowledge building (Nooteboom, 2000) for the industry partners, which in turn is harmful for the potential innovation development.

Some industry partners believe that relevant information and knowledge for each industry partner should be tailored and diffused to each firm directly. As the industry partners are participants in the same research centre, it implies that the actors to a certain degree have shared knowledge bases. However, the distinct interest in research results indicate that the technological proximity is divergent, and limits the extent to which actors can actually learn from each other (Knoben & Oerlemans, 2006).

The dimension of *geographical proximity* was deemed to be of low importance from both university and industry partners. It was rather the lack of time and prioritization of meeting one another that was looked upon as a constraining factor. This finding is related to Broström (2010) who claims that geographical location is generally seen as a less critical for long-term R&D projects.

Both industry partners and university partners mentions the challenges for the research centres, to both be at the forefront of international research and to contribute to practical innovations (Research Council of Norway, 2008). Vie (2012) has addressed these objectives,

and concludes that it would be difficult to achieve both due to different institutional logics between academia and industry. Our findings show that it would be true, especially in the short-term.

However, as most of the research and technologies are at an immature stage, one of the centres were more successful than the others obtaining cognitive and technological proximity (Knoben & Oerlemans, 2006) by establishing a joint applied project which engaged all the industry partners in that particular research centre which created common rules and norms (Thornton & Ocasio, 1999). Both the institutional logic of academia and industry was reached with regard to academic articles and scientific results that could be commercialised (Becker & Trowler, 1989; Perkmann & Walsh, 2007). This is a major achievement compared to the more passive industry partners in the other research centres.

4.3 The midterm evaluation

Many of the industry partners were quite passive in the collaboration in the first three-four years, and awaited to see the results from the research centre. However, during these years there was a growing understanding of what the research centre consisted of, and what it produced. When there was a formal external midterm evaluation by the research centres, many of the industry partners uttered their dissatisfaction with the ongoing activities. For some of the university partners, this came as a shock. Especially for the university-representatives not involved in the application and recruiting process. This made even some of the university researchers to question what was actually promised at early stages, particularly since some staff members involved in the recruitment process resigned after the agreement was signed. To quote one of the sub-project managers:

“I’m now starting to wonder how things have been done, how the application was written, and what we did promise to the industry partners. I know almost nothing about this issue... Therefore, it seems as some misapprehensions and expectations stem from the start-up-process. Industry partners said to us that “you were supposed to this and that”, but I believe that we did not have the same expectations”.

In accordance to this, one of the industry informants stated:

“The research centre is not as I thought it would be. I thought it would be more results flowing out. When we contribute with 1 million NOK each year and In-kind [working hours by industry employees into the research centre], then I expect that we would have more influence over the problems addressed... It may be that we was informed a bit wrong when the research centre was rolled out; what they [university partners] could deliver, and what they expected from us. That has influenced our expectations at later stages”.

A quote from the official midterm evaluation draws the same picture:

“Important reasons for this lack in industrial interest ... seems to be that corporate partners when joining the FME centres, have not always fully understood the rationale behind the long-term research, goals and research programme of the centre and/or had not in sufficient detail evaluated what their expectations are in relation to these goals before they joined. Direct interactions with user partners involving reporting of research results have mainly taken part through annual or biannual workshops and/or “centre days” (Research Council of Norway, 2013 pp. 8)

As the quotes entail, the lack of cognitive proximity through unsuccessful communication and understanding (Boschma & Lambooy, 1999), as well as technological proximity (Knoben & Oerlemans, 2006) between the industry partners and the researchers led to divergent expectations, which again led to misunderstandings.

4.4 After the midterm evaluation

Around the time of the midterm evaluation and after, there is a growing recognition of the parties' different perspectives and underlying institutional logics. The industry partners are apparently valuing the research more, and understand that it could contribute to make their day-to-day operation more knowledge-based. At the same time, the universities understand that the industry need some help to read and get something out from the articles. It could be through reader-guidelines, or short summaries in Norwegian or English that the industry partners can use internally. The industry partners gradually understood that it was necessary to put more effort into the collaboration through a higher degree of involvement to reap the benefits. An industry partner holding a Ph.D. said the following:

“At the same time I believe that what you get in return, depend on your own effort... It is wrong if the industry just blame the universities. We are not young birds that just sit here, with an open mouth, ready to be fed. Indeed, we do need to do something to reap the benefits. It is two-way collaboration.”

The growing understanding that a two-way collaborative interaction is necessary to bridge the two complementary knowledge bases is acknowledged by universities as well. As one university researcher put it: *“... We sit here in our offices with our models of the reality, and they, they are out in the reality”*.

Recalling the industry representative quoted in Section 4.1, stating the intention for joining the research centre as to *“... look where it is possible to gain most money. Either in terms of improved internal operations or more profits”* is an example of converging institutional logics. Now, after four years the same informant stated:

“... It may have something with our understanding as well; we cannot expect to get results that we can exploit commercially. It may be that we were wrong at the time we joined the research centre - that we expected to get direct commercial results. We do not get that, we get a direction and interesting inputs that we can develop further with a supplier for example”

The informant is still influenced by the “commercial logic” (Merton, 1973), and the commercial imperative to apply exploitable results (Becker & Trowler, 1989; Perkmann & Walsh, 2007). However, the cognitive proximity (Wuyts et al., 2005) is converging with the universities, and the informant shows a clearer understanding of the “academic logic” (Merton, 1973) and the university partners long-term perspective. The time horizon and goals between the universities and the industry actor are more aligned and can contribute, rather than hinder, collaboration processes and innovation development (Bjerregaard, 2010) as the technological proximity is increased (Knoben & Oerlemans, 2006).

The informants’ quote also indicates that a common understanding has developed their cognitive proximity and technological proximity, as they are now able to actually learn from each other (Knoben & Oerlemans, 2006). The following quote from an industry representative elaborates this, and that the dimension of trust has not been an issue:

“I think that it [trust] has been there all the time, but it is the understanding that has improved. The trust has been there... we are used to work with universities, and they are used to work with us. So there is nothing wrong with the trust, however, the understanding of what we can do together has become much better”.

The industry partners experience the universities as more proactive, actively seeking advice from the industry in the development of the research centre. There is a common understanding that communication is necessary, they need to talk, and learn to talk a language that both parties understand, and that takes time. As the parties became more engaged, social relations was created. University partners have visited and spent more time with the industry partners, considered as successful for both parties, especially by the industry partners as this shaped a common understanding of the problems they faced; gradually *social proximity* was created (Boschma, 2005). In this process, some research centres used the meetings to go through, and repeat what a research centre is. A centre director declares:

“I think there has been a mismatch between what the Research Council of Norway mean that a research centre should be and what the industry partners mean it should be. Therefore, the meeting with the industry partners after the midterm evaluation, one by one, has been to harmonise different understandings. In the future, I think it is important to highlight what is short-term, what is industry-relevant, and what is long-term research activities. Meanwhile we do see that some projects could be regarded as counselling, but we also recognize that it generates scientific articles, because it includes new processes and new ways of calculating. Therefore, it is up to us [research partners] to see the possibilities in the short-term activities, to spot the research possibilities inherent in the short-term activities”.

By this, the centre director shows that the universities also have an enhanced understanding of how industry partners perceive, interpret and understand the world. Cognitive proximity has therefore also been developed at the universities that contribute to an understanding of the industries institutional logics. This increased understanding enhances the capacity to absorb new knowledge (Cohen & Levinthal, 1990) and process it successfully (Boschma & Lambooy, 1999). This is clearly shown in the statement that short-term counselling activities could also contribute to learning and knowledge building (Nooteboom, 2000) through academic papers. As a consequence, technological proximity are enhanced (Knoben & Oerlemans, 2006).

As well, there is a growing acknowledgment from both universities and industries that a balance regarding “academic and commercial logic” is necessary. As a centre director expressed it: *“We got some critique for too little publications. At the same time do the industry partners say that we publish too much...So, maybe we have the balance, I do not know...But the industry do understand now that we need to publish, at least more than they did before.”*

In sum, we observe that several of the research centres have managed to achieve balance with regard to publications and industry relevance because of common understanding and social relations, which have helped them to be conscious of the collaborative partner’s requirements. Hence, different logics between university researchers and private firms converged over time within the research alliances (Bjerregaard, 2010). By providing insights into how different logics between universities and industry partners converge over time, these findings addresses (Thornton & Ocasio, 2008) call for work on the microfoundations of institutional logics.

5. Conclusion and implications

Our paper extends prior research on university-industry collaboration by clarifying how firms and universities manage to mitigate different institutional logics through various types of proximity for the enhancement of innovation development. In particular, we provide important insights into how valuable collaboration between university and industry develops over time and thereby respond to several calls stating that the collaboration processes are largely unexplored (Balland, 2011; Bjerregaard, 2009, 2010; Boardman & Gray, 2010; Lind et al., 2013; Perkmann & Walsh, 2007; Smith, 2012).

Different logics between university researchers and private firms is found to be converged over time within research alliances (Bjerregaard, 2010). We extend this finding by showing how proximity dimensions contribute in facilitating a valuable collaboration between firms and universities in research centres where academic research and innovations takes place. We observe that several of the research centres have managed to achieve a balance with regard to publications and industry relevance because of social relations (social proximity), which have helped them to be conscious of the collaborative partner’s requirements. Cognitive proximity is found to be crucial for firms converging with the universities, as this proximity facilitate a clearer understanding of the “academic logic” (Merton, 1973) and the university partners long-term perspective. Our findings also shows that a common understanding can develop cognitive proximity into technological proximity through mutual learning between firm- and university partners (Knoben & Oerlemans, 2006). This increased understanding enhances the capacity for

collaborative partners to absorb new knowledge (Cohen & Levinthal, 1990) and process it successfully (Boschma & Lambooy, 1999).

Implications

At the policy level our findings implicates that a long time period is necessary for the development of immature technologies in university-industry collaborations; firms and university partners need time to achieve common understanding and create personal relations to establish common working conditions were all the partners requirements are mitigated, which is essential for the achievement of innovations. As the process of developing proximities is timely, our findings implicates the importance of having a long time – horizon for policy, industry and university actors.

Most university-industry collaboration programs exist a much shorter period than the CEER scheme. A possible consequence is that some projects are closed before the collaboration processes finally are starting to function well. This may hinder future applicable results for both industry and universities, which have just gotten the fundament needed for technological innovations. Moreover, to enhance engagement from the industry partners there should be a requirement that the industry partners should participate actively. Consequently, the research partners should be motivated largely to involve the firm partner early in the collaboration.

On a managerial level our findings implicates that firms should proactively build different dimension of proximity towards collaborative research partners to enhance a well working collaboration within research centres. It is beneficial to the firms to get involved in all aspects of the collaboration, from initiating to completion of working tasks to gain benefits on invested resources, and to secure that the research partners mitigate the firms' requirements, important for the development of innovations.

6. References

- Ahuja, G., Lampert, C. M., & Tandon, V. (2008). Moving Beyond Schumpeter: Management Research on the Determinants of Technological Innovation. *The Academy of Management Annals*, 2(1), 1-98. doi: 10.1080/19416520802211446
- Balland, P.-A. (2011). Proximity and the Evolution of Collaboration Networks: Evidence from Research and Development Projects within the Global Navigation Satellite System (GNSS) Industry. *Regional Studies*, 46(6), 741-756. doi: 10.1080/00343404.2010.529121

- Balland, P.-A., Boschma, R., & Frenken, K. (2014). Proximity and Innovation: From Statics to Dynamics. *Regional Studies*, 1-14. doi: 10.1080/00343404.2014.883598
- Becker, T., & Trowler, P. R. (1989). Academic tribes and territories: Intellectual inquiry and the culture of disciplines. *UK*.
- Bjerregaard, T. (2009). Universities-industry collaboration strategies: a micro-level perspective. *European Journal of Innovation Management*, 12(2), 161-176. doi: 10.1108/14601060910953951
- Bjerregaard, T. (2010). Industry and academia in convergence: Micro-institutional dimensions of R&D collaboration. *Technovation*, 30(2), 100-108. doi: <http://dx.doi.org/10.1016/j.technovation.2009.11.002>
- Boardman, C., & Gray, D. (2010). The new science and engineering management: cooperative research centers as government policies, industry strategies, and organizations. *The Journal of Technology Transfer*, 35(5), 445-459. doi: 10.1007/s10961-010-9162-y
- Boschma, R. (2005). Proximity and Innovation: A Critical Assessment. *Regional Studies*, 39(1), 61-74. doi: 10.1080/0034340052000320887
- Boschma, R. A., & Lambooy, J. G. (1999). Evolutionary economics and economic geography. *Journal of Evolutionary Economics*, 9(4), 411-429. doi: 10.1007/s001910050089
- Broekel, T., & Boschma, R. (2012). Knowledge networks in the Dutch aviation industry: the proximity paradox. *Journal of Economic Geography*, 12(2), 409-433. doi: 10.1093/jeg/lbr010
- Broström, A. (2010). Working with distant researchers—Distance and content in university–industry interaction. *Research Policy*, 39(10), 1311-1320. doi: 10.1016/j.respol.2010.09.002
- Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*: Harvard Business School Press.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 35(1), 128-152. doi: 10.2307/2393553
- Cohen, W. M., Nelson, R. R., & Walsh, J. P. (2002). Links and Impacts: The Influence of Public Research on Industrial R&D. *Management Science*, 48(1), 1-23. doi: doi:10.1287/mnsc.48.1.1.14273
- DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48(2), 147-160. doi: 10.2307/2095101
- Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, 14(4), 532-550. doi: 10.5465/amr.1989.4308385
- Gephart, R. P. (2004). Qualitative Research and the Academy of Management Journal. *Academy of Management Journal*, 47(4), 454-462. doi: 10.5465/amj.2004.14438580
- Greenwood, R., Hinings, C. R., & Whetten, D. (2014). Rethinking Institutions and Organizations. *Journal of Management Studies*, 51(7), 1206-1220. doi: 10.1111/joms.12070
- Greenwood, R., Raynard, M., Kodeih, F., Micelotta, E. R., & Lounsbury, M. (2011). Institutional Complexity and Organizational Responses. *The Academy of Management Annals*, 5(1), 317-371. doi: 10.1080/19416520.2011.590299
- Hagedoorn, J. (2002). Inter-firm R&D partnerships: an overview of major trends and patterns since 1960. *Research Policy*, 31(4), 477-492. doi: [http://dx.doi.org/10.1016/S0048-7333\(01\)00120-2](http://dx.doi.org/10.1016/S0048-7333(01)00120-2)
- Heringa, P. W., Horlings, E., van der Zouwen, M., van den Besselaar, P., & van Vierssen, W. (2014). How do dimensions of proximity relate to the outcomes of collaboration? A

- survey of knowledge-intensive networks in the Dutch water sector. *Economics of Innovation and New Technology*, 23(7), 689-716. doi: 10.1080/10438599.2014.882139
- Howells, J., Ramlogan, R., & Cheng, S.-L. (2012). Innovation and university collaboration: paradox and complexity within the knowledge economy. *Cambridge Journal of Economics*, 36(3), 703-721. doi: 10.1093/cje/bes013
- Hussler, C., Picard, F., & Tang, M. F. (2010). Taking the ivory from the tower to coat the economic world: Regional strategies to make science useful. *Technovation*, 30(9-10), 508-518. doi: <http://dx.doi.org/10.1016/j.technovation.2010.06.003>
- Hussler, C., & Ronde, P. (2007). The impact of cognitive communities on the diffusion of academic knowledge: Evidence from the networks of inventors of a French university. *Research Policy*, 36(2), 288-302. doi: 10.1016/j.respol.2006.11.006
- Knoben, J., & Oerlemans, L. A. G. (2006). Proximity and inter-organizational collaboration: A literature review. *International Journal of Management Reviews*, 8(2), 71-89. doi: 10.1111/j.1468-2370.2006.00121.x
- Lane, P. J., & Lubatkin, M. (1998). Relative absorptive capacity and interorganizational learning. *Strategic Management Journal*, 19(5), 461-477. doi: 10.1002/(SICI)1097-0266(199805)19:5<461::AID-SMJ953>3.0.CO;2-L
- Laursen, K., & Salter, A. (2004). Searching high and low: what types of firms use universities as a source of innovation? *Research Policy*, 33(8), 1201-1215. doi: <http://dx.doi.org/10.1016/j.respol.2004.07.004>
- Lind, F., Styhre, A., & Aabo, L. (2013). Exploring university-industry collaboration in research centres. *European Journal of Innovation Management*, 16(1), 70-91.
- Mansfield, E. (1991). Academic research and industrial innovation. *Research Policy*, 20(1), 1-12.
- March, J. G. (1991). Exploration and Exploitation in Organizational Learning. *Organization Science*, 2(1), 71-87. doi: 10.2307/2634940
- Merton, R. K. (1973). *The sociology of science: Theoretical and empirical investigations*: University of Chicago press.
- Meyer, J. W., & Rowan, B. (1977). Institutionalized Organizations: Formal Structure as Myth and Ceremony. *American Journal of Sociology*, 83(2), 340-363. doi: 10.2307/2778293
- Mowery, D. C., & Sampat, B. N. (2005). Universities in national innovation systems. In J. Fagerberg, D. C. Mowery & R. R. Nelson (Eds.), *The oxford handbook on innovation* (pp. 209-239). Oxford: Oxford University Press.
- Mueller, P. (2006). Exploring the knowledge filter: How entrepreneurship and university-industry relationships drive economic growth. *Research Policy*, 35(10), 1499-1508.
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: how Japanese companies create the dynamics of innovation*. New York: Oxford University Press.
- Nooteboom, B. (2000). *Learning and innovation in organizations and economies*. Oxford: Oxford University Press.
- Ocasio, W. (1997). Towards an attention-based view of the firm. *Strategic Management Journal*, 18(S1), 187-206.
- Perkmann, M., & Walsh, K. (2007). University–industry relationships and open innovation: Towards a research agenda. *International Journal of Management Reviews*, 9(4), 259-280. doi: 10.1111/j.1468-2370.2007.00225.x
- Ponomarev, B. L., & Boardman, P. C. (2010). Influencing scientists' collaboration and productivity patterns through new institutions: University research centers and scientific and technical human capital. *Research Policy*, 39(5), 613-624. doi: <http://dx.doi.org/10.1016/j.respol.2010.02.013>

- Powell, W. W., Koput, K. W., & Smith-Doerr, L. (1996). Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly*, 41(1), 116-145. doi: 10.2307/2393988
- Pratt, M. G. (2009). From the Editors: For the Lack of a Boilerplate: Tips on Writing Up (and Reviewing) Qualitative Research. *Academy of Management Journal*, 52(5), 856-862. doi: 10.5465/amj.2009.44632557
- Raesfeld, A. V., Geurts, P., Jansen, M., Boshuizen, J., & Luttge, R. (2012). Influence of partner diversity on collaborative public R&D project outcomes: A study of application and commercialization of nanotechnologies in the Netherlands. *Technovation*, 32(3-4), 227-233. doi: <http://dx.doi.org/10.1016/j.technovation.2011.12.001>
- Research-Council-of-Norway. (2013). Midterm Evaluation of Centres for Environment-friendly Energy Research (FME). Oslo.
- Sampson, R. C. (2007). R&D Alliances and Firm Performance: The Impact of Technological Diversity and Alliance Organization on Innovation. *Academy of Management Journal*, 50(2), 364-386. doi: 10.5465/amj.2007.24634443
- Sauermann, H., & Stephan, P. (2013). Conflicting Logics? A Multidimensional View of Industrial and Academic Science. *Organization Science*, 24(3), 889-909. doi: 10.1287/orsc.1120.0769
- Smith, P. (2012). Where is practice in inter-organizational R&D research? A literature review. *Management Research*, 10(1), 43-63. doi: <http://dx.doi.org/10.1108/1536-541211228559>
- Styhre, A., & Lind, F. (2010). Balancing centripetal and centrifugal forces in the entrepreneurial university: a study of 10 research centres in a technical university. *Technology Analysis & Strategic Management*, 22(8), 909-924. doi: 10.1080/09537325.2010.520471
- Thornton, P., & Ocasio, W. (1999). Institutional Logics and the Historical Contingency of Power in Organizations: Executive Succession in the Higher Education Publishing Industry, 1958-1990. *American Journal of Sociology*, 105(3), 801-843. doi: 10.1086/210361
- Thornton, P., & Ocasio, W. (2008). Institutional Logics. The SAGE Handbook of Organizational Institutionalism. SAGE Publications Ltd (pp. 99-129). London: SAGE Publications Ltd.
- Thornton, P. H. (2004). *Markets from culture: Institutional logics and organizational decisions in higher education publishing*: Stanford University Press.
- Tjora, A. H. (2012). *Kvalitative forskningsmetoder i praksis*. Oslo: Gyldendal akademisk.
- Vie, O. E. (2012). The Need for Knowledge Integration in Renewable Energy Innovation Projects. *Energy Procedia*, 20(0), 364-376. doi: <http://dx.doi.org/10.1016/j.egypro.2012.03.036>
- Wuyts, S., Colombo, M. G., Dutta, S., & Nooteboom, B. (2005). Empirical tests of optimal cognitive distance. *Journal of Economic Behavior & Organization*, 58(2), 277-302. doi: 10.1016/j.jebo.2004.03.019
- Yin, R. K. (2009). *Case Study Research - Design and Methods*: Sage Publications.