Creating an innovative culture

A case study of research groups at the University of Oslo

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A Case Study of Research Groups at the University of Oslo

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Abstract

This thesis explores how senior scientists’ create a culture of innovation in their research group. This is a social process that is less understood, and not well documented. By primarily analyzing six research groups at the University of Oslo, conducting research in different academic disciplines, the thesis aims to shed light on how academics as visionaries of the groups, draw upon previous experiences to create and maintain a culture of innovation. Moreover, how do academics work in supporting and socializing junior colleagues in this way of work.

The findings show that academics utilize elements of previous experiences in order to establish a logic in the research groups that span the whole dimension of basic- to application-oriented research. The fluid dimension of integrating different forms of research is a core characteristic of the research groups, making it difficult to characterize the groups as performing one aspect of research work. Furthermore, academics establish particular activities aimed socializing junior colleagues into the overarching logic.

Through the theoretical concepts of institutional logics, institutional entrepreneurship and institutional work, the study presents insight on how senior scientists actively engage in creating a culture that incorporates their perception of research, and how they socializes junior colleagues into the culture of innovation. This highlights the importance of an individual level perspective on culture creation as it influences to a high degree the immediate surrounding.

Key words: Innovation, Basic Research, Applied Research, Logics, Culture, Research Group, Senior Scientist
Preface

As I approach the end of my master thesis, I feel satisfaction in being able to say that I have uncovered some of the secrets to the mystical creature that is innovation. However, it has been a long road. I have truly experienced that “innovation” is a complicated; a creature that require intense study to uncover just a tiny bit of its secrets. Perhaps it is the many secrets that makes innovation so fascinating and sought after? Nonetheless, my time at the Center for Technology, Innovation and Culture (TIK) has provided me with direction, and clarity to pursue those secrets.

I would like to thank everyone at TIK for introducing me to the fascinating literature of both innovation, and STS. To my fellow students, thank you for all the moments we have spent together, and thank you for being helpful, kind and allowing me to learn from all of you. I want to especially thank my supervisor, prof. Taran Mari Thune. Thank you for being patient, calming presence, and provided me guidance and help during my quest in completing this master thesis. For this, I am truly grateful. To my friend Henrik, thank you for proof reading, and especially for helping me in times of need. I would like to thank my mother, father, sister, Kenneth, and Julie. You have all supported me immensely during this journey.

Finally, I would like to thank my girlfriend, Ingrid. You have been with me when I doubted myself, you have supported me, and you have helped me to complete this journey. I will forever be grateful for your help, thank you.
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1 Introduction

There has been a growing interest in understanding how academic science contributes to innovation. Rather than being disengaged knowledge contributors, academia has become an instrument for innovation (Mowery & Sampat, 2005, p. 210). Studies have analyzed how industrial rationales have affected universities, research groups and individual scientists in this context, often in light of stakeholders’ expectations of universities contributing towards economical and societal development (Abreu & Grinevich, 2013; Etzkowitz, 1998; Foss & Gibson, 2015; Lam, 2010; Perkmann et al., 2013). Others have sought to provide explanations on how comingling of “cultures” have created distinct knowledge regimes that integrate both academic and industrial rationales (Berman, 2012; Bjerregaard, 2010; Colyvas & Powell, 2006; Sauermann & Stephan, 2013; Vallas & Kleinman, 2008). In general, previous literature has described academia as highly complex, with flow of multiple “cultural” influences affecting universities, faculties, research institutes and individual scientists, resulting in continuous change in research activities, beliefs and practices.

Considering the multiple influences in academia, less has been written about how scientists respond and act upon these influences. As noted by Alice Lam (2010, p. 355), scientists being exposed to multiple influences can draw upon these in their research practices, and should be considered as important agents of academic development. Furthermore, Göktepe-Hultén (2008) argues that it is inadequately explored in which manner scientists influence research groups, departments and the university towards “innovation culture”. These topics deserve attention given the scientific interest in understanding innovation in academic institutions.

Inspired by previous literature, my purpose is to contribute to the literature by exploring how senior scientists establish a “culture of innovation” in their research group. Innovation can be understood as the attempt to carry out an idea in practice (Fagerberg, 2005, p. 4). According to Zilber (2012, p. 88) culture are elements of meanings, ideas and symbols embodied in languages, practices and geographical proximities that guide individuals and organizations. In popular terms, culture can explain “why individuals and organizations act the way they do”. Moreover, individuals can contribute to cultural construction (Zilber, 2012, p. 88). Through utilizing the theoretical concepts of institutional logics, institutional entrepreneurship and institutional work, (Battilana, Leca, & Boxenbaum, 2009; Garud, Hardy, & Maguire, 2007; Lawrence & Suddaby, 2006; Lawrence, Suddaby, & Leca, 2009; Thornton, 2015; Thornton &
Ocasio, 2008; Thornton, Ocasio, & Lounsbury, 2012), a framework is established to conceptualize how senior scientists actively engage in creating a culture of innovation. The concept of institutional logics defines logics as composed by cultural elements (Thornton, 2015). This allows the study of how senior scientists function as institutional entrepreneurs that draw upon cultural ideas and practices from different “logics” they have experienced, to be implemented in their group. By engaging in institutional work, scientists combine and implement these ideas and practices in the research group through research projects and activities, which encourage utilization of conducted research. In addition, research projects function as a mechanism for socializing new members into the culture residing in the group.

1.1 Cases – Research groups at the University of Oslo

The empirical context in this study is research groups at the University of Oslo (UiO). UiO has had a continuous development of goals and strategies in order to enhance innovation (Gulbrandsen, 2011, p. 275). However, as argued by Gulbrandsen (2011, p. 275) innovation has never found a natural spot as a core activity within the university framework. With the introduction of the overarching strategies, Strategi 2020 and Handlinsplan for Innovasjon 2013-2015, the University of Oslo has taken upon itself to cement innovation as a core pillar of focus (Gulbrandsen, 2011, p. 275; Universitetet i Osloa; Universitetet i Oslob). However, to further understand how an innovation culture is created, studies of senior scientists’ and their research groups are necessary. The cases analyzed in this study are research groups located in the fields of technology, natural sciences and medicine at UiO.

Innovation often occurs in an informal manner, and often rely on the scientists desire to promote these activities locally (Gulbrandsen, 2011, p. 278; Göktepe-Hultén, 2008, p. 664). However, available insights on these processes are limited (Gulbrandsen, 2011, p. 279). Thus, there is a need to enhance understanding on how an innovation culture is created from the “bottom-up”. This suggests that a micro-level approach may uncover interesting aspects (Colyvas & Powell, 2006). It is important to emphasize that findings in the current study are limited to the research groups subject to this study. However, there are indications of wider influences at UiO. Research groups included in this study have occasionally been put forward in UiO publishing as examples of good practice within innovation.
1.2. Aims and objectives

The aim of this study, through the selected cases, is to illuminate how a culture of innovation is created in research groups. It is of interest to provide insight to the process and rationalities on how and why the research group operate as it does. This is important given the understanding of this thesis; research is often initiated in the vision of leading scientists (Göktepe-Hultén, 2008, p. 666). In the context of academia and purpose of this study, there has been an increased attention on universities’ ability to contribute to innovation. Therefore, it would be of interest to further understand how research groups operate in terms of contributing to this goal. By making use of three perspectives, institutional logics, institutional entrepreneurship and institutional work, the study will provide explanations on how to understand the creation of an innovative culture in academic research groups.

The cases studied in this thesis all have certain characteristics that constitute an innovative culture. I argue that the characteristics are imprinted due to the leading senior scientists’ prior experiences. This gives the study reason to bring the analytical level down to a micro-perspective to study “why the research groups function as they do”. In other words, scrutinize the bottom-up processes in creating a specific culture. Informed by previous literature analyzing macro to micro effects, and contributions on individual level analysis of scientists, the thesis is guided by the following overall research question:

“How do senior scientist create a culture of innovation within their research group?”

In order to provide comprehensive insights into this issue, the thesis has derived two sub-questions. The first sub-question is formulated in the following manner: How do scientists draw on prior experience that are imprinted in the research group?

Research groups consist of multiple members often ranging from the senior scientist to master level degree students, with different backgrounds. The academic literature has discussed how previous experiences have affected scientists and their corresponding research practices (Göktepe-Hultén, 2008; Lam, 2010; Owen-Smith, 2003). One way to interpret the role of the senior scientist is as lead visionaries of the research group. In this manner, the senior scientists can be understood as highly influential in the overall process of practices and ambitions that define the research groups, and why they conduct research the way they do. In addition, certain stakeholder influences are important consideration that may affect the group. The sub-question
is formulated in a manner that seeks to provide insight on how senior scientists make use of ideas and practices from previous experiences, which are implemented in the research group.

The formulation of the previous sub-question leads to the definition of the second sub-question: “What kinds of activities are performed in groups in order to create a culture for innovation?”

There are certain characteristics that define the research groups. This contributes in the understanding on how they work in order to foster an innovative environment. This sub-question is interested in highlighting the everyday activities that constitute the culture of the research groups. This sub-question is defined in a twofold manner; first, illuminate activities performed. Second, investigate how these activities simultaneously create, and enforce an environment that socializes members into the particular practices and ambitions of the groups. Thus, an analysis on this sub-question seeks to provide insights on the activities performed, and how the activities contributes towards developing the research groups’ innovative culture.

1.3. Thesis structure

As briefly mentioned above, the thesis is structured thematically as according to the sub-questions that underpin the overall research question. The following chapter presents a literature review as well as a presentation of the theoretical framework of the thesis. The literature review elaborates upon on the development of academic science, and particularly how elements of commercial interest have been integrated into academia.

Chapter 3 presents the methodology chosen and the data gathered. The data has been gathered from various sources, most importantly prior literature, public documents including online publications and strategies, and interviews conducted with participants in related research groups.

Chapter 4 present the empirical finding and a brief presentation of each research group. This chapter is divided into thematically sub-chapters that seeks to answers the sub-questions underpinning the overall research question. The empirical evidence will be presented in a descriptive manner.

Chapter 5 involves a discussion of the empirical findings in light of the theoretical framework that has been established. Last, there will be a concluding section that will summarize key findings of the thesis, and discuss possible implications.
2 Theoretical framework

2.1 Introduction

There have been written many literature contributions that elaborate on the development of academic science and subsequent cultural influence on how scientific research activities have changed. Arguably, since the introduction of the Bayh-Dole act of 1983 in the United States, which broadly expressed a need for scientific research conducted in academia to have an impact, a large amount of scholarly contributions highlight various aspects. However, a salient topic has been the wider understanding of the relationship between university and industry (Perkmann et al., 2013).

Important contributions have aimed at providing insights through different theoretical lenses on how universities and individuals in the academic field have been influenced by market-oriented rationalities in practices, organizational forms, and research activities. The literature has provided concepts such as academic capitalism, “third mission”, entrepreneurial university and academic entrepreneurs amongst others (Abreu & Grinevich, 2013; Colyvas, 2007; Etzkowitz & Leydesdorff, 2000; Foss & Gibson, 2015; Slaughter & Leslie, 1997). An increasingly popular theoretical framework to scrutinize development and change in academic science, is through institutional change (Bjerregaard, 2010; Owen-Smith, 2003; Vallas & Kleinman, 2008).

In brief, academia and industry rationales for action have been conceptualized as distinct institutional spheres, or distinct institutional logics (Berman, 2012; Sauermann & Stephan, 2013). Institutional logics can be conceptualized as guidelines of perceived appropriate behavior and subsequent responses, in order to grasp how and why individuals, and organizations act as they do. However, the existence of more than one logic also provide individuals opportunities of developing local rationales of behavior and corresponding action, leading to variation in behavior different social contexts (Berman, 2012; Colyvas & Powell, 2006; Friedland & Alford, 1991).

Given empirical and theoretical contributions that aim at elucidating how logics influence behavior, which consequently lead to institutional change in academic science (Berman, 2012; Bjerregaard, 2010; Sauermann & Stephan, 2013), the thesis will draw upon this perspective to
provide an analytic framework. The analytic framework consist of concepts from the wider understanding of institutional theory, namely institutional logics, institutional entrepreneurship and institutional work.

The concept institutional logics will serve as an overarching framework of this study. In extension of this, the concept of institutional entrepreneurship as embedded in the logics perspective, is presented to provide a more nuanced understanding on how individuals act, utilize and draw upon elements constituting the logics. Last, the thesis will draw on “institutional work” in order to provide insights on how institutional entrepreneurs establish a culture, or set of beliefs, norms and practices, and related to this, how new members are socialized within the institutional environment of the research group. The main purpose of providing such an analytical framework is to carefully make use of previous literature, as well as provide alternative insights on why research groups follow particular course of action. I consider a perspective from the micro-level important in this regard.

In this chapter, the theoretical contributions of institutional logics, institutional entrepreneurship and institutional work will be presented. Second, literature review on prior literature of institutional logics and change in academia will be presented. This is done to provide a certain context on how market-related rationales such as innovation and industry collaboration has become of relevance, and intermingled with the traditional idea of academic science. This highlights development of research practices influenced by multiple logics (Borlaug, 2015, p. 18) Third, theoretical motivations will be presented to serve as an analytic framework for the empirical study.

2.2 Institutional logics

The institutional logics perspective is an increasingly popular framework within the wider area of institutional theory. In brief; institutions’ are in this study perspective, the rules, norms and beliefs in society that shape social actors’ behavior and sets guidelines on what is deemed appropriate course of action (Hoffman, 1999, p. 351). Criticism towards institutional theory, and perhaps more precisely against neo-institutional theory, is that the approach has a tendency towards elucidating the process of homogeneity, or “iso-morphism”. This has resulted in explanations that conceptualize the emergence of universal behavior amongst a range of
different actors, not being able to affect their institutional environment (Hoffman, 1999, p. 351; Thornton & Ocasio, 2008, p. 100).

2.2.1 The term institutional logics

The term institutional logic was introduced by Friedland and Alford (1991) as a concept for providing insights on how to understand individual or organizational behavior. The authors argued that it is not possible to grasp behavioral rationales without locating actors in a societal context (Friedland & Alford, 1991, p. 232). Friedland and Alford (1991, p. 232) conceptualize society as inter-institutional, and emphasize that society (Western societies was the primary focus) has certain core institutions. Those of the capitalist market, bureaucratic state, democracy, nuclear family and Christian religion. Each of the core institutions have a central logic that are a set of material practices and cultural symbols. The practices and cultural symbols constructions shape individual and organizational behavior, as they define a set of interests and acceptable “codes-of-action”. These are guidelines for social interaction and behavior, intended to realize those interests. Thus, logics can be understood as providing guidelines of action that are perceived as acceptable (Goodrick & Reay, 2011, p. 374). Following the conceptualization of the logics perspective as presented by Friedland and Alford (1991), the core premise is that individuals and organizations interests, beliefs, identities and assumptions are shaped by logics. Behavior is guided by what is deemed appropriate and legitimate within the logics social actors are embedded in.

2.2.2 Complexity

Institutional logics, rather than just functioning as constraining scripts of appropriate behavioral and social action, provide enabling opportunities due to the multiple logics available in that exist in society (Thornton & Ocasio, 2008, p. 104). The more there is, the more there is to draw upon (Thornton et al., 2012, p. 107). Particular logics may, or may not be more dominant within an organization, or the broader field. However, there is a constant flow of multiple, often contradictory, logics that individuals and organizations are influenced by (Thornton & Ocasio, 2008, p. 104).

This leads to what recent literature refers to as institutional complexity (Borlaug, 2015, p. 18; Greenwood, Magán Díaz, Li, & Lorente, 2010). Due to the multiplicity of logics, actors can engage in strategies that aim at combining, keeping apart or co-exist different logics (Currie &
Spyridonidis, 2016, p. 78). For example, the field of healthcare has typically been used as an example where multiple logics co-exist, that has led to a integration of professional, healthcare and business-minded logics (Currie & Spyridonidis, 2016, p. 376). Another example is the field of academic, where central inquiry has been to uncover how researchers are affected by science logic and commercial logic (Sauermann & Stephan, 2013).

In a historical perspective, Goodrick and Reay (2011) provide empirical arguments through their study on professionals in the pharmaceutical field. The authors find that multiple logics have been guiding the practice of pharmacy professionals by examining historical development. Different logics influence over time and are subject to change (Goodrick & Reay, 2011). How logics at a macro-level have influenced practices at micro level in an academic setting is emphasized by Colyvas and Powell (2006). They have performed case study of Stanford University, on how entrepreneurial practices were adopted by scientists gradually and became more legitimized and institutionalized over time. Following the logics perspective, this can be interpreted as leading to blending of practices, beliefs and norms, giving rise to multiple unique logics (Thornton & Ocasio, 2008, p. 104).

### 2.2.3 Inter-institutional system – decomposable and enabling action

As noted by Powell and Colyvas (2008, p. 277) it is necessary to elaborate on the micro-dynamics in institutional research in general. The authors argue that institutional forces shape individual behavior. However, how individuals utilize the influence of multiple logics has been less understood (Powell & Colyvas, 2008, p. 277). Moreover, ideas and practices constituting an institutional logics can be picked up in one setting, and utilized in another (Powell & Colyvas, 2008, p. 277). Thornton and Ocasio (2008, p. 101) emphasize in a similar manner that material practices and cultural symbols that compose logic(s) in the inter-institutional system are detachable, and accessible to social actors such as individuals, groups and organization to manipulate, elaborate and make use of. As logics are decomposable, opportunities for actors to utilize them to their advantage is highly probable.

As mentioned above, the inter-institutional system conceptualize society as guided by particular core institutions. Thornton (2015, p. 550) states that particular institutional orders can be understood as societal subsystems, and that it is more likely that culture happens within, rather than across institutional orders. In order to fully appreciate the inter-institutional concept, Thornton et al. (2015; 2012) describes a matrix where the institutional orders are defined as the
The institutional orders, each being different, are cornerstone institutions that represent the cultural symbols and practices that provide a governance system for social actors influenced by that particular order (Thornton et al., 2012, p. 54). In this understanding, the institutional orders provide an overall top-down guide of action.

Each of the institutional orders are made up of cultural symbols and material practices defined as categorical elements, or “building blocks”. These are the Y-axis, which are unique to that particular institutional order (Thornton et al., 2012, p. 54). By following Thornton et al. (2012, p. 54) theoretical propositions, the categorical elements represents influences on individuals and organizations by providing a sense of identity and how to act. The axes within the X and Y matrix make up the institutional content of society, and furthermore what constitutes an institutional logic. However, Thornton (2015, p. 551) emphasizes the decomposable and autonomous composition of logics. Social actors, such as institutional entrepreneurs, have the ability to combine and reconfigure different cultural and practical building blocks, and transform them into a hybrid logic. This present a possibility to understand how individuals may contribute to institutional creation and change by maneuvering in terrain of multiple logics (Lee & Battilana, 2014, p. 33).

Table 1 – Inter-institutional System Ideal Types

<table>
<thead>
<tr>
<th>Y-Axis:</th>
<th>X-Axis: Institutional Orders</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Categories</strong></td>
<td><strong>Family</strong></td>
</tr>
<tr>
<td><strong>Root Metaphor</strong></td>
<td>Family as firm</td>
</tr>
<tr>
<td><strong>Sources of Legitimacy</strong></td>
<td>Unconditional loyalty</td>
</tr>
<tr>
<td><strong>Sources of Authority</strong></td>
<td>Patriarchal domination</td>
</tr>
<tr>
<td><strong>Sources of Identity</strong></td>
<td>Family reputation</td>
</tr>
<tr>
<td><strong>Basis of Norms</strong></td>
<td>Household membership</td>
</tr>
</tbody>
</table>
### Y-Axis: X-Axis: Institutional Orders

<table>
<thead>
<tr>
<th>Categories</th>
<th>Family</th>
<th>Religion</th>
<th>State</th>
<th>Market</th>
<th>Profession</th>
<th>Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basis of Attention</strong></td>
<td>Status in household</td>
<td>Relation to supernatural</td>
<td>Status of interest group</td>
<td>Status in market</td>
<td>Status in profession</td>
<td>Status in hierarchy</td>
</tr>
<tr>
<td><strong>Basis of Strategy</strong></td>
<td>Increase family honor</td>
<td>Increase religious symbolism of natural events</td>
<td>Increase community good</td>
<td>Increase profit</td>
<td>Increase personal reputation</td>
<td>Increase size of firm</td>
</tr>
<tr>
<td><strong>Informal Control Mechanisms</strong></td>
<td>Family politics</td>
<td>Worship of calling</td>
<td>Backroom politics</td>
<td>Industry analysts</td>
<td>Celebrity professionals</td>
<td>Organization culture</td>
</tr>
<tr>
<td><strong>Economic System</strong></td>
<td>Family capitalism</td>
<td>Occidental capitalism</td>
<td>Welfare capitalism</td>
<td>Market capitalism</td>
<td>Personal capitalism</td>
<td>Managerial capitalism</td>
</tr>
</tbody>
</table>

Tabled obtained from (Thornton et al., 2012, p. 56)

### 2.3 Institutional entrepreneurship

Institutional entrepreneurship has emerged as a fruitful concept to elucidate how individuals or small groups can contribute towards creation and change of institutional logics (Berman, 2012, p. 261). Tracey, Phillips and Jarvis (2011, p. 60) argue that the concept of institutional entrepreneurship is a promising approach to understand how individuals’ create new organizational forms infused with unique institutional logics. This is often achieved through individuals that are able to draw upon, and combine different logics.

Institutional entrepreneurs are organizations, small groups or individuals who create or transform an institutional landscape by performing human agency. Human agency is the ability of individuals to have a certain effect on the social world (Battilana, 2006, p. 657).

On the outset, enabling factors of change is due to the state of the environment and the institutional entrepreneurs’ social position, according to Battilana, Leca and Boxenbaum (2009). Social actors located in the periphery of the core institutional logic(s) are more likely to introduce change. Furthermore, individuals who have been exposed to multiple fields are more likely to function as institutional entrepreneurs by carrying practices from one context, to another (Battilana et al., 2009, p. 77). The enabling factor of the environment are often “shocks” in the environment, such as drastic political effects, technological disruptions, or emergence of unstable fields. This might potentially leave the environmental landscape exposed and
vulnerable to new influences that the institutional entrepreneur can transform. Other enabling factors in the environment is the degree of heterogeneity in terms of practices and beliefs. A common assumption is that more heterogenetic environments are more prone to change due to less institutionalization and firmly embedded practices and beliefs (Battilana et al., 2009, p. 75). However, Battilana et al (Battilana et al., 2009, p. 75) note that highly institutionalized fields also can be exposed to change.

Actors social position, prior experience, as well as the state of the environment, are all factors that contribute towards an actor partaking in institutional entrepreneurship (Battilana et al., 2009). Combined, these factors can empower the institutional entrepreneur to create or transform the existing dominant institutional logics into new ones aligned with the entrepreneurs’ interest. Moreover, the institutional entrepreneur(s) need to convince others actors to partake in establishing the new emerging institutions (Battilana et al., 2009, pp. 77-78).

However, the entrepreneurial perspective has been criticized for infusing the institutional entrepreneur with too much of an heroic imagery, as an individual who almost defies the surrounding institutional logics in order to pursue own interests (Thornton et al., 2012, p. 106). As noted by Lawrence, Suddaby and Leca (2009, p. 5) institutional entrepreneurs are also embedded within institutional contexts. This limits to a certain extent the possibility of institutional creation and change. Furthermore, questions have been raised in what manner a minority is able to transform logics within a larger organizational field. Studies on mature fields such as academia (Berman, 2012; Borlaug & Thune, 2017; Colyvas, 2007; Colyvas & Powell, 2006), has further proposed that change in mature and stable fields can happen without clear cut institutional changes or entrepreneurs, inclining an institutional drift rather than dramatic change (Berman, 2012, p. 291). This additional aspect needs consideration in the particular context of this study.

This calls for a more nuanced picture of the institutional entrepreneur engaged in creating or shaping logics, by not deifying the concept of embeddedness (Battilana et al., 2009, p. 96). Related to this, Thornton et al. (2012, p. 79) argues that individuals are guided by their social interaction and identification with social groups. In this manner, they are constrained by the prevailing norms and beliefs of that group, giving them a defined space of possible action, which does not resort to heroic action of individuals.
2.3.1 Logics, identity and the entrepreneurs

Identity is an important component within the institutional logics perspective (Thornton & Ocasio, 2008, p. 111; Thornton et al., 2012, p. 171). Identity creates a sense of understanding of “who I am”, and “how I should act” according to that identity (Alvesson, Lee Ashcraft, & Thomas, 2008, p. 6; Lok, 2010, p. 1308; Wry, Lounsbury, & Glynn, 2011, p. 451). Thornton et al. (2012, p. 132) argue that identities are best understood in their relation to a particular logic, and there are considerable variations in identities and individuals’ behavior given what institutional logic(s) they are influenced by.

Thornton et al. (2012, p. 83) argues that through an individuals’ socialization, individuals have multiple available (and accessible) senses of identity and corresponding courses of action that may be drawn upon. For example, an individual that moves across different organizations can have an opportunity in experiencing ideas and practices in one setting, that can transferred and utilized in another setting (Thornton et al., 2012, p. 110). This presents the social actor an exposition to an “arsenal of repertoires of action” that might be drawn upon. This is similar Battilana’s et al. (2009) perspective on an individual’s social position as described above. As noted by Borlaug and Gulbrandsen (2015, p. 7) the influence of multiple logics on individuals’ identity may be mitigated through “bridging” or “buffering” strategies. The former being the ability to draw on multiple logics simultaneously, whilst the other is dividing logics and activate those perceived acceptable in the situational context.

Furthermore, to understand what kinds of elements rooted in identities and continuous behavior are utilized, one also needs to take into account the situational context (Thornton et al., 2012, p. 80). Current situation affects what kind of knowledge an individual draws upon in facing a particular situation. In addition, individuals are more or less attached to particular identities and embedded in corresponding logics. Thus, individuals are more likely to draw on knowledge from the identity where they are the most embedded, according to Thornton et al. (2012). This can occur when prior experience for example in industry, may affect what kind of courses of action someone will use in the face of a new situation, in the academic setting. Lee and Battilana (2014) as well as Dufays and Huybrechts (2016), provide empirical insight into how individuals, or small groups draw upon embedded logics which are materialized and imprinted in organizations. Thus, given that individuals are embedded within certain logics through socialization, individuals will be imprinted and are likely to draw upon this experience later on (Lee & Battilana, 2014).
By understanding how individuals draw upon former experiences, I argue for a more nuanced picture of institutional entrepreneurship. Institutional entrepreneurs might not always be deliberate change agents, but rather individuals who utilize their prior experiences in a new context. The theoretical discussion has painted a picture of individuals as embedded in multiple logics, making it possible to combine ideas and practices from multiple logics. I argue that this paints a picture of institutional entrepreneurs acting within confined logics, nuancing the institutional entrepreneurs’ available maneuverability. Furthermore, the theoretical framework is not necessarily aimed at changing or replacing existing logics within organizations or field. Rather they function as a disposition that allows individuals to draw upon them for their own advantage in their local setting. Thus, the proposal is to place the institutional entrepreneur in embedded logics, to allow the study of how individuals make use of previous experiences in new settings.

2.4 The concept of institutional work

A central concept the thesis will draw upon to elucidate how actors utilize their embeddedness in multiple logics, is the concept of “institutional work”. Institutional work is defined as ‘the purposive action of individuals and organizations aimed at creating, maintaining and disrupting institutions’ (Lawrence, Leca, & Zilber, 2013, p. 1024). The main explanatory power of the concept is to illuminate how social actors’ actions’, affect institutions (Lawrence et al., 2009, p. 7). Institutions are products of human action as well constraints on actors, in a recursive relationship. The concept provides nuances in the relationship between individuals and institutions in the creation, preservation and change of institutions (Lawrence et al., 2009, p. 6). Institutional work is grounded in previous work on agency within institutional theory, as well as in the sociology of practice literature. Practice is to be understood as the situated actions of individuals and social groups that are organized around a shared social understanding and desirable outcome (Lawrence et al., 2009, p. 6). Thus, the concept calls for attention to social actors’ purposeful activities and actions’ in altering institutions, in a bottom-up perspective (Lawrence et al., 2009, p. 1).

Actions are often highly visible as they are performed by institutional entrepreneurs, however, as emphasized by Lawrence et al. (2009, p. 1), actions may often be of a mundane nature performed through everyday activities. One bland example can be training programs in organizations that aim at integrating commercial practices. Therefore, it is of interest to identify
mundane activities that contribute towards an institutional change. This aligns the concept with Powell and Colyvas’ (2008) calls for micro-level understanding of institutional change.

Lawrence et al. (2009, p. 11) argue that to understand social actors’ purposeful action, their intentionality is of high importance. Actors’ ability to draw upon multiple former experiences, and perception of present situations, all constitute necessary considerations of specific action (Lawrence et al., 2009, p. 12). This highlights actors as ‘reflexive, goal-oriented, and capable’ in shaping institutions (Lawrence et al., 2013, p. 1024). Moreover, this inserts social actors in the broader institutional framework, by aligning institutional work with institutional entrepreneurs’, embedded in institutional logics.

The literature briefly described above has sought to provide explanations on how institutional work occurs, and who engages in it (Lawrence et al., 2013, p. 1025). Empirical contributions, such as Tracey, Phillips and Jarvis (2011), whilst not examining institutional work directly, find that institutional entrepreneurs engage in institutional work at multiple levels, namely macro-, meso- and micro-levels, in order to bridge institutional logics in “hybrid organizations”. By performing six different types of institutional work that sought to combine elements from different logics, the founders of for-profit company Aspire, established an organizational form with practices rooted in seemingly contradictory logics, those of charity and business (Tracey et al., 2011, p. 69). Recent literature, for example Gawer and Phillips (2013) propose to understand artifacts as a type of institutional work themselves. Through their study of technology company Intel, they find that the development of a new interfaces, the technological artifact was inscribed with emerging logic of the organizational field making it “a physical instantiation of the logic” (Gawer & Phillips, 2013, p. 1062). Through the technological interface, an overarching logic guided the interactional nature amongst the members of organizational field (Gawer & Phillips, 2013, p. 1063).

Nonetheless, it is worth noting that the study of institutional work present an understanding of institutional change as not being determined in a linear fashion. By emphasizing activities, Lawrence et al. (2009, p. 11) argue that the perspective moves beyond a “linear process” of institutionalization, and that the process itself is characterized by resistance and transformation. This proposes possible alignments with Colyvas and Powell (2006) historical case study of Stanford University “back-and-forth” development of the entrepreneurial practices as spanning over several decades.
2.5 Literature review – Change in academic science

In the last three decades, there has been increased emphasis on stimulating universities’ contributing innovation. This has emphasized universities’ and scientists as something more than “disengaged knowledge creators” (Fagerberg, 2005, p. 210). The motivation behind such an increased emphasis on innovation, has seen as a response to changes in the environment. Moreover, this has correspondingly led policy-makers to view science as a tool for economic growth, industry development and creation of new jobs (Mowery & Sampat, 2005). Initiatives towards realizing these desirable outcomes have for example been commercializing research, through licenses and patents, creation of spin-off companies from university research, intensifying university-industry collaboration projects, and establishment of support structures such as technology transfer offices’ and governmental support programs for industry collaboration with academia (Abreu & Grinevich, 2013, p. 429; Perkmann et al., 2013, p. 423; Rasmussen & Gulbrandsen, 2012, p. 528).

The increased importance of academia in wealth creation, economically and socially, has shaped scientists, and affected teaching and research missions in higher education towards economical and societal benefit (Etzkowitz & Leydesdorff, 2000, p. 315; Lam, 2010, p. 307). Simultaneously, on the micro-level, these developments have led to increased opportunities for scientists to intertwine the classical role of research with a commercial focus on applicability (Owen-Smith & Powell, 2002, p. 5).

According to Etzkowitz (1998, p. 824), this shift can be understood as a transformation from highly held classic values of academic science, through gradual normative change towards entrepreneurial science. This change has been conceptualized as a change from a “Mertonian” academic logic, towards a commercial logic (Sauer mann & Stephan, 2013, p. 889). Mertonian logic can be understood as the classic pursuit of knowledge, and freedom of research, whilst the commercial logics is more towards applicability, knowledge transfer, utilization, and innovation (Borlaug & Gulbrandsen, 2015, p. 4; Sauer mann & Stephan, 2013, p. 889).

Vallas and Kleinmann (2008, p. 283) claim that there is a two way influence between the academic and industrial sphere, that they term comingling. The comingling of academia and industry has developed novel and unique logics, as they constitute the “cultural traffic” between the separate spheres (Vallas & Kleinman, 2008, p. 283). Due to the “cultural traffic”, Vallas and Kleinmann (2008, p. 289) propose to understand the development of academia, as well as
industry, as co-evolutionary. This is reflected in spin-off firms, increased literature citations in corporate laboratories, and increased mobility between academia and industry (Vallas & Kleinman, 2008, p. 289).

However, as argued by Colyvas and Powell (2006) the transformation from Mertonian values within the university towards incorporation of industrial rationales is not a linear process, and may be halted and even reversed. Related to this, Borlaug and Thune (2017) find that the academic logic has not shifted, but has become more complex, combining both traditional roles, and new commercial roles. By understanding integration of academic and industrial logics as a process of institutionalization, the sphere of academic science is subject to a non-linear developmental process. This process is dependent on influences from the wider environment, as well as internal changes (Borlaug & Thune, 2017; Colyvas & Powell, 2006).

In a similar manner, non-linear developments are observable at the micro-level. Both Owen-Smith and Powell (2002, p. 5), and Lam (2010, p. 309) find that that the intertwining of the industrial sphere within academic science contributes to nuancing the identities of scientists. Rather than seeing scientists as either “entrepreneurial scientists” or “Mertonian-scientists”, Lam (2010) suggests hybrid identities that draw upon both logics. Environmental change may provide incentives towards change in scientists’ research practice. However, it is equally dependent in what manner individuals contribute to the changing nature by rejecting, applying or combining elements from different logics in their practice (Lam, 2010, p. 335). This provides an increasingly complex picture as the individual scientist is capable of drawing upon different logics, contributing to a perspective of non-linear development (Lam, 2010, p. 335). Sauermann and Stephan (2013, p. 905) provide insight on disciplinary differences, but also that differences exists within academic disciplines on how particular science practices are influenced by different logics. They argue that that heterogeneity exist within the same field, in science.

The literature have provided theoretical and empirical perspectives on academic science and has presented a picture of highly complex dimensions. Scientists’ identities are not easily divided between “entrepreneurial” and “Mertonian”, or by Mertonian or commercial logics. By acknowledging the complex dynamics where multiple logics and practices, norms and activities reside, a more thorough appreciation on how academic science develops is presented. This gives perspective on how organizations and scientists respond and utilize various influences in their everyday actions to shape their work and work surroundings.
2.6 Summary and theoretical motivation

This sub-chapter has provided an understanding on how the intersection between academia, and primarily industrial influences has shaped academic science. The literature discussion proposes that a dichotomy of either “Mertonian” or “entrepreneurial” scientists is not a satisfactory understanding to provide answers on “why scientists do as they do”. As it has been shown earlier in this chapter, scientists’ can be understood as embedded in multiple logics. However, to develop a comprehensive explanation on research practices, the scientists’ ability to purposefully draw upon practices and ideas from multiple logics need to be considered. Inspired by this literature, I have developed an analytic framework that draws on the concept of institutional logics, institutional entrepreneurship and institutional work.

By utilizing the theoretical concepts described in this chapter, I attempt to provide a integrated understanding on how senior scientists create a culture of innovation. I conceptualize senior scientists’ as institutional entrepreneurs, embedded in multiple logics. By acting as institutional entrepreneurs, I study how senior scientists’ draw upon, and combine cultural elements, the ideas and practices, from multiple logics. I propose that scientists’ have been exposed to various logics through former experiences. Through their function as institutional entrepreneurs, senior scientists’ establish an overarching “research logic” that guides the main ambition of their research groups. This can be interpreted as “the ways of doing things” which constitutes the innovation culture of that particular group. Moreover, in research groups there is a relatively high frequency of changing personnel that need to be socialized and embedded in to the practices and activities of the group. Through conceptualizing the design of research projects, and performed activities as a form of institutional work, I suggest that senior scientists’ intentionally develop mechanisms that aims at creating, maintaining and introducing members to a specific research logic.

In summary, by conceptualization senior scientists as institutional entrepreneurs embedded within multiple logics, we can attempt to understand the processes of creating a culture of innovation. Furthermore, in order to introduce and preserve the culture, the senior scientists partake in institutional work through purposefully establishing activities, and designing research projects in a specific manner. Overall, the theoretical framework suggest that the culture of a research group is a complex affair, where multiple logics are combined into a coherent “logic”.

3 Methodology

In this chapter there will be describe my methodological approach for this study. First, I will present the case study approach as a methodological approach. Second, I will elaborate on the data collection methods including interviews and documents. Last, there will be a discussion of validity and ethical concerns.

3.1 Case study methodology

In this thesis, a qualitative case study approach is pursued in order to understand how an innovation culture is created within research groups at the University of Oslo. The purpose of using a case study approach is to provide knowledge and understanding of complex social phenomena (Yin, 2014, p. 4). In this manner, it is of interest to illuminate the creation and socialization of beliefs, practices and norms that are expected to occur in an innovative environment. The need to elucidate social dynamic within research groups is of broader interest as innovation in the academic setting often has been discussed in terms of identifiable characteristics. The characteristics have been patents, industry relations and spin-off companies. According to OECD (2012), there has been recognition of cultural and social values and beliefs as instrumental in innovation. Thus, the case study sheds light on “invisible” processes related to the creation of an innovative culture.

An important element in the case study approach is to differentiate between what, how and why oriented research questions. The main research question of the thesis, how researchers create an innovation culture within a research group, arguably makes case study a suitable approach. However, a case study needs multiple sources in order to give the case validity, often based on triangulation (Chambliss & Schutt, 2010, p. 87). Triangulation is the gathering of data from various sources to secure consistency (Yin, 2014, p. 241) The biggest obstacle in this process was the difficulty to obtain relevant data that could contribute towards shedding light on the social dynamic in research groups in a consistent manner. The available data, apart from interviews, have contributed to the data set in larger or smaller extracts. A method of observation would be ideal to combine with interviews documents that was gathered. However, due to time-limitation, this was a difficult task. Only limited observations were made, which do not generate reliable data. This is a significant weakness in a case study approach.
3.2 Data collection

The data gathered consist of literature research, various documentation such as videos, power-point presentation materials, news articles and strategy documents, as well as qualitative interviews with senior scientists. The majority of data is therefore what is considered qualitative. This sub-chapter highlights the process of how the data gathered for the purpose of this study has been conducted. In the last section, I present a brief elaboration on how the data sets were analyzed.

3.2.1 Literature research

The core literature utilized in this thesis was found through using various sources such as the University of Oslo Library, Google Scholar, and the Web of Science. I was also presented suggested readings from my supervisor and others professors and the Centre for Technology, Innovation and Culture (TIK). I utilized relevant topics in the literature as a preliminary point of reference in order to gather knowledge about empirical results and theoretical frameworks used in the study. The empirical results in the literature informed the thesis in developing sub-questions to supplement the overarching research question.

The literature search was a continuous process throughout the duration of the study. The main strategy of the literature research, after preliminary scanning, was threefold. First, syllabus and proposed literature that was considered relevant, and touched upon topics of interest, I utilized a snowballing strategy through scanning citations of the previous article in order to widen and explore relevant literature. Second to narrow down on relevant literature, I applied keywords such as culture, research group, innovation, university innovation, professor and student, academic entrepreneurship, in the snowball strategy to find more thematically specific literature. Third, I applied the same keyword as mentioned above, however, I included a longer string of keywords in order to find literature relevant to the overall research question.

3.2.2 Public documents

Archival records such as strategy documents, news articles, interviews, videos and presentations were used as data in this thesis. These data were used to analyze two aspect: First, overarching characteristics and strategies at the University of Oslo, and faculty innovation
strategies. Second, the data contributed towards analyzing overall characteristics of the research groups that were subject to the study.

Strategy documents at both university and faculty level were examined in order to look at how innovation was regarded within the university setting. The university, as well as several faculties see innovation as something desirable to achieve. However, faculty strategies vary in some degree. Some faculties emphasize commercialization and contact with industry. Others emphasize to stimulate innovation through multidisciplinary cooperation. News articles published, served as information on research groups to gain an overarching view on how the research groups are composed, and get first impressions on what they do. In addition, video presentations were from the perspective of senior scientists, which provided certain insights on how they establish an innovation culture in their research groups. These were all published through UiO.

Most of the archival documents collected were available through the official website of the University of Oslo, as well as official publications by relevant faculties’ websites. One should approach documents in a critical manner due to possible biases. This may have been especially important given that the publications were produced by the University of Oslo itself, possibly emphasizing particular successful outcomes (Yin, 2011, p. 12). I acknowledge that the available documents are not neutral descriptions of reality. However, I argue that some of my archival documents have provided interesting descriptions on what scientists emphasize in their research groups, and have in this way contributed to elucidate processes that were reflected in the qualitative interviews.

3.2.3 Interviews

When performing a qualitative case study, interviews are one of the main sources of gathering information about social phenomena. Interviews allows for concentrated discussion and reflections about specific topics of interest (Punch, 2014, p. 144). First, a brief elaboration of interviews as a data collection method is presented. Second, description and reflections regarding the interview process follows. I emphasize this sub-section, as qualitative interviews were the primary source of information in the thesis.

Interviews are considered an essential source of information when performing a case study, as knowledgeable informants may provide important insights and reflections on the case (Yin,
2014, p. 113). I choose to pursue a strategy of “fluid, but guided” conversations and thus the interviews where of semi-structured structure. The interviews aimed at guiding the conversation, while at the same time allowing informants to elaborate on interesting aspects related to the overall topics of interest (Patton, 2002, p. 354; Yin, 2011, p. 135). Furthermore, the interviews where what Yin (2014, p. 110) refer to as shorter case study interviews, meaning they were conducted in less than one hour.

Even if interviews are a particular good method to collect data, a shortcoming is that of possible bias. As pointed out by Yin (2011, p. 132), data gathered from conducting in-depth interviews, no matter how informed and thoughtful, are limited to the informants own reflection on behavior, action, and perceptions. Therefore, one should always keep in mind that the information might contain bias. Furthermore, this makes it difficult to extract generalizable conclusions beyond situations studied (Yin, 2014, p. 40). Nonetheless, interviews are a source of information well suited to elucidate norms and practices within a research group, which is difficult to study without involving the participants.

I have conducted eleven interviews with individuals from carefully chosen research groups. Through the interviews, the intent was to get insights on how the scientists worked towards creating an culture of innovation within their research group as this information was not particular easy to obtain through available documents. The informants have their academic backgrounds primarily within natural sciences and technology, as well as medicine. The rationale behind approaching informants rooted in these fields of science is that in most contemporary literature these fields are usually in the forefront in research-oriented innovation. This is not to say that other fields are not involved in innovation, but for reasons of simplification, informants within these fields were chosen.

This has led me to particularly interesting and reflective informants with knowledge on the subject at hand, and thus provide interest and open contributions towards the study. In addition, prior interaction with some of the informants may contribute to certain biases. Further elaboration on this issue follows below.

3.2.4 Finding informants and conducting interviews

The informants who provided information in this study were selected through a nonprobability manner, mostly through the methods of purposive and snowball sampling (Chambliss & Schutt,
Together with my supervisor, I purposefully chose informants that were professors and senior scientists that had a proven track record in innovation activity. However, some of the informants held different positions during the timeline this study was undertaken. This has led to information from the point of view of department and institute “coordinators”. Material presented during courses in preparation for the thesis helped in “mapping” potentially interesting informants. The material listed various scientists that had engaged in patents and licensing activities. Based on this list, one strategy was to follow number of licenses and patents as an assumption of a suitable informant. University publications were also used as a “path” to find interesting participants.

I also had a brief meeting with some of the informants prior to the conducted interviews, due to my position as assistant in an innovation project at UiO. On a positive side, previous meetings helped in determining knowledgeable informants with interesting perspectives. However, this may contribute negatively as it may influence my bias and perception prior to the information gathering process. Nonetheless, contact was established through a mixture of formal and informal channels.

Furthermore, it was of interest to interview people in the research groups, including students and junior scientists. For this purpose, an snowball strategy was performed after completed conversation with one senior scientist. The snowball strategy was directed towards finding knowledgeable informants at student level (Chambliss & Schutt, 2010, p. 123). I was able to meet with some of the students and junior scientists that provided perspectives from their point-of-view. A drawback is however that the number of students and junior scientists interviewed was quite low. In addition, two of the informants were currently in the same research group. Furthermore, an important consideration regarding the snowball informants is that they are contacted on the recommendation of the prior informant. By being purposefully recommended by prior informants, I recognize that certain biases may exists, thus making me reluctant to suggest that similar reflections are widely shared amongst other students and junior scientists’ (Chambliss & Schutt, 2010, p. 124).

The interviews were conducted in Norwegian as all the informants were Norwegian speakers. All the interviews were arranged as face-to-face, as proximity was not an issue. All the interviews were recorded by an audio recorded on a mobile phone. The audio recorder was used in order for me to be fully focused on the participant, questions and answers. This allowed me to follow-up on topics of interest in consistent manner. All the interviews were transcribed, and
sent as copy to the informants for confirmation. The informants have all been anonymized, and I have chosen to paraphrase extracted quotations in order to secure the anonymity of the informants. Moreover, a “natural” paraphrasing has occurred due to the fact that the interviews were conducted in Norwegian, and have been translated to English for the purpose of the study.

I chose not to send my informants the topics and question beforehand, as I did not want my informants to overthink the questions and answers. This was done as a strategy in order to lower the risk of providing me with answers that I wanted to hear, as opposite to describing the actual situation. An overview of questions is provided in the appendix. A reflection on the interviews is that I may have pursued the informant to provide a fulfilling answer, and with that generated certain bias in the answer. Related to this, it could have been advantageous to send my informants topics and questions beforehand (Yin, 2011, p. 132).

Furthermore, it is important to mention as caution and potential weakness of the study; in this thesis I treat my informants as the single creators of culture within their respective research group. However, research groups often consist of several senior scientists, and thus arguably all contribute in one way or another towards the groups’ culture and practices. This is sub-optimal considering the validity and reliability of the study. But due to time-limitations such a strategy was considered as the best option.

Table 2 – Overview of informants

<table>
<thead>
<tr>
<th>Informant</th>
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<tr>
<td>Informant¹</td>
<td>Faculty of Mathematics and Science</td>
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<td>Informant²</td>
<td>Faculty of Mathematics and Science</td>
</tr>
<tr>
<td>Informant³</td>
<td>Faculty of Mathematics and Science</td>
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<tr>
<td>Informant⁴</td>
<td>Faculty of Dentistry</td>
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<tr>
<td>Informant⁵</td>
<td>Faculty of Mathematics and Science</td>
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<tr>
<td>Informant⁶</td>
<td>Faculty of Mathematics and Science</td>
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<tr>
<td>Informant⁷</td>
<td>Faculty of Medicine</td>
</tr>
<tr>
<td>Informant⁸</td>
<td>Research Institute</td>
</tr>
</tbody>
</table>
3.2.5 Analysis of interviews

It is of importance to state that the present study has characteristics of being developed in an inductive manner, as the data gathered was somewhat prior to theoretical contributions (Yin, 2014, p. 138). Moreover, the whole process of this thesis was a continuous and adaptive process (Yin, 2014, p. 65), and thus subject to back and forth traction between gathered data, theoretical contributions, development of characteristics. The main strategy in the analytical process was inspired by the logic model, proposed by Yin (2014, p. 155). As noted by Yin (2014, p. 155): *The logic model stipulates and operationalizes a complex chain of occurrences or event over an extend period of time.* My strategy was to trace information to thematic sub-divisions. This led me to define characteristics of each research groups. The following sequence elucidates this strategy.

Questions were formed in such a manner that would elaborate on the senior scientists, and the research group. This was done to understand the “identity” of the group. As I did not follow the research groups over a time-period, my strategy followed a thematically approach, based on current traits. The first attempt at analysis was to listen through the audio files, to recognize particular themes within the information provided. This provided key concepts that were considered as worthwhile to pursue further. I proceeded to code information perceived as thematically important, that lead me to a description of core characteristics of the research groups, divided into themes. From this, I proceeded to trace core characteristics backwards to statements made by informants, in order to ensure that it corresponded with the thematic coding. The analytical approach of building thematic subdivision, allowed me to identify core characteristics of how an innovation culture is created in a holistic manner. Furthermore, it allowed me to spot similarities and differences between statements, even when different wordings were used to describe somewhat similar phenomenon.
3.3 Ethical concern and validity

This chapter has presented and discussed the methodological foundations that have been used in the process of writing this thesis. This is done to ensure transparency in the work conducted, in order to provide validity and reliability of the overall study. As noted by Chambliss and Schutt (2010, p. 65), as researcher I have an obligation towards the scientific community to be transparent, and present my research methods in order to assess the validity of my research.

The main methodological approaches in order to gather, and sub-sequentially analyze the gathered information has been done in a qualitative manner. The empirical findings and subsequent analysis portrays cases subject to the current thesis, and do not represent a general sample of research groups. The thesis recognizes that performing additional quantitative questionnaires or utilizing quantitative data sets would be advantageous to strengthen the overall validity of the study. As argued by Yin (2014, p. 19), qualitative and quantitative approaches are not mutually exclusive, and can re-inforce one another. However, due to the inductive approach, lack of other than sporadic data sets and time limitations, a quantitative approach was not included. Utilizing existing data sets may have been prone to purposely fitting data to the current study, due to various data sets covering different analytic levels.

Furthermore, as mentioned in point 3.1, a weakness in the study is the lack of observational studies. It would advantageous to perform observations in order to experience the group culture first hand. Observational studies would be especially effective combined with a longitudinal study. Moreover, it would be desirable to widen the scope of informants of the category students and junior scientists. This would increase the reliability and validity of the study by having more robust contributions from both senior scientists, and members of the research groups. As it stands now, information provided may be perceived as painting a picture from one side, the senior scientists.

Regarding ethical concerns, a highly important part when conducting research is to secure the informants integrity during the whole duration of the project. When reaching out to the relevant informants, a request was sent with a brief description of the project. Prior to the beginning of the interview a consent form was presented with information about the project, and request of recording of the interview if accepted by the informant. The full transcription of the interview was sent to each informant, as well as a follow-ups’ with relevant extracts. This was done to
secure that data utilized in the thesis is approved of stemming from the informant. A proposition to receive the audio file recordings, was also presented to the informants.

The interviews conducted, and information provided focused on the research groups. Personal information of the interviewee were not discussed. This also regards classified information about research projects. Rather, general discussions of the research conducted in the groups was done to provide context. Nonetheless, certain individual traits have been necessary to understand in order to develop a thorough understanding. All the informants have been anonymized, making it troublesome for future studies to extract similar responses as have been provided in the context of this study. This could lead to lower the validity and reliability of the current study. However, extracts from interviews have been compared to the best of my ability to available documentation such as video presentations and articles in order to secure reliable information.
4 Empirical findings

The empirical findings in this chapter focus on how senior scientists create a culture for innovation in their research group, and how members become socialized into this culture. Research groups are important to achieve innovation in the contemporary university. Research is seldom conducted in isolation, by a lone researcher. Rather, research is conducted in groups (Göktepe-Hultén, 2008, p. 657). Göktepe-Hultén (2008, p. 658) emphasizes that most of the research activities are organized in groups consisting of professors, post-doctoral, PhD- and master degree students. The senior scientists in research groups can be described as the most significant individuals. This is largely due to their role as visionaries, principal investigators and team leaders of the group (Göktepe-Hultén, 2008, p. 661). In the following paragraphs, a description of the research groups included in this study are presented. The research groups, and the senior scientists’ subject to this study all reside in the disciplines of natural sciences, technological sciences, and medicine at the University of Oslo.

The first research group specializes in research on processes that aim at reducing energy consumption, as well as reducing the amount of negative bi-products, in terms of pollution. This is particularly interesting for global and Norwegian gas industry. The research group is big in size, with 40-50 members at given point of time. The group consist of different disciplinary backgrounds.

The second group specializes in new energy technology, in terms of energy conversion. They perform research to develop knowledge on how materials are utilized in environmental friendly energy conversion processes. This is a highly interesting topic for oil and gas dependent economies. The research group has approximately 20-30 members with disciplinary backgrounds in natural sciences.

The third group specializes in immunological and biological processes on a molecular level. They perform modulations in order to understand the structure of the proteins. The group consist of approximately 10-12 members. The knowledge gained from this research may be later utilized to design protein based drug candidates that are of high societal value.

Two of the other group specialize in the creation of drug candidates, with both of the groups having approximately 8-12 members at the given time. The first group is multidisciplinary, with specialization in antibiotic resistance and designs drug candidates for this purpose. The second
group specializes in creation of molecules that combat increased development of illness. This group also consist of multidisciplinary personnel.

The last group specializes in biomaterials and bone regeneration with approximately 30 members. The group conducts research on how the human body reacts to materials and modifications of materials. In addition, the group specializes in regenerative medicine, development of materials, processes and structures that support human bone regeneration.

Last, two informants provided insights from their role that can be understood as coordinators at the organizational level. These informants were mentioned in the methodological chapter (3.2.4), providing organizational-level perspective. The first informant was connected to the medicinal sciences at the UiO. The second informant was connected to a research institute that has strong collaborative ties with UiO. Both of these informants operated towards integrating the various disciplines and research groups existing within their respective departments.

In the first sub-chapter, I look at prior experiences of senior scientist, and how seniors are shaped by previous experiences. Further, I look at how they draw upon these experiences to create a culture of innovation in their current research group. In the second sub-chapter, I look at activities that are performed in order to generate an innovative culture. Moreover, in order to elucidate how new members become socialized into the group culture, I look at research projects as a socializing mechanism.

4.1 Group leaders and their role as innovators(?)

In this sub-section I will investigate how senior scientists make use of prior experiences in the current research group. Through the information collected from interviews, I will look at the seniors’ previous experiences and how they affect the senior scientists’ ambitions. Moreover, how these ambitions influence the groups’ activities and innovation culture. This sub-chapter will answer the sub-question: How do scientists draw on prior experience that are imprinted in the research group?

When the interviewees were asked about their experiences of performing “innovation in research”, one reoccurring theme appeared. All the senior scientists expressed that they had been working with an “innovation approach” in research at some point. The scientists’ described “innovation in research”, as approaching research problems with the ambition of
application, or utilizing their research. When asked about how informants became introduced to this ambition, prior experience were expressed as having an considerable impact. The senior scientists’ described former experiences as shaping them in applying a mindset of performing research, with a “bigger perspective”, “solving a need”, or prospects of “leading to a product” in mind. In general, the scientists had brought this mindset with them, throughout their career and implemented it within their research group. This is illustrated by one of the informants’ description of the current group:

“The culture you enter is the one that will reflect you (...) as a student I didn’t think about the fact that I was going to join a group that focused on innovation (...) I was inspired by the environment in that group (...) Performing basic research, but also keeping in mind the bigger perspective (...) This train of thought is something that drives the current group” (Informant6).

First, some of the senior scientists’ mentioned that innovation is something they have been introduced to after “just being” pure scientific researchers (2, 5). The ambition of utilizing research was described as stemming from exposure in research communities that focused on such goals. One senior scientist described this in the following way:

“Innovation is something I have become aware of (...) I am not a typical innovator, I’ve only been in the industry for a short while, however I’ve been involved with other research groups where the culture for innovation is very prominent. The department has also had a focus on it due to the discipline being innovative in itself. It is something that is very prominent here, and has been reinforced” (Informant5).

Some of the scientists’ elaborated on working in research communities abroad, which emphasized the value of utilizing research outside of academia. Other scientists’ had become part of a research community that “expected” their research to lead to something useful, in example a product. This shaped them to applying a mindset of approaching all of their research with an application focus. I find that senior scientists, through exposure in these research communities, have been influenced to apply a mindset of utilizing their research. The seniors have an ambition of utilizing basic research for societal or industrial benefits, for example through new products. In relation to this way of thinking about research and innovation, the senior scientists have brought with them organizational structures and work processes, and implemented them in the current research group. As an example, one of the seniors’ described
how the research group is organized in a specific manner, which allows a high degree of information flow amongst members.

Second, other senior scientists’ have been embedded with an innovation perspective in their research from early on, through masters-degree and PhD programs, or nature of their academic field (1, 4, 6). One of the scientists elaborated on this:

“Innovation and demand has always been a part of the academic field. The nature of the academic discipline has always had a reasoning to think how we can solve a particular problem” (Informant4).

The scientists’ mentioned that conducting research with application-oriented perspectives, was something that they had been doing throughout their career. Having a perspective on how research can be utilized was more or less taken-for-granted in how the interviewees approached scientific problems. This was even the case when the scientists elaborated on basic research activities. They still had a goal of utilizing basic insights outside of academia somehow. The senior scientists’ close involvement with innovation perspectives in their research through education, or more generally within their academic field, was reflected in the group’s approach towards research problems. Moreover, early exposure to innovation perspectives had led the concerned interviewees to adapt multi-disciplinary approaches and industrial co-operation to fulfil the groups’ research goals.

Some informants also mentioned that they had gained experience in innovation-related work through prior work experience in industry. On one hand, directly through employment, on the other in an in-direct manner through educational programs and affiliations with research institutes. One senior scientists with a background from industry stated the following:

“It started during the master program (...) where I got an opportunity to work in the industry (...) The positive attitude I experienced was exiting, and it made me stay. I was inspired through that environment by the goal of creating something” (Informant3).

Furthermore, related to particular experiences the scientist brought with them:

“It has always been multi-disciplinary, ever since my master’s degree (...) However, in industry (...) There it’s already multi-disciplinary, you work with many different disciplines. It is something I’ve been a part of and something I’ve brought with me” (Informant3).
The senior scientists’ had brought with them the importance of upholding multi-disciplinary and cross-sectoral cooperation. In addition, it is of interest to note that some of the scientists mentioned that connection with industry had taught them how to optimize and leverage knowledge exchange, by treating industry as important partners. This was done without compromising the overall goal of the research group, and what they strived to achieve, according to the informants (1, 4, 5, and 6)

It is important to emphasize that the experiences shaping the senior scientists’ ambitions do not come from only one source. Some of the senior scientists mentioned that both their educational background and industry experience had made an impact on them, and shaped how they see goal of research. They utilized particular knowledge explicitly from industry in terms of the innovation process, whilst the nature of the academic discipline made it natural to approach research problems with a multi-disciplinary perspective. For others, through their educational background, contact and cooperation with industry was part of the educational process. This led to the scientists treating industry as knowledge partner from early on. Others mentioned that exposure within a particular research environments was of primary importance in shaping the scientist to an innovation “mindset”. However, the same interviewee mentioned how exposure during studies also contributed to develop interest in commercialize research.

Furthermore, senior scientists’ are also subject to continuous development in society. Evolvement of disciplines, industry and other areas of influence extends the scientists possible repertoire of action that can be drawn upon, and later materialized in the research groups. One senior scientist explains this in the following manner:

“What I try to do now is to implement a perspective of openness in this group (...) what I mean by that is that I want the group to share insights on the work process. I believe we can gain much from that, not just scientific knowledge, but knowledge to make it more efficient (...) This perspective has also had an effect on how we organize our laboratory. Everyone is close to each other (...) students can come to my office if they wish (...) it is very open, I think that is important as I believe we gain more in the long run” (Informant4).

External factors, such as influences from important stakeholders such as funders, also have an impact on research groups. In this section I will explore how the availability of funding potentially influence research groups and corresponding projects. All interviewees except two mentioned financing as some form of substantial influence. On one hand, innovation
requirements in research grants did stimulate the scientists to adapt a perspective of utilization when designing research projects. However, some of the scientists problematized the emphasis on innovation, as it puts ever-increasing pressure to compete for funding. The senior scientists devoted substantial time and effort in obtaining funds, rather than conducting research. Some also expressed concerns towards the innovation emphasis in funding, as it could potentially hamper future interesting discoveries due to requirements in solving current needs. According to the scientists, long term and basic research efforts were often needed to support innovation-oriented projects later on, or to develop new innovative projects. However, short-term effects are not particularly easy to pin-point in terms of concrete and foreseeable impacts, which make it difficult to obtain funding for basic oriented projects.

Nonetheless, these findings suggest that external conditions affect the research groups’ research activities and ambitions. The emphasis on demonstrating societal impacts to obtain sufficient funding requires senior scientists to adapt activities, and formulate research problems that can deliver outcomes in the form of innovations. Subsequently, this affects the design of research projects that in some of the cases were described as targeting “short term” or “easy wins”, rather than addressing long-term challenges.

Overall, my findings indicate that the ambitions of the research groups’ are connected to the prior experiences of the senior scientist. Through the empirical data, I find that prior experiences are explicitly drawn upon to establish the research groups’ main ambition, that of having a “bigger perspective” in research conducted. This is most visible in what can be understood as the “research logic” of the research group, namely the continuous work along the fluid boundaries of basic-, and applied, or innovation-oriented, research work. The findings indicate that this logic does not favor any of the dimensions; rather they are a fulfillment of each other in order to generate the best possible outcomes. As one scientist described:

“What characterizes this group is that we have a wide span in what we do….we work on the fundamental, but at the same time encourage thought processes on how it may lead to a product (Informant²).

Another senior scientist described ambition of the group in a similar manner:
“I’ve always worked closely with industry (...) But to truly make a difference, I needed to work on more fundamental research (...) Even though the group performs basic research, we always have a goal of discovering something new, something that may be utilized”. (Informant1).

Furthermore, certain core practices, such as the importance of multidisciplinary approaches or industry partnerships are explicitly drawn from prior experiences. Moreover, previous experiences are visible in organizational characteristics of the research group, such as group composition and organization of the laboratory. These influences have been implement in the current group structure. The scientists’ also emphasis that the goal of combining basic science and innovation is influenced by external stakeholders, particularly in funding calls. The joint influence from developments within the scientific field and policy/program developments drive an increasing focus on combining basic and applied focus to deliver innovative research and innovation output in these groups.

4.2 Creating a culture of innovation

In this section, I address the activities that groups and the group leaders in particular, perform in order to develop an innovation culture. The sub-question addressed in this part is: “What kinds of activities are performed in groups in order to create a culture for innovation?”

4.2.1 Key practices to support innovation in research groups

The senior scientists all mentioned the value of interaction amongst team members as crucial for generating ideas and opening new research opportunities. Most of the research groups had established regular sessions of discussing literature and research results. These activities were an important part of the daily activities that lead to expansion of competence, and discovery of new research opportunities, due to input and sharing of knowledge amongst members. As one senior scientists stated, these activities are important for the development of the group:

“A laboratory has to be dynamic (...) some may sit and play with ideas, others might discover them through intensive work over a longer period, and the idea develops for example through interaction with others (...) A research group is primarily composed of “doers”, they are crucial (...) There has be certain considerations, we have a lot of ideas and it is engaging to work with students, there is a low threshold towards suggestions (...) Sometimes we identify
something highly interesting, then we pursue that opportunity which is connected towards a project, or that the project may develop in a different manner” (Informant 6).

The members of the research group are encouraged to critically discuss established scientific facts, bring forth own ideas, and participate in broader group discussion. On an overall level, the senior scientists emphasized that critically discussing science, as well as questioning taken for granted research methods and facts, contributed to development of new interesting results. Furthermore, this stimulated the senior scientists to rethink the existing research problems. This was especially related to students’ and junior scientists’ role in the group by questioning established “truths”, and in this way contribute to idea generation. As one of the scientist mentioned:

“The students who contribute towards exiting ideas, it is not a result of them saying “oh look, I have an idea about something” (...) often it is a result of them doing something opposite to what was agreed upon, then we get a result we do not understand and learn from it (...) They are allowed to do this in the group, question the methods, techniques and the seniors. It is an interaction between the students and myself and the other seniors” (Informant 2).

The findings indicate that an important mechanism for idea generation in the research groups are contributions from students and junior scientists. Students and juniors’ are allowed to pursue interesting and new research problems, or follow up on observations that do not fit established knowledge. This contributes towards generating new results, some of which can be developed into new projects. Some of the senior scientists even stated this role explicitly:

What characterizes this group is that students have freedom to pursue their curiosity (...) Of course they have to do certain tasks and we make sure that it has relevance, but if they wish to pursue something interesting, we do not stop them (...) It is important to let them think for themselves. (Informant 1).

One of the junior scientists’ in the same group supported this notion:

“We contribute by working on the research projects (...) However, we also shape the projects along the way. When you work at something for a long time, undoubtedly something new will appear, and thus contribute towards new potential paths” (Informant 9).
However, masters-level students often need to learn specific techniques and research methods. Most of the senior scientists elaborated on a specific path for the students. The early stage was more guided, and as experience grew, the students became more independent and thus able to pursue own curiosity in a higher degree. One professor stated the following on this topic:

"Students at master’s degree contribute in two important ways. The desire to work in team, it is in within the team that results happen, in this context the students are very important. In addition through generating new results, and thus contribute towards the projects. But they often perform designated task, developed by their supervisor” (Informant³).

An interesting observation that one senior scientist mentioned, is that master-level degree students were often much more prone to errors and saying wrong things. This triggered what was described as a creative process for the senior scientist, to investigate potential outcomes of the errors (Informant²). The findings indicate that one important element in the culture of innovation is strongly rooted in the interaction amongst members, which grants certain freedom in pursuing academic interests, and sharing of knowledge and ideas in the group.

4.2.2 Inter-disciplinary knowledge and practices

Another important driver for generating novel ideas is the fact that research groups were composed of people from different disciplines. This allows the research groups to harvest diverse knowledge and disciplinary perspectives. The multi-disciplinary composition of groups is vital in the idea generation and problem-solving phase, as it makes it possible to scrutinize research problems from different angles. Especially one senior scientist made an explicit remark upon this process:

“What I’ve been very determined on in this research group, is to recruit individuals who have something we do not already have (...) We want to widen our competence (...) We try to have about three or four senior staff with special competence, and when we recruit PhD and master students, we try to recruit from different universities as well as different disciplines (...) This gives us the possibility to understand the overarching problem, but solve it from different perspectives” (Informant⁴).

The possibility to utilize knowledge from multiple disciplines was also remarked by other senior- and junior scientists’ as an explicit strategy. Related to this, supplementation of
knowledge was additionally emphasized through exposing existing members of the research group to relevant partners in order to expand competence that were of necessity to the group. This led members to be exposed to new methods or instruments by partnering with relevant partners. Many of the scientists interviewed stated that combining, and reflecting on problems and solutions through different theoretical and disciplinary lenses, had led to further advancement of knowledge, and in particular occasions to potential new innovations. Others emphasized the importance of utilizing supplementary knowledge from partners, in other research groups or in industry, as one senior scientist mentioned:

*We collaborate with another research group. We have a close collaboration with them, it is really important. It is in this melting pot that we generate new results*” (Informant3).

Overall, the senior scientists all expressed that interaction and knowledge sharing is of high importance to generate both knowledge and innovation. Especially the element of multi-disciplinary perspectives seemed to be highly valued, given the complexity of the research performed, and the need to approach research problems in new ways. Informants (7, 8) who provided insight from an organizational level perspective, also mentioned the importance of bringing together cross-disciplinary knowledge, as well cooperation amongst members from different part of the faculty, and the research institute. Through recruitment policies and establishment of cross-disciplinary projects, the coordinators aimed at generating cross-disciplinary knowledge that was to be utilized in innovative ways. In example, integrating ITC in the medicine field, aimed at developing more efficient tools to map DNA. This makes the process of discovering illness much more efficient.

### 4.3 The role of research projects in supporting innovation culture in groups

I find that research projects are integral part in establishing an innovation culture in the groups, and therefore find it to be of particular interest. In the groups studied, research activities is always organized in projects and sub-projects. It is the senior scientists and most experienced junior scientists’ that often design the projects. To become a member of the research group, students and junior scientists apply on available vacancies that are connected to specific research project. These projects have the function of “sub-projects” with designated tasks, connected to the overall research goals of the group. Thus, they are the operational basis, or the
core activities that contribute to fulfilling the overall goals of the group (1, 4, 6, and 11). As one senior scientist stated:

“We do not create projects just for the sake of it. Our research is quite expensive, so all the projects are in one way or another connected to the overall purpose of our research” (Informant6)

Being designers of research projects, I find that the senior scientists’ create a system that “sets in motion” the innovative culture through the activities described earlier:

“The projects we have, as much as possible we create project groups with about 4-5 students in one, and maybe 2-3 in another where they work towards the overall research problem, but with different approaches (...) some of them work with creating materials, some characterize them, some test them, and others create theoretical predictions on how we can change them later on. Then you have 2-3 people working like this, they can learn from each other, discuss between each other (...) I think it lifts everybody” (Informant1).

A junior scientist elaborated in the same manner:

“I have a job description that has a goal, my own project. But the way our research is, it is almost impossible to do it alone. For example, there are many different measurement techniques that are required (...) If you are making a new material, aimed at making a chemical process more efficient, you’ll have someone that creates the material, test it, and process it somehow. You have someone that specializes in the creation, someone specializes in testing, and for example the last group, specializes in characterizing. You’ll have very good cooperation amongst them” (Informant11).

The projects encourage activities that involve interaction amongst members of various backgrounds, contact with external partners, as well as the possibility for members to follow up on discoveries in an experimental manner. Moreover, by dividing projects into sub-projects and tasks, the senior scientists’ establish a work process that covers the whole dimension from basic research to application-oriented activities in a “back-and-forth” relationship. The research projects also function as arenas, or instruments of socialization of new recruits. Some of the senior scientists explicitly mentioned that the projects were designed to function as an arena for socialization and learning (Informants 2, 3, 6). New members that are recruited to the group, become exposed to the everyday activities, and “the way of thinking” existing in the group
through participation in projects. Simultaneously, for existing members, the research projects function as a tool to reinforcing the culture of the group.

4.4 Summary

This chapter has discussed how senior scientists are important for creating a culture of innovation in research groups. By drawing on previous experiences, I find that the senior scientists focus on utilizing their research, and act to establish practices within their group that span both basic research and application-oriented activities, to reach goals of innovation. Furthermore, I find that certain research practices can be traced back to the seniors’ previous experiences, for example implementation of organizational features, team compositions, partnerships and multidisciplinary approaches. An important arena for developing culture in research groups, are the research projects. The research projects function as a mechanisms of socializing students into activities and the culture within the research group. Furthermore, through the design of research projects into “sub-projects” that connect with one another, activities such as idea generation and exploration of ideas are encouraged across multidisciplinary backgrounds. This contributes substantially to innovative results in terms of new projects, or new technologies.
Figure 1. –Summary of main empirical findings
5 Discussion

The purpose of this chapter is to discuss the findings in light of the theoretical framework. Senior scientists, by acting as institutional entrepreneurs, make use of the multiple logics they have been exposed to in order to create an innovative culture in their group. Moreover, by acting as institutional entrepreneurs, the scientists engage in forms of institutional work that socializes new members to the culture that resides in the group.

5.1 Carrying and bridging logics

On an abstract level, I find the research groups encompass two different institutional logics that are common within science (Sauermann & Stephan, 2013). These are often referred to as the basic research logic, and the commercial logic, or as Borlaug and Gulbrandsen (2015, p. 4) propose; the innovation logic. The innovation logic is directed towards what has been described as the commercial, or the applied research logics in science (Borlaug & Gulbrandsen, 2015, p. 4). Through the empirical material, I find that the scientists interviewed draw upon both logics to create a culture within the research group.

Interpreting the findings from an institutional logics perspective, as well as the institutional entrepreneurial perspective, senior scientists are influenced and shaped by the respective logics they are embedded in. Certain external influences, such as funding possibilities, are also affecting the dynamic of the groups. This leaves senior scientists to consider external considerations.

The scientists also act as institutional entrepreneurs by combining ideas and practices from different domains and experiences. Later, they draw upon these ideas and attempt to implement them in their research groups. The ability of the senior scientist to make use of experiences and diverse sources of knowledge follows Thornton et al.’s (2012) argument of individuals ability to draw on logics that they are most familiar with. Theoretically, this sets certain limitations on the individuals’ ability to draw upon available logics. Thus, the institutional entrepreneur have confined maneuverability in the institutional landscape. This portrays a toned-down picture of entrepreneurs, rather than “heroic change agents” that can draw upon and meld different ideas from different social spheres.
Furthermore, by combining ideas and elements from different logics, the findings indicate that the creation of the innovative culture within the research groups can be interpreted as a bottom-up process, and thus draws upon a micro-level perspective within broader institutional theory (Powell & Colyvas, 2008). Moreover, this sheds light on the importance of individuals in institutional change, as they are able to utilize logic to their own advantage (Powell & Colyvas, 2008), but within constraints.

My empirical insights have similarities to the findings of Lee and Battilana (2014). The authors show in their study of social entrepreneurship ventures, that founders of the new organization are most likely to draw upon logics they have been exposed towards. Thus, the fundamental logic of the group and accompanying practices are likely to be imprinted within the group due to the founder. This leads me to suggest that senior scientists and organizational-level coordinators are carriers of the most prominent institutional logics (Almandoz, 2014, p. 443). This observation provides explanations from a micro-level perspective; in order to explain certain characteristics of research groups, and how attention should be given to individuals’ previous experiences.

Of further interest is that rather than in conflict, the empirical evidence suggest a complementarity in the relationship between the logics. The cases studied in this thesis show an existence of both basic research and an innovation oriented logic, where neither is particular dominant. I find them to function as supplements to each other, as both dimensions are needed to continuously drive the research process forward. Rather than seeing a clear distinction between basic research and innovation-oriented activities, the findings show that the research groups operate in the whole dimension between the two. This makes it difficult to present a clear categorization of the research groups. In fact, the research groups move rather seamlessly between basic research and innovation activities, in a reinforcing relationship.

The availability of multiple logics are often seen as contributing towards increased complexity, which might increase difficulty in cooperation on an organizational level. Various groups are usually imprinted with a dominant logic, however other logics are present in organizations (Lee & Battilana, 2014). Sometimes two logics exist that are in direct conflict. In certain cases, complexity has been problematized towards creating sub-cultures in organizations, where strategies deployed aim at mitigating conflict (Battilana & Dorado, 2010, p. 1420). As mentioned above, in the research groups examined in this study the logics seem to act more as complementary, then in conflict.
It is of notable interest that there were explicit mentions of increased complexity in some of the cases. This is linked to the multi-disciplinary compositions within the research groups, which are seen as a source of new knowledge and idea generation. Complexity can in this manner be interpreted as desirable, as the seniors are able to bridge various disciplinary backgrounds in order to achieve the research groups’ ambitions. It would be of further interest to relate complexity to geographical influences as members originate from different universities, both nationally and internationally, to study how seniors handle geographical aspects. The present empirical data does not provide sufficient insight besides complexity in terms of knowledge contribution rooted in different academic disciplines. Overall, the existence of two logics that are bridged in the research groups means that the seniors have to perform a role as “boundary spanner”. They act as a bridge between the basic research and innovation dimensions, as well as incorporating influences stemming from stakeholders (Borlaug, 2015, p. 71).

Related to the role as “boundary spanners”, it is of interest to note that the culture in the groups is dynamic. It will be altered, as scientific fields develop and interesting scientific discoveries emerge. As found in the empirical material, some of the senior scientists mentioned innovation in a historical perspective. It was something they have become accustomed to, and is now an important part of their research perspective (1-5). Others mentioned innovation as something they have become more aware of, and expanded upon through targeted strategies (4). Finally, the flow of members with various backgrounds continuously expose the research groups to new ideas and potentially logics, which must be integrated in the group. These findings are similar to the findings of Colyvas and Powell (2006), and Borlaug and Thune (2017). They argue that creation of culture for innovation in universities should be considered as developmental process in a historical perspective, subject to constant change deriving from both internal developments and external influences.

5.1.1 Embedded entrepreneurs

Overall, in terms of institutional entrepreneurship within the wider institutional logics perspective, I propose to categorize the senior scientists as entrepreneurs in their own manner. The literature on institutional entrepreneurship, especially when connected to the micro-level perspective, has sought to provide insight on how institutional change may happen at the micro-level, and how this affects meso- and macro-level systems over time. Such findings have not been identified in the present study. Neither has the primary purpose been to highlight such
impacts. Rather, the concept of institutional entrepreneurship serves as a theoretical framework to understand how senior scientists draw upon ideas and practices rooted in various experiences, and influence their immediate surroundings. Senior scientists act as entrepreneurs by combining ideas and practices in the creation of their own research group, and in the research projects. This has established an “innovation” culture consisting of rationales and practices within each research group, where the ambition is to “make use” of the conducted research. Furthermore, the senior scientist act as institutional entrepreneurs by exposing and socializing new members into the culture.

5.2 Research projects as institutional work

In the empirical chapter, I find that through the design of research projects there are particular activities that generate an innovation culture. Students and junior scientists become members of the groups through recruitment to research projects. Simultaneously, they become socialized in the group culture through participating in those projects.

The senior scientists engage in some kind of educational institutional work (Lawrence & Suddaby, 2006, p. 17). Through supervisor interaction during the projects, and gradual fading of guidance to students and post docs, the purpose is to increase members’ independence. This is important in the overall strategy, in order to infuse members with appreciation of how the system works. This indicates that getting students into the “ways of doing things” is a developmental process.

A second and related form of institutional work described above is the important role of research projects and activities. As described in the empirical chapter, the research conducted in the groups is divided into sub-projects that work towards realizing the overall goal of the group. Through the design of projects as supplementary to one another, the seniors organize the groups in a manner that emphasizes activities such as team interaction, knowledge flows and multi-disciplinary group composition. This is done to in order to push research boundaries, develop new knowledge, question taken for granted facts, and to utilize knowledge in new and innovative ways. Senior scientists, by intentionally designing research projects the way they do and with their focus on open generation of ideas, a template of routines and practices to generate novelty in ideas and application of those ideas is developed (Lawrence & Suddaby, 2006; Tracey et al., 2011). In this manner, I suggest that an innovation culture is created, and
maintained by performing idea generation activities that become routines. Both organization and design of teams and projects contribute to this end. New members of the research group being employed on research projects, are socialized by becoming part of the same routines.

By linking the theoretical concepts of institutional logics, institutional entrepreneurship and institutional work, I highlight how senior scientists, by drawing upon ideas and practices create an overarching “research logic” that bridges the idea of basic science and innovation. This is implemented in the practices of the research group. Through paying particular attention to research projects, I find that the design includes activities of multidisciplinary idea generation, and freedom to pursue ideas, that compose the innovative culture of the research group. Moreover, the research projects through their design, function as both creating and socializing members to the innovative culture.
6 Conclusion

In this study I have asked the following research question: “How do senior scientist create a culture of innovation within their research group?” By drawing upon inspiration from previous literature within the institutional logics perspective, I pay interest to how senior scientists create a culture of innovation, and how students and junior scientists’ become socialized into the existing culture. Approaching the study from a perspective that emphasizes the individuals, allowed me to identify micro-processes involved in the creation of institutional environment.

By designing a qualitative case study, the primary objective was to understand how senior scientists work to create a culture of innovation in their research group. The conducted interviews with informants, and supplementary data has provided interesting empirical evidence. I developed my theoretical framework through the literature of institutional logics, institutional entrepreneurship and institutional work, in order to build a comprehensive understanding of the empirical findings. The theoretical concepts allowed me to analyze how senior scientists were influenced by logics through their previous experiences, and how they utilize these experiences in creating a culture for innovation in their research group.

Two sub-question were developed to provide an answer to the overarching research question. The first sub-question was how senior scientist utilize prior experience in the development of their own research group. Through the analysis, I find that each of the senior scientists have been shaped by multiple logics in a variety of settings that they later attempt to implement in their own group. The findings show that the scientist have been exposed to both basic research and innovation-oriented research in their previous careers or education. The senior scientists seem to function as “boundary spanners”, who draw upon and combine previous experiences. The boundary spanning element proposes that basic research and innovation-oriented logics should not be viewed as either strictly separated or in conflict with each other in the groups. Rather, they function as supplements in the particular cases.

The second sub-question was what kind of activities senior scientist perform in order to create a culture for innovation in the research group. This sub-question sought to provide insight on specific activities that could be identified as contributing to developing the culture of the group. As noted above, the groups have incorporated a fluid logic of basic research and innovation-oriented research. I find that this logic is reflected in the activities performed by the research
groups, that have activities that cover the whole spectrum of basic- and application oriented activities. The empirical findings show that certain characteristics of the research groups are imprinted from the senior scientists’ prior experiences. These include features such as multidisciplinary team composition, and relevant partnerships with the industry and other research groups.

An important part of the institutional work in bridging the logics, is the design of research projects. I find that the research projects are built on the fluidity between logics of both basic research and innovation logics. Moreover, activities such as idea generation and interaction across multidisciplinary lines are a form of routines, encouraged from the design of research projects. New members become socialized into the culture of the research group by being recruited to projects, and thus participate in these routines.

This study emphasizes that micro perspectives are of high interest to understand how senior scientists create an innovation culture. As argued by Powell and Colyvas (2008), a micro-institutional perspective is needed to provide insights on how ideas and knowledge are borrowed, shared and utilized in different variants and contexts. In the particular cases of this study, I find the senior scientists’ ability to compose an overarching logic drawn from multiple influences, is instrumental to understand how the research group develops a culture for innovation. This is a relevant for policy developers, as it provides insight into how an innovative culture is created at the bottom. The findings in this study might contribute to further studies on if and how senior scientists contribute in creating an innovative culture outside of their immediate research group. However, as mentioned in chapter three, the empirical material in this study is limited to the immediate research groups subject to this study.

Second, in terms of theoretical contributions, I have attempted to provide a holistic understanding in the relationship between institutional logics, institutional entrepreneurship and institutional work. Individuals draw upon ideas and practices from multiple embedded domains. By taking ideas and pieces of knowledge from different domains into the research group, the senior scientists assemble a variety of ideas into new specific logic, namely that of the fluid integration of basic research and research-based innovation. This provides insight on the bottom-up process of institutional creation where logics have been melded through the actions of boundary-spanners.
In brief, I suggest that further studies should consider to put forward a holistic understanding of the institutional environment. This is to capture the two-way influence. On one hand, how influences at the macro-level affect the micro-level. On the other how micro-level activities may affect the macro-level, thus bringing further emphasis on micro-level perspective in understanding social dynamics. For example studies on how senior scientists as leaders of research groups, have affected faculties and the overall university in developing an innovative culture would be of interest. This would present a bottom-up perspective to observe institutional change for example on the organizational level. Furthermore, I propose that in future studies, it would be beneficial to study research groups in a longitudinal manner. Activities such as idea generation involving multiple group members have been identified as crucial for innovative culture creation in this study. To properly reflect upon and experience everyday activities and how ideas develop, would require a longitudinal perspective to incorporate flows of various academic influences and potential effects over time.
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Appendix

Form of consent

The creation of Innovation Culture amongst scientists and their research group. A case study of research groups at the University of Oslo

Purpose of the study:

The purpose of this master thesis is to provide insight on processes and aspects, related to creation of an innovation culture within a research group and environment. The research question that the thesis seeks to enlighten is: How are scientists creating an innovation culture in their respective research group? The study is of a qualitative manner based on information from interviews done with professors, scientists and students associated with the research group if present. The participant(s) may expect questions regarding perspectives on innovation in research, experience with innovation-driven research, activities within the research groups, and impressions of innovation culture within the research environment. The conversation will ideally be recorded. However, the participant is free to refuse recording.

The study does not require sensitive information from the participants, regarding themselves as individuals, or ongoing projects. Transcripts from the interview will be sent to the participant(s) for approval. All information is confidential and will only be available to the conductor of this project (Jakub Pawlak) and supervisor. Participation in the study is voluntary, and consent may be withdrawn at any point. Information will be anonymized and/or deleted when the study is completed (30.09.2017), or if a participant wishes to withdraw from the study. The participant will not be recognized directly by name. Any questions regarding the study or interview can be directed to Jakub Pawlak (Masters degree student at the ESST program - Society, Science and Technology in Europe at UiO TIK Centre for Technology, Innovation and Culture)

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I have received information about the study.

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(Signature, date)
**Questionnaire scientists**

- **S0: Introduksjon:**
  - S0.0: Navn og hva er din/deres stillingstittel?
  - S0.1: Hvilket fakultet tilhører du/dere?
  - S0.2: Hvor mange deltakere er det i forskergruppen?

- **S2: Den innovative forskeren:**
  - S2.0: Kan du fortelle om hva dere forsker på?
  - S2.1: Hvilken erfaring har du med å kombinere et innovasjonsperspektiv i forskningen?
  - S2.2: Hvordan ble du introdusert til et innovasjonsperspektivet i forskningen?
  - S2.4: I hvilken fase av karrieren ble dette relevant?
    - S2.4.0: Har dette endret seg gjennom karrieren?

- **S3: Forskningsgruppen - De innovative studentene**
  - S3.0: Studentene/stipendiatene i gruppen; ulike utdanningsnivå og fagdisipliner?
  - S3.1: Har stipendiatene emner eller kurs hvor innovasjon er et sentralt element?
  - S3.2: Hvordan blir stipendiatene en del av forskergruppen?
  - S3.3: Er det viktig at stipendiatene innehar et visst fokus på innovasjon?
    - S3.3.0: Hvor viktig er dette for stipendiatene selv?

- **S4: Hvordan jobber (1)gruppen og (2)miljøet rundt opp mot innovasjon?**

  (1) Gruppen

  - S4.0: Hvordan ville du beskrevet innovasjonskulturen innad i gruppen?
  - S4.0.1: Hvor viktig er innovasjonsperspektivet og kulturen for gruppen sitt arbeid?
- **S4.1:** Kan du fortelle om hvordan du jobber med å skape denne kulturen og praksisen innad i gruppen?
- **4.2:** Påvirker stipendiatene til dannelsen av kulturen i gruppen?
  - **4.2.0:** *Hvis ja:* Hvordan gjør de dette?
  - **S4.2.1:** *Hvis nei:* Hadde dette vært en ønskelig?

(2) **Det større miljøet**

- **S4.3:** I det større forskningsmiljøet du/dere er en del av; er det kollegaer og andre som er opptatt av å skape en innovasjonskultur relatert til forskningsarbeidet?
  - **S4.3.0:** *Hvis ja:* hva er inspirasjonen til at det har blitt sånn?
  - **S4.3.1:** *Hvis nei:* hvordan oppleves det å være alene om dette?
- **S4.4:** Er du/dere viktige lederskikkelse(r) rundt det med å fremme innovasjonskultur og praksis i forskningen?
- **S4.5:** Tanker om hvordan du og din gruppe påvirker miljøet dere inngår i?
- **S4.6:** Forskningsmiljøer som er mer perifere i forhold til sitt eget; har man et forhold til disse som kan bidra til dannelsen av innovasjonskultur?
- **S4.7:** Hva er din oppfatning av universitetets/organisasjonens generelle tilnærming til innovasjon i forskningsarbeid?
  - **S4.7.0:** Har det vært endring over tid?

- **S5:** **Idéutforming og påvirkning fra utsiden**
  - **S5.0:** Hvordan går man frem for å evaluere en idé?
  - **S5.2:** Kan du fortelle om tilknytning til andre aktører, f. eks inkubatorer, næringsliv eller andre organisasjoner?
- **S5.3:** I hvilken grad blir eksterne aktører tatt med i betraktningen rundt bruksområder av forskningen?

- **S6: Fremtidig påvirkning**
  - **S6.1:** Tenker du at et innovasjonsperspektivet og kulturen har påvirket, og vil påvirke fremtidig praksis i forskningsarbeidet?
  - **S6.2:** Noe du/dere vil legge til som du/dere mener er utelatt i intervjuet?
Questionnaire students and junior scientists

- **S2: Introduksjon:**
  - S2.0: Navn og din stillingstitel?
  - S2.1: Hvilket fakultet tilhører du/dere?

- **S3: Forskningsgruppen - De innovative studentene**
  - S.3.1: Kan du kort fortelle om hva du jobber på nå?
  - S3.2: Hvordan ble du en del av forskergruppen?
  - S3.3: Hvorfor akkurat denne forskergruppen?

- **S4: Hvordan jobber (1)gruppen opp mot innovasjon?**

  (1) Gruppen

  - S4.0: Hva tenker du om innovasjon i forskningsarbeid?
  - S4.1: Hvordan ville du beskrevet (måten dere jobbet på i) forskningsgruppen?
    - S4.0.1: Kan du fortelle litt om arbeidet du gjorde som student/stipendiat i forskningsgruppen?
  - S4.2: Var et innovasjonselement en viktig del av forskerkulturen/praksisen i gruppen?
  - S4.3: Hvordan ville du beskrevet innovasjonskulturen innad i gruppen du ble en del av?
    - S4.3: Ble det gjort noe spesielt ovenfor studentene for å bli en del av dette?
  - S4.3: Har du noen tanker om hvordan du, evt andre studenter bidro til dannelse av innovasjonskulturen?
  - S4.4: Har du noen tidligere erfaring/kurs innenfor innovasjon, knyttet opp mot det akademiske arbeidet?

- **S5: Fremtidig påvirkning**
- S5.1: Har du noen tanker om hvordan forskningsgruppen har påvirket deg under, og i etterkant av studiet?
- S5.2: Noe du/dere vil legge til som du/dere mener er utelatt i intervjuet?