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Campus – a place for innovation?

Exploring the role of place in innovation processes at NTNU

Master's thesis in Innovation, Entrepreneurship and Society
Supervisor: Nina Gunnerud Berg

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NTNU

Kunnskap for en bedre verden

Abstract

The Norwegian University of Science and Technology (NTNU), is currently working on a campus development project where the aim is to gather its academic environment, moving from geographically scattered areas to one central and unified campus in the center of Trondheim. In doing so the university seeks to create an improved environment for its core tasks, and one of them is innovation. Therefore, this thesis explores the role of place, networks and proximity in innovation processes at NTNU, by asking the following questions: How do actors in innovation processes at NTNU collaborate and connect with other actors inside and outside of NTNU? How do actors at NTNU create place in relation to these processes? And, how important is proximity to other actors for collaboration and innovation at NTNU?

The research design had a qualitative approach and data was generated through interviews and text analysis. Through the narratives of actors who had been involved in innovation processes leading to spin-offs at NTNU, and public texts relating to the campus project and NTNU, I found: i) that place has an essential role in innovation processes at NTNU through its people, built environment, finance, emotions, norms, practices, location, power and values, ii) actors create place through their innovation processes, and these practices are at times seen as being both "in place" and "out of place" on campus, iii) the data supported the need for temporary geographical proximity in innovation processes, but neither the data nor the literature supports co-location as a sufficient mean to achieving this.

I also argue that a multidimensional understanding of place can help us identify the different elements that create a particular place and see how they work together in shaping the context actors operate in. I believe this is a useful analytical approach that can enrich geographical analysis of university innovations, and complement more well-known geographical concepts in that body of research such as networks and proximity. The primary data for this thesis has been limited, and I decided to focus on a narrow definition of innovation in order to manage the scope of work within the framework of this thesis. In order to gain a richer understanding of innovation processes at NTNU, it would be interesting for future projects to generate data on other innovation processes, not only those leading to spin-offs. Such information could prove useful for future campus development work, especially if one has the ambition of developing campus as a place for innovation.

Sammendrag

Norges teknisk-naturvitenskapelige universitet (NTNU) er midt i et campus-utviklingsprosjekt der målet er å samle det akademiske miljøet som i dag er spredt utover byen til et mer sentralt og samlet område rundt Gløshaugen i Trondheim. Gjennom dette prosjektet ønsker universitetet å skape et bedre miljø for sine kjerneoppgaver, derav en er innovasjon. Derfor utforsker denne oppgaven hvilken rolle sted, nettverk og nærhet spiller i innovasjonsprosesser på NTNU, og den gjør det ved å stille følgende spørsmål: Hvordan skapes nettverk og samarbeid mellom aktører i innovasjonsprosesser på NTNU, både internt og eksternt? Hvordan skaper aktørene sted i disse prosessene? Og hvor viktig er det med nærhet til andre aktører for samarbeid og innovasjon på NTNU?

Opgaven har et kvalitativt forskningsdesign, og utvikling av data gjordes gjennom intervjuer og tekstanalyse. Intervjuene gjordes med aktører som har vært involvert i innovasjonsprosesser på NTNU som ledet til dannelse av spin-off selskap, samt offentlige tekster om campus prosjektet og NTNU. Mine funn var i) sted spiller en sentral rolle i innovasjonsprosesser på NTNU i form av mennesker, bygninger, finansielle mekanismer, emosjoner, normer, praksiser, lokasjon, makt og verdier, ii) aktører skaper sted gjennom innovasjonsprosessene, og disse praksisene kan være både «in place» og «out of place», iii) datamaterialet viser at det er behov for temporær geografisk nærhet i innovasjonsprosesser, men hverken data eller litteratur tyder på at samlokalisering er et tilstrekkelig middel for å oppnå det.

Jeg argumenterer også for at en flerdimensjonal tilnærming til sted kan øke forståelsen for de ulike elementene som skaper sted, og åpne opp muligheter for å identifisere hvordan disse elementene jobber sammen for å forme den konteksten aktører forholder seg til. Jeg mener dette er en fruktbar analytisk tilnærming som kan bidra til geografiske analyser av universitetsinnovasjoner, og komplementere mer etablerte geografiske konsepter i innovasjonslitteraturen som nettverk og nærhet.

Primærdataen i denne oppgaven har vært begrenset, og jeg bestemte meg for å fokusere på en forholdsvis snever definisjon av innovasjon for å gjøre oppgaven operasjonaliserbar i forhold til tid og omfang. For å få en rikere forståelse av innovasjonsprosesser på NTNU hadde det vært interessant for fremtidige prosjekter å utvikle data om andre innovasjonsprosesser, ikke bare de som leder til spin-offs. Den informasjonen kan være nyttig for fremtidige campusutviklingsprosjekter, spesielt for de som har en ambisjon om å utvikle campus som et sted for innovasjon.

Preface

This thesis is the result of many peoples invaluable contributions. First of all, I would like to thank my informants, for making themselves available and for sharing their stories with me. Our talks were informative and inspirational, and I learned a lot from all of them. I have done my best to bring their experiences to the core of this thesis.

Another important person whom I would like to acknowledge is my supervisor Nina Gunnerud Berg at the Department of Geography. She has provided essential guidance and support, and helped me develop my understanding of place-theory both through our conversations and her writing. Nina together with Berit Therese Nilsen and the rest of the campus group, offered a stimulating environment for academic discussions on geography and campus throughout this project. A special thanks to Berit and her team for organizing a number of informal and interdisciplinary discussion groups focusing on campus and campus development. This informal (and digital) meeting place has given me valuable input and inspired my work in many ways.

Lastly, this would not have been possible without support from my home-crew. Thank you for your patience and encouragement.

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List of Abbreviations

NTNU	The Norwegian University of Science and Technology
IP	Intellectual Property
SINTEF	Independent Research Organization
NDA	Non-Disclosure Agreement
TTO	Technology Transfer Office
SPARK	Mentoring service for students
FORNY	Program for research based innovation from Norway's Research Council
Gløss	Gløshaugen campus
HR	Human Resources
ANT	Actor-Network Theory
NSD	Norwegian Center for Research Data
SDI	Stepwise-Deductive Induction
ICT	Information and Communication Technology
Start	Student organization that works with innovation at NTNU

1 Introduction

The Norwegian University of Science and Technology (NTNU), is currently working on a campus development project where the aim is to gather its academic environment, moving from geographically scattered areas to one central and unified campus around Gløshaugen in Trondheim (NTNU, 2021c). In doing so the university seeks to create an improved environment for its main tasks such as learning, research, creativity and innovation to mention a few. Innovation is said to be critical for the world to solve some of its most pressing challenges, and universities as places of knowledge production play an important role in the innovation process as seen in the Triple helix model (Mitra, 2020). NTNU was ranked as the 56th most innovative university in Europe in 2019 by Reuters (Ewalt, Unknown), and innovation is an area of importance for the university.

Therefore, this Master thesis will explore the connection between campus as a place and innovation at NTNU. I seek to understand if there is a connection between place and actors in innovation processes. The main research objective is: To explore through a social- and cultural geography lens, the dynamics between the place known as campus NTNU and the actors that interact through campus. I will explore these dynamics by focusing on one of the many activities that NTNU promote, namely activities that lead to innovations.

When I started the work on this thesis, I had been a student at NTNU for one year but never been physically on campus in Trondheim because of the COVID pandemic which resulted in closed borders between my home in Sweden and NTNU in Norway. My intentions of commuting by train or car to NTNU proved impossible as restrictions on movement increased. This is partly what triggered my interest in this research, because even though I had never been there – I had a sense of campus and of being part of a collective group. “My” campus at the time was mainly constructed through people that I had been connected to through digital tools. Additionally, it was colored by online sources such as text, videos and images of NTNU. 2020 was described as “the year that NTNU disappeared”, and it became a digital projection of its former self (Oksholen, 2020). I would follow live streams of the inauguration, participate in seminars and courses run by the library, attend classes through Blackboard and Zoom, and collaborate with fellow students on presentations and papers through Teams or discussion groups on Facebook. In other words, my campus was relational and virtual, it was with people geographically far away from me, but nonetheless representing a place and a group I felt somewhat connected to. The question of how “real” this virtual connection was had been with me through this experience. This experience combined with the theories on place and innovation that I had been learning about during this same year, made me curious to explore further the proximity dimensions of collaboration, creativity and innovation. I had a sense of connection across distance that I found to be productive and on point, but at the same time I felt like I was missing out on meetings that could bring with them something unexpected.

This thesis is connected to the research project “Campus as a place and a place in Trondheim city” coordinated by Nina Gunnerud Berg at the Department of Geography at NTNU, and she is also supervising my work. The call for proposals for this research project asked for projects that was anchored in social and cultural geography, with focus

on place theory and using qualitative methodology (Fremtidens Campus, 2021). My research question and design have sprung from these requirements, and then been mixed with my personal interests, a multitude of theoretical inputs, a number of exciting conversations with informants, students, professors and informal discussion-groups, and developed into this final thesis.

In this chapter I will present the campus development project in more detail, and look at some examples of how innovation is presented in project documentation. I then close this chapter by presenting my research question and the structure of the thesis.

1.1 NTNU and Campus Development

NTNU is one of Norway's main universities, and has its headquarters in Trondheim, with additional campuses in the two towns of Gjøvik and Ålesund as well as an office in Brussels that actively connects with European partners (NTNU, 2021b). With its close to 42 000 students it is Norway's largest university according to numbers from Statistics Norway (Statistisk Sentralbyrå, 2020).

The campus development project was started "in its current form" in 2016 (NTNU, 2021d) and should be complete in 2027 if all goes as planned (NTNU, 2021f). In addition to the student body there are close to 7000 employees at the university that will eventually have their place of work in the center of Trondheim (NTNU, 2021a). When describing the purpose and aim of a unified campus closer to the city center NTNU states:

"In addition to giving the university a stronger presence in the area, this will improve the basis for business establishment, innovation and collaboration with the university's partners" (NTNU, 2021a).

And continues:

"The main aim of the project is to ensure that NTNU's campus becomes a strategic tool for realizing NTNU's academic ambitions. For example, strategic positioning of open and inviting buildings will lower the threshold for working across disciplines, so that different academic groups can work more closely together to solve the challenges that our society faces in the years ahead. The physical setting should provide better conditions for internationally outstanding education, research, art, innovation and dissemination, by creating attractive meeting places as well as future-oriented spaces for work and learning. It should also realize the NTNU campus as a development arena and a laboratory" (NTNU, 2021a).

As these excerpts show, one of the arguments used to support the move is that a physical presence in the city center will benefit innovation, collaboration and business establishment. They also see Campus as a tool for the university to achieve its goals, and one of these seems to be to increase interdisciplinarity in order to solve society's wicked problems. It is underlined that the physical setting should encourage and enable meetings between people as they perform certain practices, such as innovation. There are in other words grand expectations put on the physical structures of this new campus in terms of what practices and meetings it should facilitate and stimulate. Figure 1 shows an illustration from NTNU of the planned locations for the new campus, as well as the groupings of the different faculties (NTNU, Unknown).

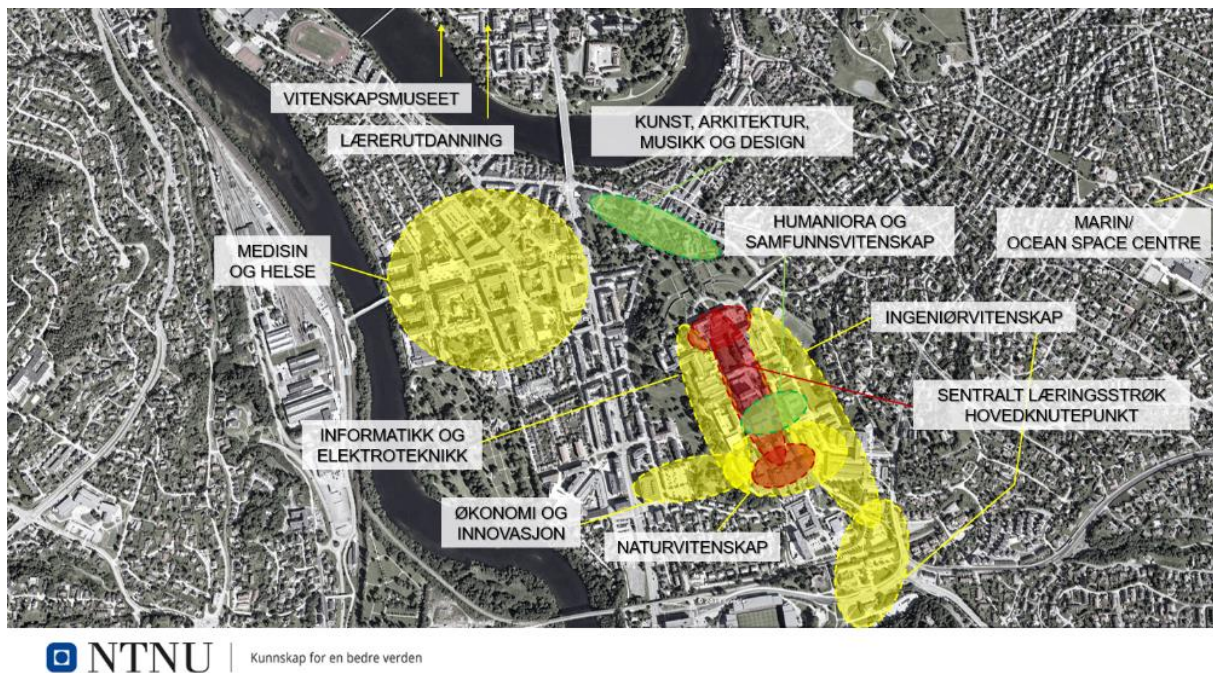


Figure 1: Illustration of planned campus location

It should be noted, that the campus development project as discussed in this thesis is limited to Trondheim only. It does not include the campuses in Gjøvik and Ålesund. Additionally, it stretches over a decade which means that many of the people that will be using the new campus are not necessarily part of the development process, and many of those who are current “campus users” might not be a part of NTNU by the time the project is completed. There are also challenges involved in imagining a vision for the future needs of the institution in a world that’s changing rapidly.

In April 2022, at the time of writing this thesis, the future of the campus development project is being discussed. The Minister of Higher Education recently announced considerable cuts in the budget, and has requested updated proposals on a couple of different scenarios, one of them involving that students and staff at Dragvoll campus stay at Dragvoll (Oksholen, 2022a, 2022b). Whether the final decision will be to co-locate all campuses in Trondheim or not, remains to be seen. These discussions do not change neither the focus nor relevance of the questions asked in this thesis. I believe documenting and analyzing the current situation, actions and opinions can prove useful regardless of final decisions and directions of the project. As NTNU is discussing the best ways of designing a new co-located (or not), city-centered campus, this thesis explore how things currently work when it comes to innovation and collaboration across campuses, across NTNU as an organization, with the city of Trondheim, and beyond. Because innovations and the processes behind them do not happen in just one individual in a vacuum – they happen in networks of people, tools, organizations and institutions. They happen in networks and relationships that stretches over time and space.

1.2 Research Question

The research question has matured throughout the process of working on this thesis, as you will see from my information letters in Appendix 2 and Appendix 3 which shows the initial approach and questioning. The formulation of the questions have evolved, and is

today more concise and in line with the theoretical framework of place and with what knowledge this framework can produce. That being said, the key elements of campus, place, innovation and proximity have been at the core of the questions from the start.

The research question that this thesis is exploring is: **What is the role of place in innovation processes at NTNU?**

The following sub-questions guided me in generating data that helped answer this question.

- How do actors in innovation processes at NTNU collaborate and connect with other actors inside and outside of NTNU?
- How do actors at NTNU create place in relation to these processes?
- How important is proximity to other actors for collaboration and innovation at NTNU?

Through this work, I would like to document some of the innovation and collaboration processes that have happened at NTNU so far, and identify enabling factors as well as barriers in relation to spatial dimensions. By approaching this through theories of place and place making, I want to explore if theories from social and cultural geography can add new insights into what stimulates innovation processes at NTNU. I hope this study can contribute to the literature in human geography on campus in new ways by combining the concepts of place and proximity when looking at how actors connect and practice, but also to the literature on innovation and the role of place in innovation processes.

1.3 Structure of Thesis

This thesis is structured in the following way: Firstly, in chapter 2, I discuss the theoretical framework for this thesis. This is followed by chapter 3 on research methods and design. Chapter 4 presents the main findings and analysis of my research, followed by chapter 5 where I present some final reflections and conclusions.

2 Theory

This chapter introduces the main theoretical framework that have influenced and supported this thesis, and presents research in the field of geography with relation to place, campus, proximity and innovation.

Firstly, I define three key concepts for the thesis: place, campus and innovation, followed by a brief discussion on interdisciplinarity and its connection to both the campus project and to innovation.

I then provide an overview of human geographical research on place and place-making, including some of the geographical approaches to campus and campus culture. At the end of the chapter, I present a selection of theoretical perspectives on the role of universities in innovation, and give an overview of some of the key theories on proximity and its impact on learning and innovation.

2.1 Definitions

There are three key concepts in this thesis that I think is important to clarify and define from the start. I will discuss their theoretical implications further in other sections of this chapter, but would like to provide definitions here that can help guide the reader in terms of my thinking and approach.

2.1.1 Defining Place and Campus

Firstly, the concept of place is at the core of this work, and it is used here not just to refer to a geographically located and bordered place, but to a multidimensional and relational place. Simonsen's definition of place is in line with the way I use it and approach it in this work, namely as "a specific articulation of social practices, social relations, and materiality as well as experiences, narratives and symbolic meanings of the place held by its different users" (Aure et al., 2015, p. 17; Simonsen, 2008, p. 16). In this way, campus NTNU is a place not only in terms of its location but also in terms of its relations, practices, and users.

Campus in the Anglo-American context usually refers to the grounds and buildings of a university or college. In the Anglo-American context, campus is a place for teaching and learning as well as for living, and the areas are designed with that in mind. In a Norwegian context the "living" is not happening on campus, students and faculty have their homes outside of campus. It's a fairly new term in a Norwegian context and started to appear more frequently around the 2000s, as changes were happening in the higher educational system in Norway making it more international (Brottveit, 2020). Additionally through the merging of several institutions in different geographical locations the term campus was used to identify the university buildings and infrastructures in the different towns, like for instance for NTNU with Campus Ålesund and Campus Gjøvik. Campus is used in this thesis to refer to the grounds and buildings, but it also includes social practices and social relations happening there. Seeing campus as a multidimensional place is key to the research and analysis in this thesis and I argue that it is a useful perspective when exploring approaches to campus development.

2.1.2 Defining Innovation and Spin-off

The term innovation has been defined in different ways, and it is usually linked to inventive technology and commercialization processes. The ISO definition reads as follows: "an innovation is a new or improved product or process that differs significantly from previous products or processes and is made available to users" (International Organization for Standardization, 2019). This is also very much in line with the EU definition which also specifies product innovation and process innovation as two separate outcomes of innovative activity, where product innovation is "the market introduction of a new or a significantly improved good or service" and process innovation is "the implementation of a new or significantly improved production process, distribution method or support activity for goods or services" (Eurostat, N/A). When Schumpeter developed his thinking on entrepreneurship and innovation he differentiated inventions from innovations by focusing on the commercialization of the new idea or invention, it was the commercialization that made it something different, an innovation (Mitra, 2020).

Universities contribute to innovation and economic development through several paths, student innovation is one, commercialization or university spin-offs another, but for NTNU the majority goes into existing industries as a result of close research collaboration and partnerships (Kaloudis et al., 2019). The results and impact of the latter are without doubt major, but nonetheless challenging to measure and quantify (Larsen, 2021). Patents and spin-offs are easier to quantify and can more easily be measured and studied. For researchers to go from lab results to commercialization is a big step, and it requires dedication and knowledge not only of the academic field but of legal issues, HR, operations, strategic management, sales and marketing. Technology Transfer Offices (TTO) can help in these processes but social and cultural factors can be just as important, if not more (Fini et al., 2017). I decided to focus on employee innovation in this thesis because I expected to find employees to be more rooted in their expertise and disciplines compared to students, and thought this could give an interesting perspective to the question about collaboration across disciplines. In addition, I chose to focus on spin-offs and the reason why is threefold: i) the definition is clear and the cases could be easily identified for the purpose of this project and scope, ii) spin-offs represent a successful innovation process as the idea led to commercialization and new firm, and iii) in spite of its controversy it presents an additional potential for universities to participate in activities with positive economic and social outcomes for society at large. I would like to stress that this by no means is the only way to define innovation success in a university setting. In fact, some would claim that spin-offs and commercialization are not at all what the university should be doing, and that innovation in this context should be more focused on thinking in new ways (Schei, 2021; Tjora, 2019b).

2.1.3 Connecting Interdisciplinarity and Innovation

The purpose and aim of the campus project is often described with words such as increased collaboration and interdisciplinarity both between environments at NTNU as well as beyond the institution (NTNU, 2016). It has been argued that the initial purpose of the project was to create more physical space for actors at the university, in particular at campus Dragvoll, but has moved into a focus on collaboration and interdisciplinarity (Tønnesen, 2021). The focus on interdisciplinarity is not new, but was also a prominent factor in arguing for the move to Dragvoll when that campus was first established (Bjørrgan, 2022). The changed direction of the conversation from space to interdisciplinarity may be seen in tandem with what is currently being proposed in the new campus buildings which is leaving many employees with less working and teaching

space than what they currently enjoy. This debate is especially heated when it comes to office space, and the projection that not all employees will have their own office has been a subject of heated discussion (Hanger, 2021).

Whether it was intentional from the beginning or not, the fact that the current discourse is giving prominence to collaboration and interdisciplinarity shows the importance of these two activities for the university and its operations in the socio-political context of today. Researchers on innovation have been adamant in arguing for the benefits of diversity and adaptive skills to increase the chance of innovation (Cohen & Levinthal, 1990) Diversity in knowledge and background is seen as positives, although with a balance; too much diversity can make it difficult to collaborate, and too little makes it hard to create new and innovative ideas (Boschma, 2005). Literature reviews have found that there is agreement that interdisciplinary collaboration is both essential for innovation and is needed as a pedagogic strategy (Moirano et al., 2020). Moirano et al. conclude that it is often intrinsic problems that challenge this type of collaboration. The term interdisciplinary assumes the notion of disciplinary, and in the university context there are obviously strong connections between the academic and his or hers discipline. Martimianakis and Muzzin (2015) showed in their study of a Canadian university, that there are generational differences in the way knowledge-makers negotiate shifts in relation to interdisciplinary knowledge-making. Older participants promoted an approach to interdisciplinarity that did not challenge the key role of disciplines in the construction of expertise and knowledge. Whereas younger participants on the other hand, would more easily resist disciplines, they identified more with interdisciplinarity and enjoyed being in the margins of knowledge spaces (Martimianakis & Muzzin, 2015).

In an environment like NTNU, with disciplines ranging from the humanities, to social sciences, natural sciences, engineering, medical sciences, architecture and design - the opportunities for new connections and new collaborations to be made seem plentiful. But how much cognitive proximity is there between different research environments, and in terms of contributing to innovations that can be commercialized, how much absorptive capacity is there? What is NTNU's "ability to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128)? Although not a firm, NTNU is a professional institution in which employees and students according to the strategy are expected to contribute to innovative performance and commercialization in different shapes and forms (NTNU, 2018) - working towards NTNU's motto "knowledge for a better world".

2.2 Place in Geography

One of the main pillars of my research question is the concept of place, and its impact on lived experiences and actions. From a geographical theoretical point of view this concept cannot be ignored and is at the heart of the epistemological approach. In the case of this thesis, it influences what I deem to be relevant questions to explore as well as what knowledge is relevant to produce. Although central to the academic field of geography, place (and space) are still contested concepts, which both Massey (2005) and Cresswell (2015) discuss in their works. They introduce their works by acknowledging that not having a clear and defined understanding of these concepts presents a challenge for geography as an academic field and its academic production.

For Massey space and place are intertwined, and they cannot be seen as separate units isolated from one another. She argues for a conceptualization of space as "open, multiple and relational, unfinished and always becoming" (Massey, 2005, p. 59). Place in Massey's

work is relational and connected to other places in what we could call networks, and allow for flows of people and ideas between scales of local and global. Massey sees place as an event, unique in its thrown togetherness and not as something separate and particular. In this view place is not static, it is a process; it does not have boundaries, as the outside is part of the inside; and it does not have a singular identity, rather it contains internal conflict (Cresswell, 2015; Massey, 1994). Cresswell sees place as a location with meaning which can be contested and transgressed (Cresswell, 1996, 2015). He highlights the impact of relational geographies on the redefinition of place in geography, moving from the regional approach to place which was more focused on describing the differences between areas of the Earth's surface (Cresswell, 2015). This move according to Cresswell made the discussion about place into something more than a discussion of location or region, and more into an idea and a way of being-in-the-world, and about the way things relate to each other where scale and absolute location are no longer of essence (Cresswell, 2012, 2015). The relational approach has not been without criticism, and questions have been raised regarding what these relations are made up of, who gets to make things relate, and can something be non-relational, in short, how do you theorize 'relational' (Cresswell, 2012; Jones, 2009)? Jones (2009) for instance argue that socio-spatial relations are outcomes of:

"forces produced neither through structural determinism nor through a spontaneous voluntarism, but through a mutually transformative evolution of inherited spatial structures and emergent spatial strategies within an actively differentiated, continually evolving grid of institutions, territories and regulatory activities" (p. 498).

Nonetheless, in this thesis while recognizing the limitations of a relational approach, I argue that it offers a useful framework for understanding place and place-making, and for exploring the elements of what makes campus a place.

2.2.1 Campus Through a Geographical Lens

A literature search on human geographical research on campus and campus culture reveals a field covering topics ranging from the internal organizations and negotiations of power and identity, to a campus' relationships with external forces, actors and structures (Andersson et al., 2012; Brooks et al., 2016; Giesecking, 2007; Hopkins, 2011; Hubbard, 2009; Lee, 2004; Self & Hudson, 2015; Smith & Hubbard, 2014; Turner & Manderson, 2007). These works show that campus is a multidimensional place, and it is not neutral (Brooks et al., 2016), it is a place with a diversity of borders, cultures, discourses and actors. It is a place where power structures and power balances are continuously negotiated. It is relational, shifting, and at the same time confined to a geographically defined area consisting of built structures.

Some researchers have referred to these two dimensions of campus as i) physical and ii) social campus (Giesecking, 2007). However, as we have seen from the discussion on place in the above section, this type of division into physical and social becomes limiting in a multidimensional and dynamic approach to place. A place is both physical and social at once, interlinked and interdependent. Hopkins (2011) identified three different bodies of literature on universities and campus in geography focusing on i) issues of regional development, ii) housing issues, iii) and city living, and called for more work on "the internal geographies of the university campus and the embodied identities of students" (158). This thesis contributes to the literature on internal geographies of university campus by focusing on campus as a place for innovation.

Following Hopkins' plea for a wider geographical perspective on universities and campus newer research has made some valuable contributions. Brooks et al. (2016) present an

analysis of the space of student unions at campuses in the UK, and how campus influence union activity. They argue that the experiences of higher education institutions are spatially differentiated and that this in turn is often related to social differentiation, and that both the material and relational elements impact on the identities of those who act within it (Brooks et al., 2016). In other words, actors on a campus are not neutral when entering the campus environment, and campus as a place and space is also impacting their identities and their actions.

Another study has focused on diversity. Although a campus environment is in theory a place where people of different backgrounds, nationalities, and expertise may meet and connect, this may not be what actually takes place. Anderson et al. (2012) asks the question whether sharing of campus space with "others" produce cross cultural interaction, and find that it's not necessarily the case. It is pointed out in their paper that the university setting is for many, in particular for students, a new and unfamiliar environment in which they rather search for the familiar and comfortable when it comes to interaction, instead of the "other". This indicates that when creating place, identifying with it, and establishing a sense of being "in place" instead of "out of place" (Cresswell, 1996), we tend to look for people, objects and relations that are similar and familiar to us.

2.3 The Elements of Place

What does place consists of then? Over the years, geographers have worked on breaking down some of these elements of place in order to more easily analyze its complexities. As a basis the dimensions of place can be identified as i) locale (which could be understood as a context for social interaction, norms and practices) ii) location (which could be understood as a defined area on a map) and iii) sense of place (a place of meaning to which people attach emotions) (Agnew, 1987; Aure et al., 2015; Cresswell, 2015). This has later been developed further, adding other aspects and more nuances to them. One element that is of importance to this thesis is practices, as expressed by Simonsen whose definition of place I cited in 2.1.1: "a specific articulation of social practices, social relations, and materiality as well as experiences, narratives and symbolic meanings of the place held by its different users" (Aure et al., 2015, p. 17; Simonsen, 2008, p. 16). This description that Simonsen offers includes the relations and the materiality of a place, but it also gives prominence to the practices of a place and the role of practices in place-making which I will come back to later. It also underlines the fact that places are experienced and performed differently by different individuals. The central part is not the place in itself, but the ongoing, continuous constitution of the place (Aure et al., 2015, p. 18; Simonsen, 2008, pp. 17-18). If we apply this thinking to campus NTNU it means we cannot see it as a constant, defined place, but rather a constantly evolving expression of practices, relations and materiality combined. This also indicates that when looking at developing a place like campus, attention should be paid to all these elements and not just the location and its buildings.

2.3.1 Place Making on Campus

When we know what elements make up a place, then the question that follows is what are the different ways in which places are created and becoming? Place making is social processes between different actors and their actions or practices (Frisvoll, 2015). Actions or practices are part of creating place in all its dimensions. In the making of a university or a campus, the practices are at the core. In other words, the things actors do – like teach, study, write, discuss, socialize – are creating and supporting the concept of

university. Structures can guide how we do this, but actors can also adapt the structures so that they fit what they need to do. Rearrange rooms, use space differently than planned, collaborate on other projects that seem more important than what the boss or professor tells you to do, these are all examples of ways structures can be adapted by actors (Cresswell, 2015). This suggests that there is a flexibility in places that allow for an ongoing interaction between structure and agency.

Materiality is usually the first thing that comes to mind when one thinks of a place and what makes a place a place. The physical buildings, rooms, infrastructure, monuments, people, paths – these are elements that I think many will recognize as part of what makes a place a place. The materiality of a place has been of interest to theorists who wanted to balance the influence of the representational views, and materiality includes not just humans but what has been called “more-than-humans” such as animals, nature, technology and non-living entities (Berg & Dale, 2015). Materiality relates to both locale and location. When Agnew talked about locale, he referred to the material setting for social relations, norms and practices, like buildings and physical structures.

With regard to locale we may ask, what is the relationship between buildings and normative practices of a university campus? Hebdige (1979) argued that:

“Most modern institutes of education, despite the apparent neutrality of the materials from which they are constructed (red brick, white tile, etc.) carry within themselves implicit ideological assumptions which are literally structured into the architecture itself” (p. 12).

He continues to state that these structures have supported the categorization of knowledge into arts and sciences and reproduced them into different faculties and different buildings (Cresswell, 2015; Hebdige, 1979). The lecture halls and the seated auditoriums mainly suited for one way communication hint at the power relations between professor and students. As Cresswell puts it: “The university you have inherited is, in other words, the product of hundreds of years of the practice of education in particular ways” (Cresswell, 2015, p. 68).

On the other side, the structures built into materiality is always negotiated and human agency is not easily structured. Structures are made through the repetition of practices by actors (Cresswell, 2015, p. 67). If we take the built structures of a campus as an example, even if the main practices of education and learning are continuously being encouraged and performed, the way they are being practiced are bound to constantly change (with new people, evolving socio-political contexts, ideological shifts in how society views the role of the university etc.), and with these changes the agency of actors can overrule the implicit ideological structures. These changes might not be radical but incrementally evolve over time.

Location is another concept that must be taken into consideration, when we speak of the materiality of universities and campus. Where the university and its campus is located will make a difference on how it is made a place. It makes a difference whether it is in the USA or in Norway, and similarly whether a campus is located in Oslo or Trondheim will also make a difference. Location connects the place to an area on a map, but in a multi-dimensional understanding of place this area does not necessarily need to be a fixed area, it can change (Agnew, 1987; Aure et al., 2015; Cresswell, 2015). In the case of NTNU campus as defined in this thesis, its location is in focus in two ways: firstly because the campus development project revolves around a planned shift in location from one area in Trondheim to another, and secondly, it is also in focus because of its location in Trondheim and what that means for campus as a place *in a place*. Location as

an element of place recognizes a macro-order, and that it is embedded in a state and in a world that impacts place (Agnew, 1987).

In symbiosis with the materiality of a campus, a significant factor in making it a place is the sense-of-place. The term sense of place has been used to capture the identity or soul of a place. Agnew referred to the subjective and emotional attachment people have to place based on their experiences (Agnew, 1987; Cresswell, 2015). Cresswell refers to the loss of sense of place that some people express as a result of globalization and the erosion of local cultures (Cresswell, 2015). The concept of sense-of-place allows us to see that places are given symbolic meaning and actors in places identify with them (or not) (Aure et al., 2015, pp. 17-18). On a campus there are a number of elements that can evoke a sense of place, which can also include a sense of belonging or exclusion (for examples see Hopkins, 2011).

2.3.2 Assemblages and Networks

Another element of place making is the "thrown-togetherness of actors and objects in time and space" (Massey, 2005) but it is also their relations within and with the outside that creates a place (Cresswell, 2012). This brings us to assemblages and networks as connections that stretch across borders, linking and engaging the inside and outside. Delanda (2006) described an assemblage as a "unique whole whose properties emerge from the interactions between parts" (Cresswell, 2015, p. 52). In an assemblage, parts can be removed and replaced, producing new unique wholes (Cresswell, 2015). If we take campus as an example, there are buildings, objects and people – inside and outside - but in and of themselves they are not a place, it is the connection between them that make them both an assemblage and a place (Berg & Dale, 2015; Cresswell, 2015).

Assemblages and networks have many similarities and may in some cases overlap. There has been efforts to distinguish the difference between them (Berg & Dale, 2015) but suffice to say that they are both analytical concepts that can help us understand place and place-making better. There are several social network models that have been developed over the years, and the Actor-network theory (ANT) is a model that provides analytical tools for explaining the process of constant reconfiguration of society (Callon, 2001). ANT focuses on actors in networks, and by actors it is referred to actors or actants (human and non-human) with agency who make something happen (Latour, 2005). ANT relies on empirical evidence to describe rather than explain social activities (Latour, 2005). It sees processes and relations as something that can stretch and connect deep and wide, and seeks to avoid dialectics such as agency/structure, local/global, big/small (Blok et al., 2020). Latour argues against the science of the "social", and he sees the social as a trail of associations between heterogeneous elements, as a "type of connection between things that are not themselves social" (Latour, 2005, p. 5). According to Latour, by following the actor(s) and their associations and traces scientists may be in a better position to actually say something about the social without forcing predefined categories and definitions on to the focus of the study. ANT assumes that what the social sciences call 'society' is an ongoing achievement, and it seeks to provide an analytical tool for explaining the constant reconfiguration of society (Callon, 2001). There are similarities between how ANT looks at society as constantly reconfigured, and how the concept of multi-dimensional place looks at places as an ongoing continuous constitution.

ANT has since its conception developed further and have been used in a wide range of studies and fields (Blok et al., 2020). Blok et al. do not see ANT as a theory or a method

but “that ANT entails a sensitivity for engaging with the world – not a central perspective, but an open repository of terms and texts, concepts and accounts, enacting and testing modes of attuning to the social life of things, to what an actor might be and to how things and actors coexist, clash, differ and associate” (Blok et al., 2020, p. 1). In this thesis, I am inspired by ANT in the sense that I have focused on a few key actors in innovations at NTNU, and followed their narratives to get an overview of how they connect with others, with whom they connect and how their actions lead to innovations. When we talk about campus and innovation, the networks and the connections in networks or assemblages are key. Innovation is not an isolated activity, it is something that happens in groups and networks. It usually requires different types of knowledge and perspectives, it requires resources and investments. Elements of place are important factors in guiding these connections, and influencing them. So looking at how people connect and form networks for innovations outside as well as inside of campus could give us clues as to the role of place in these processes.

2.3.3 Place and Power – the Contested Place

As we have seen above, place-making is also about bordering and ordering – or (b)ordering (Anderson, 2015). Through practices and relations we create place, and by doing so we also exclude and include. There is power in this (b)ordering, and since we have seen that place is multidimensional and situated, it follows that they may also be contested. The practices and the relations that make up a place are not always agreed upon across the board, and are sometimes under constant negotiation. If we take the university and a campus as an example – the practices of a university are mostly clearly defined (teaching, learning, studying, discussing, researching etc.) and the way these practices are performed mirror a long ideological history of the university’s role in society. However, these ideas may change and evolve as society changes, and a practice like innovation may be prioritized in different ways through time. The questions of what a place should be and what it should be for, and which practices are encouraged and which are not, become relevant in this constant negotiation. According to Murdoch (2006) relational space is power-filled space, where some alignments dominate and others are dominated – relations will coexist but there will be competition between them.

In the case of campus NTNU, there are certain practices that are highlighted in the current communication and branding of the university. To innovate is one practice that is in focus, and to act interdisciplinary and sustainable are other highlighted practices. What this actually means in practical terms for actors in this place is something that is being continuously discussed and negotiated (see the following for examples Brattebø & Larssæther, 2022; Hjelseth, 2022; Tveten, 2022). These practices are often linked to solving the challenges and wicked problems of today and the future, and it all comes together under the slogan of “knowledge for a better world” – as the overall purpose of everything NTNU does. These practices and their overall purpose are not necessarily contested, but the way in which they are understood, performed and prioritized may be, and in these negotiations the element of power becomes relevant.

2.4 Innovation and Place

What is the connection between innovation and place? As we have seen so far, innovation happens in time and space. It happens in groups and networks. Also the groupings and connections between actors in innovation processes can be seen from a place based approach using assemblage theory and network theory. The activities

involved in innovation processes are one type of practices that create place – that make campus a place – a place for innovation.

Innovation starts with creativity. Kramvig and Førde (2015) argue that place, knowledge production and creativity are closely connected. While they focus on cultural arenas and businesses in the cultural sector, their findings are applicable to a university setting, in particular when it comes to innovation processes. They observe in their data that value creation happens through building networks, and through these networks there are connections made and un-made, and remade in new configurations. These connections allow for flows of knowledge, trust, work and objects (Kramvig & Førde, 2015). They ask the question if an idea or a creative process can survive without its place, and they conclude that good ideas need to be anchored locally before they can travel globally – the idea is dependent on its place (Kramvig & Førde, 2015).

2.4.1 The Role of Universities in Innovation

As mentioned in 2.2.1, Hopkins (2011) acknowledged that one of the areas that have been extensively covered in geographical research on universities and campus is its role in regional development. Especially in economic geography, there has been a focus on universities' role in the regional context of innovation, where the universities are part of a national and regional system to support, promote and advance innovation through its knowledge intensity, and through this innovation stimulate economic and social development of the region (Mitra, 2020). The Triple, and later also Quadruple and Quintuple Helix models indicate the current role of universities in the development of societies - an active and direct role (Goddard & Vallance, 2011). As the demand for specialized and diverse knowledge is increasing, universities are expected to actively contribute to the development process of local communities and regions – making use of the knowledge they possess (Goddard & Vallance, 2011). Teaching and sharing the knowledge in a traditional and theoretical academic way is still important but not enough, the applicability of the knowledge, the knowledge in practice, knowledge for the purpose of solving specific problems, is also important.

The increased focus on universities to take on commercialization of research and technology transfer has been said to bring new challenges to the university sector. In a study of four European universities the researchers concluded that all four had increased their commercialization activities, and have implemented a range of support mechanisms for entrepreneurship (Rasmussen et al., 2006). The challenge according to Rasmussen et al. was how to coordinate both these new activities and mechanisms as well as the traditional ones.

Goddard and Vallance (2011) argue that the “actual success of universities in stimulating regional growth often does not match the role prescribed it in theory” (p. 432). They suggest that the narrow role of the university in regional development as a source of knowledge within a local economic innovation system is overstated (p. 433). They bring up alternative roles suggested by other researchers such as Delanty (2001) who sees it as an important site of interconnectivity in the knowledge society and a key institution for formation of cultural and technological citizenship (Goddard & Vallance, 2011). In other words, the university is an important part of economic development, but it needs to be more than that in order to fulfill its mandate and potential. Their argument links to the debates about the role of the university which I have touched upon earlier in this thesis: Is the university a place for knowledge in its purest form, or should it contribute to commercialization and adapt to capitalist influences (Tjora, 2019b).

Silicon Valley has often been used as an example of what a strong university can do for innovation, firm creation and economic development where the university creates strong knowledge spill-over locally, which then helps build up a local buzz (Bathelt, 2011; Goddard & Vallance, 2011). This process has been seen as spatially concentrated, meaning geographical proximity was seen as a necessity for the transfer of knowledge and building of relationships. With new technology and globalization, many suggested that we would see “the death of distance”, but that has not been the case (Forman et al., 2018).

2.4.2 Innovation and Proximity

When it comes to innovation research within geography one concept is of particular interest in this thesis, namely proximity. Traditionally, innovations have been seen as clustered in spatial terms – meaning they tend to happen in geographically concentrated areas (Davids & Frenken, 2018). Especially when it comes to exchange of tacit knowledge the need for face-to-face interaction is seen as high (Davids & Frenken, 2018). However, numerous studies have also shown that co-location within a cluster is not a necessity for knowledge transfer and collaboration, one should rather aim for temporary geographical proximity at different stages of an innovation process (Balland et al., 2015; Boschma, 2005; Davids & Frenken, 2018; Ferru & Rallet, 2016; Torre & Rallet, 2005). It has also been argued that proximity is relational and can be constructed through interactions over time through different forms of networks. There may therefore be analytical benefits to combining network theories with the proximity concept (Balland et al., 2015).

From a focus on geographical concentration and clusters, researchers started exploring the connections between local clusters, the wider community and interrelated firms, and by doing so they shifted the focus to social processes, learning regions and networks (Mitra, 2020). Network theory is useful when exploring data that indicates relations between actors, especially since it can be done on various levels (individual, organizational, national etc.) (Balland et al., 2015). This is also why network theory integrates well with the proximity framework, as the proximity framework can benefit from the theoretical developments of network theory across disciplines (Balland et al., 2015). Studies show that geographical proximity may seem less important in certain processes, but it is found to positively affect tie formation in knowledge networks (Balland et al., 2015). In that sense, a co-location of the NTNU campuses would be a move in the right direction for improving knowledge networks within NTNU. However, as Balland et al. highlights (2015), we need to better understand the collaboration patterns in knowledge networks, especially since these types of networks are seen as crucial in the so called knowledge economy.

In a project that aims at co-location like the NTNU campus development project does, the idea of proximity is at the core and relevant to explore further from a theoretical perspective. The term proximity and its role in geography is not new, but before the 1990s it had mainly been used in terms of its geographical dimension (Ferru & Rallet, 2016). However in the 1990s, French economists started using it to analyze the relationship between territory and industry. Proximity became a tool that could be used not only with reference to its geographic dimensions but as a concept that could combine geographic dimensions with economic dimensions in a dialectic relationship, and proximity was seen as a multi-dimensional concept (Boschma, 2005; Ferru & Rallet, 2016, p. 100).

It was long presumed that geographical proximity was a necessity for innovation, and a clear focus was on the benefits of geographical proximity in the creation of successful industrial districts, local buzz and relatedness in terms of knowledgebases. In other words, the physical meetings and connections, the geographically close networks that could generate actual meetings of knowledge sharing and ideas were in focus. Boschma (2005) contributed to the research on the role of proximity for learning and innovation, by clarifying and defining the relationship between different dimensions of proximity such as i) cognitive, ii) geographical, iii) social, iv) institutional and v) organizational, and by also discussing the potential negative effects of proximity which thus far had been given less attention (Ferru & Rallet, 2016). One of Boschma's points was that geographic proximity must be seen in relation to these other proximity dimensions, as they could offer alternative solutions to the problem of coordination, meaning if geographical proximity was missing one of the other dimensions like social or organizational proximity could complement and create similar conditions for learning and innovation.

2.4.3 Proximity – a Dynamic and Situated Concept

When talking about proximity, it is also relevant to talk about its opposite, namely distance – and the relativeness of these two concepts. The definition of proximity and distance could potentially be defined in terms of geographical measures, but the perceived proximity and distance can never be defined, because it is highly personal and highly situational. I may perceive a proximity on any dimension to someone or something that is far away, and a huge distance to someone or something although we may be in the same building.

And this perception may change completely from one day to another depending on events or actions. How can we create analytical categories for something that is so situational? Researchers have suggested that social interactions make us feel geographically close and not the other way around - the type of social interaction we have impacts on the perception of geographic proximity and its activation (Ferru & Rallet, 2016). This idea is echoed by Balland et al. (2015) who paraphrases Padgett and Powell (2012) by saying that in the short run, proximity creates knowledge networks, in the long run, knowledge networks create proximity (Ferru & Rallet, 2016).

If geographic proximity is not physically objective but rather a representation responding to social activities, it might be interesting to look further at how interactions create geographic proximity in innovation processes (Ferru & Rallet, 2016). Something which is in line with what Balland et al (2015) suggests, namely that proximity needs to be analyzed as a dynamic process constructed by interactions between actors. In this thesis I give some examples of interactions that help create proximity in innovation processes, and discuss the relationship between place, proximity and actors at NTNU.

2.5 Summary

In this chapter I have argued for a multidimensional approach to place as it creates an interesting foundation for successful place development. A place development that takes into consideration materiality and functionality as well as social relations and practices. Innovation activities are one of many practices making campus NTNU a place, but the status of the practices may not be agreed upon. Innovation as in commercialization may be a contested activity in university settings, although at NTNU it currently has a prominent position in the branding of the university. I have also discussed the role of

networks and assemblages in innovation processes and in place-making, and presented ANT as a useful approach when seeking to establish networks, or traces of associations.

The role of universities and campus in geography has often been connected to regional and economic development, and innovation has been seen as an important part of that development process. Although this thesis looks at innovation processes leading to spin-offs with potential positive economic development outcomes for the region, my focus is not so much on the regional benefits of these innovations. My focus is more on the processes themselves, what enables them and what hinders them. By looking at these processes on campus, I want to contribute to the literature on internal geographies of university campus by focusing on campus as a place for innovation.

I have also argued that the concepts of place and proximity are both situated and multidimensional, and understanding their multidimensional sides are important when using them empirically. Place cannot just be understood in terms of its materiality and location, and proximity cannot just be understood in terms of geographical proximity. Geographical proximity can help learning and innovation but is not a prerequisite. Cognitive and social aspects may be more important, and some claim that social proximity is what creates geographical proximity. This indicates that if one wants to create more proximity between actors in a place one would benefit from focusing more on increasing the social proximity over geographical proximity. In addition, research has also argued that co-location within a cluster is not a necessity for knowledge transfer and collaboration, but one should rather aim for temporary geographical proximity at different stages of an innovation process

3 Methods

In this chapter I will describe my research design and the methods used for generating data. I will also describe my approach for coding and analyzing the data, and discuss potential implications on ethics and rigor.

3.1 Research Design

I have taken a qualitative approach in order to answer my research question. As NTNU is discussing the best ways of designing a new co-located, city-centered campus, I wanted to understand how things currently work when it comes to innovation and collaboration across campuses, NTNU as an organization, the city of Trondheim, and beyond. Because as we have seen discussed in chapter 2, innovations and the processes behind them do not happen in just one individual in a vacuum – it happens in networks of people, tools, organizations and institutions, and these networks stretch over time and space. The question becomes, how can we learn something about these networks, about what initiates them, what nurtures them, and what makes them succeed? How can we learn something about the actors' experience of proximity in these processes? A qualitative approach allows for the relational dimensions to be expressed through narratives from people involved in the networks, and I think the individual and relational experiences can provide a basis for furthering our knowledge.

My design approach is based on case studies, where each innovation process presented here can be seen as a case. As argued by Baxter, one of the underlying philosophical assumptions when using case studies is that "in-depth understanding of a case is valuable on its own" regardless of what may be happening in other cases not under study (Baxter, 2016, p. 131). The question of generalizability or transferability is a valid one that I will discuss further below under Ethics and Reliability 3.3.

By using the case study approach, I am applying theories of place in innovations and the role of proximity on the university setting, more particularly on a NTNU setting. I have designed the research looking for data that can give input to the concepts under consideration, in this case the relationship of place to innovations, and the role of proximity in these processes. In my analysis I am trying to let the data lead the way, using a Stepwise-deductive induction (Tjora, 2018) as explained in more detail later in 3.2.

Czarniawska (2016) warns researchers of confusing place with case from a methodological point of view – the place is not the case. Her point is that cases are "window studies" which starts with a place, and an idea that something interesting is happening in this place. This is the approach I have taken in this study too, identifying NTNU and its innovations activities as an interesting case. Another reason why my design is based on case studies, is that case studies are done on historical events instead of current (Czarniawska, 2016), and all of my interviews were done on processes that dated back in time stretching from early 2000 to 2021. The exact time frame for some of these processes is hard to pinpoint as they are results of knowledge and relations built over time. Case study research has been defined as "the study of a single instance or small number of instances of a phenomenon in order to explore in-depth nuances of the

phenomenon and the contextual influences on and explanations of that phenomenon” (Baxter, 2016, p. 130). This is what I aim for in thesis.

In this research, NTNU is my field. It is a field that can be mapped, and depending on who do the mapping the maps of NTNU will probably look very different. There are many ways of seeing NTNU, of experiencing it, and of articulating it. The people I have interviewed are all seeing, experiencing and articulating their relationship with NTNU in different ways. In addition, my own experience and knowledge about NTNU is shaping both my design and analysis. As Couper suggests “the field site itself shapes the data collected” through numerous and constant interactions between field, researcher and equipment (Couper, 2015, pp. 99-100). As I mentioned in chapter 1, my relation to NTNU and Trondheim was limited to digital exposure up until the start of this thesis and this limitation continued to a certain degree during the work on this thesis because of the COVID pandemic. So the interactions between the field and the researcher in this case was not by physically being present there. However, the interactions with this digital version of my field was still ‘numerous and constant’ and I will discuss how this may have shaped my data further below in 3.3.2.

I did not include the campuses of Gjøvik and Ålesund in this case study, as the campus project is a Trondheim-focused project. On that point though, I find that there is a dissonance in the discourse about a co-located NTNU campus when in fact that co-location excludes two campuses of considerable size. I can’t claim to have the full overview of the interdisciplinarity debate with regards to the campus project, but I have not yet seen anyone question how an institution can create a collaborative culture based on geographic co-location if not everyone is included in that co-location? However, if we see place and proximity as multidimensional and situated concepts, and if social interaction can create geographical proximity, then the activity of co-location and merging of campus cultures for innovations could be seen across geographical distance. This may be something for further research, however, as a result of limiting the scope of this thesis, I am focusing on Trondheim.

3.1.1 Sampling of Cases and Informants

As discussed in chapter 1.1.3 it was important to have a clear definition of innovation in order to focus the scope of this thesis. I decided to focus on technical innovations resulting in new products that could be commercialized. I selected participants from the list of spin-offs that NTNU Technology Transfer (TTO) showcased on their website (NTNU Technology Transfer, 2021). Initially, I wanted to also include other types of innovations that are important for a university to nurture, such as innovative approaches to learning, processes for collaboration etc. However, I had difficulty in finding relevant cases that could be used together with the data developed on spin-offs as the definitions of innovation would divert and the scope of this thesis is limited. I therefore chose to focus on the more technical and spin-off related innovations for the purpose of this research.

On TTO’s website, they listed 41 spin-offs at the time when I started this work (see Appendix 6), and each spin-off was presented with a short description of the innovation behind the spin-off and information about the people or faculties behind the original idea. I went through the 41 spin-offs listed there, and did a first selection of people to reach out to. I aimed at some diversity with regards to the time of establishment in order to cover both newer and older innovations. I also tried to get a diversity in terms of type of innovation, whether it was an IT-based innovation, or a medical one, or more grounded in the field of engineering, to mention a few examples. I also aimed at a diversity in

terms of gender and age of the informants but this proved difficult to fulfill, in particular with regards to gender (see Table 1). I didn't specifically ask for age, but my informants included both junior and senior employees. The final criteria was that their email address was publicly available, and preferably still an NTNU address but this was not a must. I assumed that people who has an NTNU email address were still active at NTNU and would be inclined to discuss these issues with me as they relate both to the work they have done and to the future directions of their institution.

This resulted in the first selection round with 13 people from 6 innovations that I contacted via email. When seeing how many agreed to participate from this first round, I did another one where I reached out to 8 people from 4 innovations. When I had an overview of the results of the second round, I did a last one, where I reached out to 10 people from 8 innovations.

Another question that was important to give some thought to as I prepared for the selection of sources was: Who innovates at a university? In my initial outreach to potential informants from the list of spin-offs, I had at least a certain diversification in terms of gender and roles. However, in the end, most informants who agreed to participate fall into the category of professors, associate professors or senior staff at NTNU, and all of them male. Table 1 shows the list of how many requests were sent and how many accepted to participate. Out of those who declined to participate (9), the reason was either time constraints or that they didn't feel that they could contribute to the research question, and 16 did not respond. This can be considered purposive sampling, and a combination of deviant case sampling where the informants approached belong to a group of people who have achieved a specific level of success (meaning their work led to innovations that could be commercialized through spin-offs), combined with a criterion- and convenience sampling (Stratford & Bradshaw, 2016). The latter a result of the fact that I only got to interview those who were available or could make themselves available for this purpose. Approximately 26 percent of the people I reached out to agreed to participate.

Table 1: Overview of interviews requested and accepted

Category	Interview requested	Interview accepted
Innovators	31 (4 women, 27 men)	7
Staff involved in innovation processes on institutional level	3 (1 woman, 2 men)	2

As table 1 shows, I also reached out to and interviewed senior staff involved in innovation on departmental or faculty level. This group of informants came as a result of a snowball effect as an informant who I reached out to declined to participate because of time constraints but referred me to this other senior staff who agreed to participate. I realized that this group of staff that he belonged to would be interesting to speak to as they could provide a more institution- and system-wide perspective, and within this group there were representatives from different parts of NTNU. I reached out to three staff within this category, and two of them agreed to participate.

From a legal perspective, NTNU, like other Norwegian universities, has abandoned the Professor's privilege, and therefore innovations coming from academic staff are licensed to NTNU (Fini et al., 2017), and I therefore thought it could be interesting to look at employee innovations. That being said, in my interviews with professors, their students were often mentioned as key players in the innovation process that they had gone through. It could have been just as relevant to look at this research question with student innovations as the focus. But it could also have been interesting to see these innovation processes that are presented here through the eyes of the students that took part in them. What did they contribute with, what did they learn from it and how does it impact on their ability to continue with innovative processes in the future? That knowledge may be just as important as the knowledge I may be able to draw from this work that I have done. However, in order to stay within the scope of the master thesis I decided to focus on the academic staff.

3.1.2 Interview

As my main method I chose to do semi-structured interviews with the informants who agreed to participate. I come from a background of social anthropology and people and their narratives have always been of interest to me. And interviews create the opportunity for narratives to be shared as informants get to talk about the topic at hand from their perspectives, with their words. They were of course guided by my questions but as it was only semi-structured there was also room for them to lead the direction of the interview into areas that I may not have been aware of, which many of them did. In fact some of the interviews turned out to be more open than following my prepared semi-structure. One could argue that it would have been better to go with open interviews from the start if my goal was to capture narratives, but as someone who does not have extensive experience in interviewing for research I found it better to plan for a semi-structured approach and stay flexible. They provided rich narratives as they shared their views and perspectives in highly personal ways. As suggested by Valentine (2005) interview is a conversation with a purpose, and it generates rich and layered data that has the potential to give a deep picture of the issue at hand. The analysis of an interview is textual, and therefore language and meaning are important aspects of the process of interviewing - from preparing the questions, to reaching out to potential informants, to the actual conversation(s) had, to the transcription all the way through to the analysis. As I have worked with the data, I have processed it from thought and idea, to text, to conversations, to audio recordings, back to text, to visualizations, and to analysis resulting in more text through this thesis. I hope that I have managed to give a deep picture of campus as a place for innovation.

By choosing interviews as a method for generating the data material, I was aware of the fact that what I develop cannot claim to be representative or something from which I can draw universal conclusions. However, it will allow me to gather narratives and go deeper into the question of how people relate successfully in networks for innovation at NTNU, and maybe spot patterns that can help us gain perspectives on the role of place and proximity. Simonsen (2008) argues that place is constructed through narratives:

"Narratives then create storied pathways to live by, including performance conventions, plots, order, myths and so on. Exploring such narrative resources for creating and experiencing our surroundings, therefore, can institute an understanding of the place as a collection of stories. Narratives make places habitable and believable, they recall or suggest phantoms and they organize the invisible meanings of the places" (p. 21).

I had prepared an information letter and an interview guide in Norwegian and English (see Appendix 4 and Appendix 5) for my primary target group (innovators) that I slightly adapted to my secondary target group (staff involved in innovation on institutional level). The core focus of the interview for me was to listen to their stories as they described the networks involved in the innovative idea and its development, the role of campus and the role of proximity. Because of the semi-structured, or to some degree open, approach some of the interviews are similar but there are also differences in which directions the conversations developed. I believe this is fine, as I am not looking for a comparative representative truth but more an illustration of a lived experience. Initially I left it to the informant to decide on the place of the interview (on campus or online), and a few preferred to meet on campus. However, because of circumstances, sometimes time-related and sometimes logistically related, I ended up doing all of the interviews online via Zoom or Teams. I used an audio recording tool to record the conversations, and they were all between 40-90 minutes. The interviews were held in Norwegian or English, based on the preference of the informant.

Table 2: Overview of interviews per case

List of employee spin-offs	List of informants
Innovation A	Informant 1
Innovation B	Informant 2
Innovation C	Informant 4 and 5
Innovation D	Informant 7 and 9
Innovation E	Informant 8
Staff involved in innovation processes on institutional level	Informant 3 and 6

Table 2 shows the list of interviews that I have done for this thesis. In addition I have had a conversation with a representative from the NTNU Technology Transfer Office (TTO) to discuss ideas and get a better understanding of how they operate.

3.1.3 Secondary Data

In order to complement the data from the interviews I used texts, and by texts I refer to not only written words, but also visual representations relevant for my research. These texts add information about the context of innovation at NTNU, the campus project and the discourse around it (Clark, 2005). The sampling in this case has been purposive, and includes texts from NTNU's website, as well as texts from digital news outlets focusing on issues of higher education in Norway. In some cases these texts have been used to describe background and context, but I have also used a few as data.

Adding texts to my data sources, texts that have not been produced by me, creates a layer of diversity in the data. Not only am I using different methods, but I am also adding information that has not been influenced by me in its creation. However, obviously my influence is present in the selection and analysis of texts that are considered relevant. But there has been another person or entity behind the production of the information presented, and the voices we hear presented in this data are different voices than those that I had the opportunity to talk to. Initially, I expected to use more of the secondary data as I worried that the material from the interviews may not be sufficient. However, it turned out to be quite rich and I have therefore given the primary data prominence in

this thesis, using the secondary data to complement where needed to strengthen or challenge the analysis.

3.2 Analysis

One of the challenges with analysis of qualitative data is to avoid pre-defined categories and forcing data into existing theories. Since I have taken theoretical inspiration from theories of place, actor-networks and proximity, and also designed my interviews with these theories in mind, I wanted to open up my analysis in an abductive way, or more precisely as Stepwise-Deductive Induction (SDI) (Tjora, 2018). Tjora argues that this is a more appropriate analytical tool for shorter projects, where multiple visits to the field or several interviews with the same informants over time in order to develop grounded theories are not feasible (Tjora, 2018). It acknowledges that ideas for research comes from theoretical backgrounds and traditions, but aims at opening up the analysis to what is actually being said and communicated in the data material. Tjora suggests a stepwise analysis that starts with data-driven coding, which will generate numerous codes. These codes can then be grouped into a handful of categories that may then eventually develop into thematic areas (Tjora, 2018).

The interviews were transcribed by me and anonymized. All the transcriptions were digital, and I kept a separate document in my physical notebook with an overview of names and alias. However, since I only interviewed 9 people and worked with the material quite extensively it was not difficult to keep the overview of informants in my head.

I went through each transcription while listening to the audio files a second time to ensure I had gotten all the details down on paper. Then, I read through each of the transcripts and applied data-driven coding using the software NVivo. In order to test if the data-driven coding is done right, Tjora proposes a test which consists of two questions (Tjora, 2018, pp. 45-46):

1. "Could you have created the code before you started the process of coding (if yes, then it's not a data-driven code and you need to redo it)
2. What is the code telling you? (if it states what was being talked about the researcher need to redo the coding, but if it states what was being said the code can be characterized as data-driven coding)"

I found this to be an interesting approach, and applied these questions regularly to my coding. In my analysis of the interview transcripts I used the functionality "code in vivo" which creates a code from the actual text. I ended up with 535 data-driven codes, that were then categorized into 14 categories that could later be developed into 3 main thematic areas: i) elements of place making, ii) proximity as a situated concept iii) the contested role of innovation and innovation activities in a university context. I found this approach both rewarding and challenging. The challenge for me was that the SDI process as described in the literature did not necessarily unfold into a clear path for me, and maybe it doesn't really do that for anyone and that's part of the game. On the other side, I also found it rewarding because it allowed me to really dig into the data, and the informants words and stories were repeated to me over and over again in this process. The combination of the repetition of the data, and the constant work of systematizing that information without falling into pre-defined categories made me digest and interpret continuously, in intertwined loops. Nonetheless, I am not sure if I succeeded in avoiding the pre-defined categories completely. I found that the research question and theories

presented themselves in the data analysis process because my thinking was focused on these concepts and issues.

I used NVivo in order to systematize and create transparency for others, like my supervisor, to check my process if needed, but also for my own overview. I found that the tools in Nvivo allowed me to better aggregate the codes and the associated data in meaningful ways.

The data and analysis is presented in chapter 4, and I have given prominence to quotes from the interviews as a way of letting the informants speak for themselves. It should be noted that since most of the interviews were done in Norwegian, I have translated and paraphrased the quotes with the aim of staying as close to the original tone and meaning as possible.

3.2.1 Discourse Analysis

Discourse analysis is an approach to text analysis that allows for underlying structures and ideas to come through. As Waitt puts it: discourse analysis is an interpretive approach that can help identify sets of ideas used to make sense of the world within particular social contexts (Waitt, 2016). Foucault saw discourses as producers and reproducers of knowledge and power – making some knowledge common sense and silencing other interpretations (Waitt, 2016). The discourse around innovation and its role in society has gained increasing attention over the years, in academic literature as well as in regular media and popular culture. Innovation is seen as crucial, but as discussed in chapter 2, it is used in many different ways with a diverse set of meanings. However, in spite of different definitions of the term, the public discourse often presents innovation as a result of knowledge and as the source of the solutions for a more sustainable future, and it has become an intrinsic part of public policies and strategies. This means it is also connected to financial resources and positive branding for institutions, groups and individuals. The innovators are often seen as heroes, problem solvers, change makers, and at the same time their testimonies are often laden with conflicts with structures, norms, processes, cultures etc. as they try to break barriers.

In my analysis, I have been inspired by a Foucauldian discourse analysis. I have analyzed all my data, from the interviews as well as from the sampling of texts, using elements of discourse analysis in order to showcase examples of how agency and structure are shaped when it comes to innovation at NTNU. The SDI-approach by Tjora described above is in line with what Foucault describes as keeping preconceptions in suspense, looking at the material with fresh eyes (Waitt, 2016, pp. 295-296). I then looked for “truth”, inconsistencies and silence as inspired by the works of Gillian Rose (Rose, 2016; Waitt, 2016). With regards to the texts and secondary data I used the same 3 thematic areas as mentioned in 3.2 to categorize the data.

3.3 Ethics and Reliability

When using qualitative methods in general and interviews in particular, the question about the positionality and situatedness of the researcher becomes important to discuss in order to create trust in the research, and transparency of the process leading to the conclusions drawn. This goes for the use of text analysis too, as the researcher will be influenced by his or her own experiences and knowledge when making selections of sources and deciding on how to interpret the material. The practice of science is more than the final article or thesis include and communicate (Couper, 2015). This is true for the informants and their work and also for me as a researcher in the work on this thesis.

How did my background, reading, experiences and networks shape my research design? I recognize that there is no objectivity in social science (Valentine, 2005), but that does not make the results less interesting or valid, as long as the researcher can show transparency of the process. Therefore, I intend to discuss below my own positionality as well as the trustworthiness of the research I have done so that my process and how I arrived at my results can be as transparent as possible.

3.3.1 Positionality

Since I am doing research on my own organization, there are certain elements to consider such as power relationships and biases. In terms of power relations, it can be intimidating for a Master student to interview PhDs and Professors. There is also the risk of not being able to approach what the more senior and expert informant say in a critical way and ask questions accordingly if and when needed. Even if we all belong to the same organization, none of my informants belong to the same department as myself, nor the same campus (apart from one). This made it easier for me because we had no prior relationships, and their subject areas were so far away from mine so there was no pressure from my side in proving myself knowledgeable in their fields. Although all had impressive academic titles, and more academic power than myself, I never got the sense of inferiority in our conversations. My feeling was that those who agreed to participate all had a focus on student-professor communications – it seemed through their answers during the interviews like it was a priority for them to be available to students in academic conversations – not just their own students but in general. I also got the sense that they were interested in my knowledge too, and the theories behind my research and that they were happy to contribute to developing this knowledge further. I am not in a position to say whether my role as a student at NTNU discouraged some from participating as no one gave that feedback.

Also, as I mentioned in chapter 1, I came into this research with my own personal experience of campus. I had never physically been there and my experiences of digital campus had been mostly positive. I also live in a remote place and so I am used to not being geographically close to services and people. These two factors made me even more curious to understand what the benefits of being on campus was, especially with regards to learning and innovation, because even if I felt like part of a digital community there was something missing that I couldn't identify.

I also bring years of work experience into this thesis, work experience that has exposed me to the challenges of collaboration and innovation in organizations. Although my work experience is not from academic environments, there are still similarities that helped me in my conversations with informants, in understanding some of the dynamics that they described, and asking for further elaboration in areas where I, based on my own experience, thought there could be important information.

My own experiences have brought a curiosity that has influenced the questions of this thesis, and have given me a few anchors to connect their experiences with mine to better build an understanding of their context. I have done my best to not let it define how I interpret their narratives, but rather rely on their stories in combination with the literature.

3.3.2 Rigor and Trustworthiness

One way of supporting rigor and trustworthiness in research is to triangulate, and Stratford and Bradshaw (2016) refers to four dimensions that can support triangulation:

multiple sources, methods, investigators and theories. In my research, I have had multiple sources whom I have interacted with through different methods (interviews with 9 different actors, and text analysis of relevant documents). I have also discussed the research question, theories, coding and analysis with different actors such as my supervisor, the 'campus as a place' project group, the 'future campus' project group, and other master students at my program. I also checked some of my understanding with informants during the interviews to get their feedback on whether I understood them correctly or not. Lastly, I am building the design and the analysis on theories from a diverse academic field. Baxter claims that good case studies should be richly described or theorized so that it becomes easy to draw parallels with contexts outside the case, which helps create credibility and trustworthiness" (Baxter, 2016) I have aimed at describing and theorizing these cases in such a way that they can be useful in other contexts.

My research got approval from NSD in October 2021, including my ethical considerations and precautions. An information letter and letter of consent were sent out to informants as part of the invitation to participate. I intended to let informants be anonymous, and have not published any names or personal data that can reveal their identity. I did this mainly for two reasons, one being that publishing information about people demands for certain requirements to be met, but most importantly, I did not see the added value of presenting the names of the people involved. Because of NTNU's size, and of this thesis being part of the future campus project, I did not want to make the focus about the person or his/hers positions, reputation or abilities. Rather I wanted the focus to be on the process and the relations. At the same time, the sampling is from a limited pool and it may not be impossible for people with knowledge of the inventions or individuals involved in them to recognize some of the informants in spite of the anonymity. I made the informants aware of this in the letter and in our conversations, and I also promised to share with them in advance anything that would breach this agreement but nothing has been presented here that deviates from that agreement. The anonymity also means that I am not able to link or refer to other publicly available material about these innovations or processes that may support or illustrate points that I find important. This can make my arguments less impactful or rigorous. However, I still believe that the pros of not identifying my informants weighs up for the cons.

There are some weaknesses in my methodological approach that are important to highlight. Firstly, I did not get as many informants as I had hoped for, but that being said, I did get a sense of a saturation point in terms of the answers. However, if my scope had been wider in terms of the sampling, and I had included other types of innovative activity at NTNU, the saturation point may not have been present in the same way. I also relied on the information on the TTO website for my sampling, and although I consider the information there to be accurate and reliable I also recognize that it may lack important details that could have potentially made a difference in my sampling. Secondly, the group of informants were not particularly diverse in terms of gender and academic fields, and it would have been interesting to include perspectives from people with a more diverse background in terms of these categories. Thirdly, by focusing on the networks that resulted in successful innovations, I might not have gotten a complete view of what the barriers or difficulties currently are for those networks that don't succeed. Lastly, it could have been interesting to follow my informants over a longer period of time, and observe them in action for more in-depth data through participant observation or shadowing, but the scope and schedule of this master thesis did not allow for that. I don't think it has shaped my data in a negative way, but rather there could

have been additional perspectives to include had I done some form of observation on campus.

3.3.3 Transferability

The design of this research is case-based, and may not be applicable to a wider context. It focuses on a limited number of people involved in specific activities, and on specific texts produced by organizations and actors for a specific purpose. However, innovation activities are happening in other universities, as well as in organizations across the world, so there may be patterns or insights from the cases presented here that may be relevant also in other contexts. Since my thesis came to life because of the campus development project and a need for empirical knowledge on the specificities of NTNU campus my primary focus was for it to have relevance for that specific context, and hopefully also add to the production of knowledge on campus, place and innovation in more general terms.

3.4 Summary

In this chapter I have introduced my methodological approach to the research. I presented my qualitative research design and sampling, as well as my approach to analysis of the data that was generated. I argued for the use of interviews and narratives as a primary source of data in order to answer the research question, and I explained how secondary data through texts complemented and strengthened my findings and analysis. Although I am presenting a research design based on cases, I believe there are insights coming from this work that may prove useful in other contexts

I detailed my approach to the analysis and explained that the SDI-approach had been both challenging and rewarding. I also discussed how discourse analysis can be applied to identify sets of ideas used to make sense of the world within particular social contexts. Lastly, I presented the ethical considerations taken in this work, and I paid particular attention to my own positionality and to the rigor. I explained my process with NSD, and I also outlined some weaknesses in my methodology.

4 Key Findings and Analysis

In this chapter I will present the key findings from the data generated for this thesis through interviews and text analysis, and discuss them in light of the theoretical framework presented in chapter 2 and other relevant empirical studies. I will start by presenting the five different innovations that I have focused on. These presentations give prominence to the innovation process as it was described by my informants in the interviews, focusing on its actors, how they are connected and where they are located. The cases presented here reveal some patterns that are interesting to explore further in order to answer the research questions in this thesis. I will then discuss the role of place and place-making in the innovation processes, with the aim of clarifying why a place-approach can be useful if one wishes to support innovation. I then discuss how influential geographical proximity is in the innovation processes presented here, and argue for combining the ideas of proximity and place in analysis of innovation processes.

4.1 Presentation of Cases

One of my questions for this thesis asks how actors in innovation processes at NTNU connect to others in order to collaborate, learn, share knowledge and be creative together. Understanding how actors connect today, with whom, and where key actors are located both geographically and in terms of other proximity dimensions may help us identify opportunities and barriers for actors and networks for innovation at NTNU. As presented in chapter 3, I have interviewed actors from five different innovations (see Table 2 for a more detailed overview). Some of these five innovations are product innovations whereas others are service innovations, and they originated from different institutions and academic fields at NTNU and then resulted in commercialized companies, also called spin-offs.

In each interview the informants took me through what I identified as three different phases, the idea phase, the exploration phase and the commercialization phase, in more or less details. I have not complemented the story of these processes with other sources, because it would be hard to anonymize, also I am not aiming for a complete and full overview of every actor involved as I think that would be an impossible task. Instead I have focused on documenting a snapshot of the process and the actors that participated in order to highlight how elements of place engaged with the processes. Through this presentation I will respond to the question: How do actors in innovation processes at NTNU collaborate and connect with other actors inside and outside of NTNU?

4.1.1 Innovation A

Innovation A is a product in the ICT domain. The idea behind innovation A came from the professor himself (Informant 1), as a solution to a challenge he experienced in his work. It was an idea that built on his expertise knowledge within his academic field as well as a passion or hobby of his. To test his idea he got Master students engaged in the project and they helped create prototypes and do proof of concept. After four years of testing and implementing improvements the professor contacted the Technology Transfer Office (TTO) who could then connect him with external partners that could help develop it further. They went to conferences abroad to present the concept, one of these were in

the USA. At this point they had been working on the idea for almost 5 years, and felt a bit stuck. As the Professor puts it: "We lacked competence with regards to commercialization, and seeing other possibilities and other contacts and things like that."

TTO eventually connected innovation A with another ongoing project and it proved to be a successful connection as they could merge some of the thinking and technological solutions that the two projects had developed. This new partner had already been working with a firm in London and this firm had great connections and skills that innovation A benefited immensely from. TTO was the glue in this process, bridging the two projects and teams together located in Trondheim, Oslo and London. The teams at this point were a mix of academics and corporate employees:

"They had contacts and experience with customers and managing this type of projects, they had the competence that we lacked" explained Informant 1 in the interview. He continues:

"We were a bunch of engineers that together with TTO were trying to figure things out, and it never really took off until we got other expertise in, people with expertise on usability, people who could simplify, people who had the sales-think."

Today. The firm is doing well and the main office is in Oslo. They are focused on a global market.

There was no interdisciplinarity at NTNU in this innovation although they were stuck and could have benefited from other perspectives and other skills. In the end, they got this from the outside, from external actors outside of NTNU. The innovation depended on campus in several ways: i) the idea originated in a challenge experienced on campus, ii) students were a vital part of testing the concept, building it and showing the possibilities with the product, iii) support from the department head was crucial, iv) they needed infrastructure on site in testing the concept, v) and finally, the financial instruments available through the NTNU system supported them in the process. However, campus also presented some barriers and resistance in terms of colleagues not taking the professor's experimentations seriously, and it was also challenging to find time to work on the innovation on top of all other commitments as a professor. The conflicts between the role as a professor and the role as an entrepreneur came up in several of the interviews.

Figure 2 as seen below, is a visualization of the different actors involved in the innovation process as described in the interview. It is not a complete overview of every actor involved, nor are the actors mentioned necessarily within the same taxonomic category or level. However, they are actants as understood in an ANT approach, actors who made something happen. They are also actors that cannot be removed from the process without changing it.

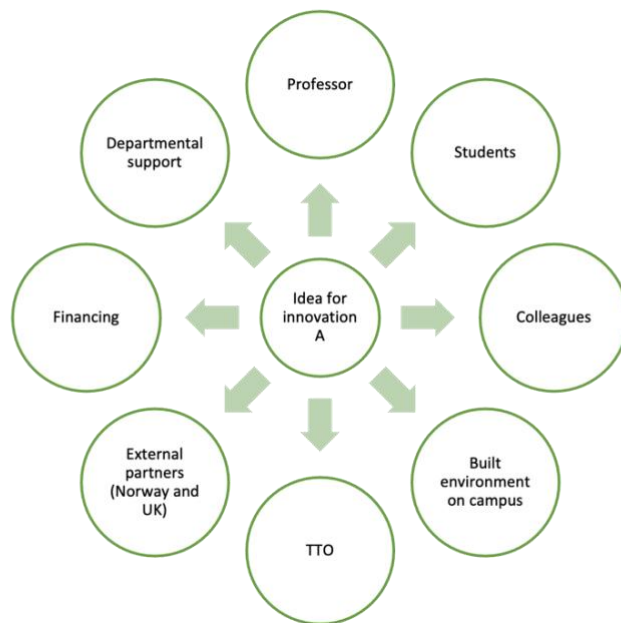


Figure 2: Visualization of actors involved in innovation A

4.1.2 Innovation B

The idea for innovation B which is a medical product started in a research project in Rotterdam and the Professor (Informant 2), who has been at NTNU for decades continued to explore this idea in Norway together with a colleague with a similar field of medical expertise. The group in Rotterdam had an idea for a more complex solution, but the Professor has now been able to design a product that is cheaper in production and therefore has the advantage of single patient use. The Professor and his colleague received indications from other medical personnel that they were interested in their solution. The Technology Transfer Office (TTO) became part of the project and have been crucial for its development in terms of finding financial support. Informant 2 explained:

“TTO has been crucial in this project, they were the ones who applied for grants from FORNY and from the Research Council and managed the project, they did all the boring administrative stuff so that we could focus on the technical part”

The Professor has been working with this academic field his whole career, both as a researcher and in the industry. He has always had a focus on finding solutions to the issues that the practitioners in the industry is experiencing. The product is now being developed and produced in a very locally based network in the Trøndelag-region. As the professor put it: “Well, there are some coincidences but I know the firm well, and know people there, and I saw it as an opportunity to get products out fast because they knew how to do it.”

There has been an expertise in this field in Trondheim since the 70s, and they were focused on industry from the beginning, however finding financial support to experiment and innovate was not always easy. Informant 2 talked about the locally based network that he has worked with over the years:

«We were a group that worked together with SINTEF on innovations already in the 70s, so we have gained a close contact, and it was because we knew the engineers in the firm (X) which also had a department in Trondheim at the time.”

Although there has been a tradition of innovation and connecting with the needs of the industry, it wasn't always easy. He continues:

"This has not happened without resistance, there was a lot of talk about us being an R&D department for the industry, right. But that has changed a lot the last couple of years when it has become more officially accepted, now we are all expected to work with innovations (laughs)."

Still, he says that they have had a lot of support from the department and faculty to work with innovations but it was not really official back then.

He says that there is a certain collaboration between his domain and other academic fields at NTNU, but in this innovation the exploration was mainly within their department, and with TTO and industry. They have also had good partnerships with academic expertise in Oslo regarding innovation B, and have another collaboration in the pipeline with a well-known university in North America. These partnerships starts with personal contacts and networks. He also mentions the importance of Master students in developing research and innovative solutions, in particular since financial support may be difficult to find.

Figure 3 as seen below, is a visualization of the different actors involved in the innovation process as described in the interview. It is not a complete overview of every actor involved, nor are the actors mentioned necessarily within the same taxonomic category or level. However, they are actants as understood in an ANT approach, actors who made something happen. They are also actors that cannot be removed from the process without changing it.

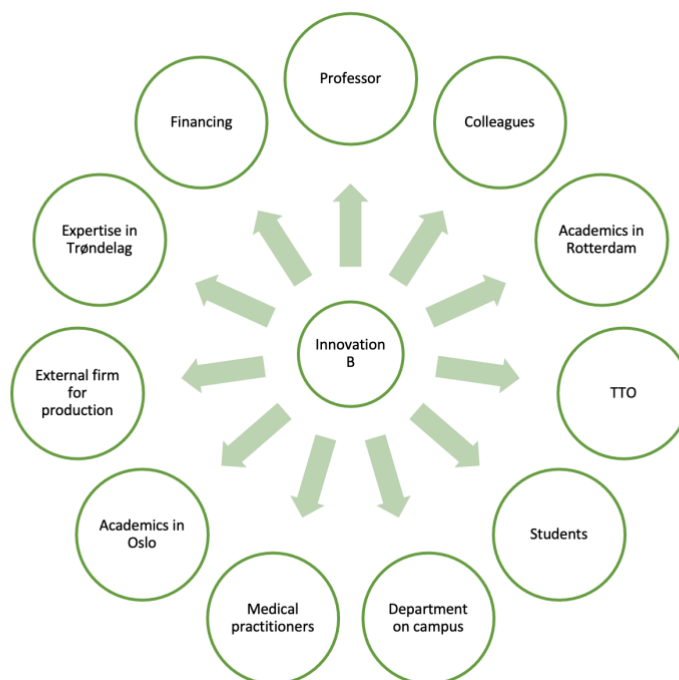


Figure 3: Visualization of actors involved in innovation B

4.1.3 Innovation C

The idea for this innovation which is also within the field of medicine, was a result of an email sent to a number of employees at several departments and faculties, that articulated a specific and urgent problem asking if someone in the group of recipients could help solve it. One professor (Informant 5) thought he had a solution and discussed with some colleagues and presented something that had potential. However, for it to be useful they needed input from experts in another department and faculty, from a different academic field. Informant 5 explained:

“I knew immediately when I saw what they (the group of Informant 4) proposed that this was what we needed. The technical part was the easy part, it’s all the rest that’s intimidating, I am not usually someone who puts myself out there...”.

The Technology Transfer Office (TTO) was involved early, and when industry could not respond to the needs in terms of production, the project team were able to set up a full scale production set-up at the university. At a certain point a full team of 50-70 people was involved in the process and all within the NTNU environment. From the outside of NTNU there are certain ingredients coming from abroad and some proof of concept that comes from other academic environments and practitioners that support the process.

It is a very locally based company in terms of production, and it still has strong connections to NTNU both in terms of knowledge, strategy and ownership. The research field in question has a long tradition in Trondheim and the professor has extensive experience. They had the knowledge to pull it through, but not only that, they also had the will to actually try. As informant 5 puts it:

“There were many others who could have done it, but for me the feeling of societal responsibility, I mean tax payers have put millions of Kroner into research that I have done over the years, and for me it was obvious that in a time of need we who have the knowledge must do our utmost to try and find solutions. Then the question was how, we had never imagined we would do this type of thing.”

Informant 4 describes the process as having changed or further developed his view on what innovation is:

“After this exposure I felt that innovation is not necessarily finding out a new product all together or a new concept altogether, but it could be a big change to an existing concept or existing product. A makeover of some concepts provided it has an application.”

He continues,

“... the moment we could club the application together we saw that there was more value in what we were doing. And that is... I think I would connect value as one of the important things to innovation.”

Out of the five cases presented here, this is the only one that has collaboration between two different faculties at NTNU at the core of the product. Another thing that differs in this process compared to the others is that the different teams never met physically until late in this project. The solution and the collaboration around it was all done online although they were in the same city, and at the same university but different campuses, and the reason was mainly the restrictions imposed as part of managing the COVID-19 pandemic. Informant 4 explained:

“... the whole innovation process actually happened on Teams, because it was not possible to meet anyone at that point in time. So we met them I think after a few months and ah ok this is the person that we have been discussing with, so it’s a very different way this innovation process happened”.

He continues

“I didn’t know who we were actually collaborating with until later, I really didn’t know them, the exact person, the profile, I never looked up who he was, what kind of research background he has, we just started with it.”

It is interesting that an interdisciplinary collaboration resulted in a successful innovation with no physical meetings to get it going. The different parties involved seem to have had a strong cognitive proximity between them in spite of operating in different fields of expertise. Another important element is that all administrative barriers were set aside, and when professor and team met criticism they were supported by leadership.

Figure 4 as seen below, is a visualization of the different actors involved in the innovation process as described in the interview. It is not a complete overview of every actor involved, nor are the actors mentioned necessarily within the same taxonomic category or level. However, they are actants as understood in an ANT approach, actors who made something happen. They are also actors that cannot be removed from the process without changing it.



Figure 4: Visualization of actors involved in innovation C

4.1.4 Innovation D

The idea for innovation D span out of a long term collaboration with the Professors, other academics in a research group at NTNU, and industry partners. Through this partnership it became clear that there was a gap between the role of academia and the needs of the industry. As technology evolves and increases in complexity the practical knowledge of how to best use and apply it in industry contexts becomes challenging, especially when considering that firms are driven by corporate objectives such as resource efficiency and productivity. The academic environment is expected to take on some of that translation

or gap-reducing, but that's not a given. For the academic actors involved this may be outside of their mandate, or even in some cases go against it.

To respond to this challenge, an idea was developed together with the Technology Transfer Office (TTO) and the research group at NTNU. However, when it came to commercialization, concerns were raised by external partners in the academic collaboration that had been developing for over 30 years – could employers of NTNU be part of this new spin-off and keep their role at NTNU without mixing the cards? Could external partners still trust them in their collaborations without worrying that what they shared would be used for commercial benefits? From an international perspective this was problematic. As a result all NTNU employees left the spin-off and kept their employments at NTNU and continued the long-term collaborations with industry as before.

The company is still running and doing well, but missing the key link to the research and academic knowledge which in this case is quite focused within this specific research group at NTNU. Informant 7 explained:

“The way I work with our industry partners, the whole point with my role, my societal responsibility if I can put it like that is that I should be helping industry to innovate. I am not the one who should be innovating. Of course I need to support with theoretical solutions, and new methods and models and that sort of thing, but I am not supposed to be making the innovative product. Our partners in the industry should do that, and I think it just creates friction with our partners if I start setting up firms and making products based on the things I am working on.”

His quote hints at the challenges of innovation activities in university settings, but also at the strengths of connecting the university with industry. Informant 9 who was also part of this innovation process was asked if this innovation could have happened in another place. This is a hypothetical question he finds difficult to give a concrete answer to but says:

«If you take this process in and of itself then it would not have been possible to do it anywhere else because it was very dependent on certain people, and it was depending on the infrastructure that was built over time. So everything was lined up for us to take the leap and try to bridge the gap between industry and research. But if you had people with the same interest and the possibilities of building that infrastructure somewhere else they could have done it too, and there are others who try to do it. But if you take this process - it probably wouldn't have been impossible - but probably difficult to do it somewhere else. The idea was sown here, and grew here, and realized here.”

In this innovation, there was no collaboration between other faculties or departments at NTNU, but the idea depended on a longtime connection with external partners. Students and PhDs have been crucial to the process, and so has the infrastructure at NTNU with labs, equipment, and access to financing from both NTNU and from the industry.

Figure 5 as seen below, is a visualization of the different actors involved in the innovation process as described in the interview. It is not a complete overview of every actor involved, nor are the actors mentioned necessarily within the same taxonomic category or level. However, they are actants as understood in an ANT approach, actors who made something happen. They are also actors that cannot be removed from the process without changing it.

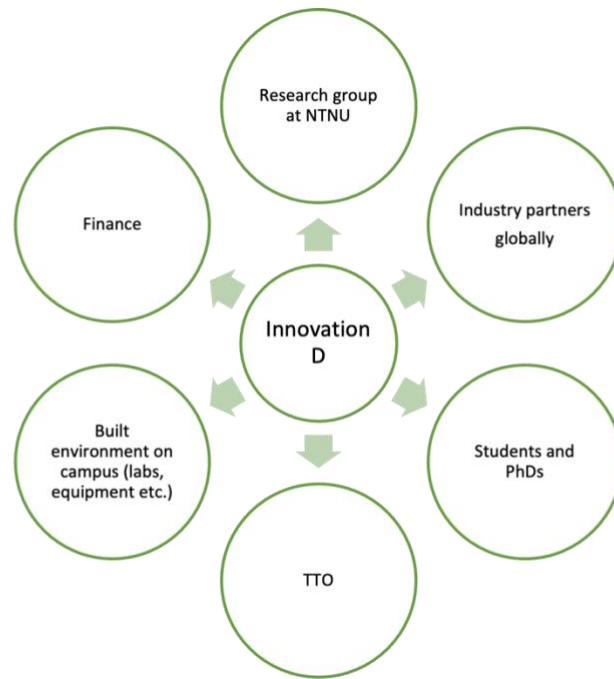


Figure 5: Visualization of actors involved in innovation D

4.1.5 Innovation E

The idea for innovation E which is a technological device used in maritime environments, came from a collaboration between the Professor (Informant 8), and two others (one from SINTEF and the other an investor). They started it on a project level and worked on it for about a year and a half before they created the spin-off. In the beginning NTNU, SINTEF and actors in the innovation ecosystem at NTNU such as the Technology Transfer Office (TTO), Spark and Start were all important actants. They also had PhDs and Master students involved, and were dependent on campus for labs, equipment and office space.

Informant 8 describes it the following way: “My feeling is that we got a lot of support, both from NTNU and from other places in getting the help we needed, and a lot of that was very useful knowing what it takes to become profitable, I didn’t have that background, my background was from delivering projects, having a customer and I could do that. But getting a whole company with organization and finance and product and market and all those things to come together, we had a lot of focus on that and that was very useful.”

But when the spin-off grew it was no longer feasible to stay in the offices at the department and they moved to a start-up hub in a different part of campus, but they found that this move, even if it was not far, still brought them too far away from the environment at the original department and SINTEF. As they grew more they moved to offices in the city center.

“With time we have gone further away from NTNU and SINTEF, and that’s in a way, we’re supposed to be independent so that’s in a way how it should be but at the same time the firm loses some of its advantage in having technological knowledge close” explains Informant 8.

After commercialization and in order for the firm to get their product produced, they first used a company in China to produce some of the equipment they needed for production, and then they worked with a company in Poland which took on the production. This was a large-scale professional producer and using them meant that they needed to streamline and quality assure the production process. After a while they brought production home to Norway, both to get it closer to the main office but also to scale down the production to better match market demands.

The idea came from a collaboration between SINTEF and NTNU, and depended a lot on the knowledge and expertise in these places and the individuals involved, as well as the infrastructure both in terms of finance, ecosystem and physical infrastructure such as labs and equipment. After having been extended internationally, the whole production process is now more geographically close and centered around the Trøndelag region. There is still a connection with NTNU and SINTEF through projects, knowledge transfer through PhDs, and involvement on the Board and management level by the founders, but it's considerable less now than it was at the start.

Figure 6 as seen below, is a visualization of the different actors involved in the innovation process as described in the interview. It is not a complete overview of every actor involved, nor are the actors mentioned necessarily within the same taxonomic category or level. However, they are actants as understood in an ANT approach, actors who made something happen. They are also actors that cannot be removed from the process without changing it.

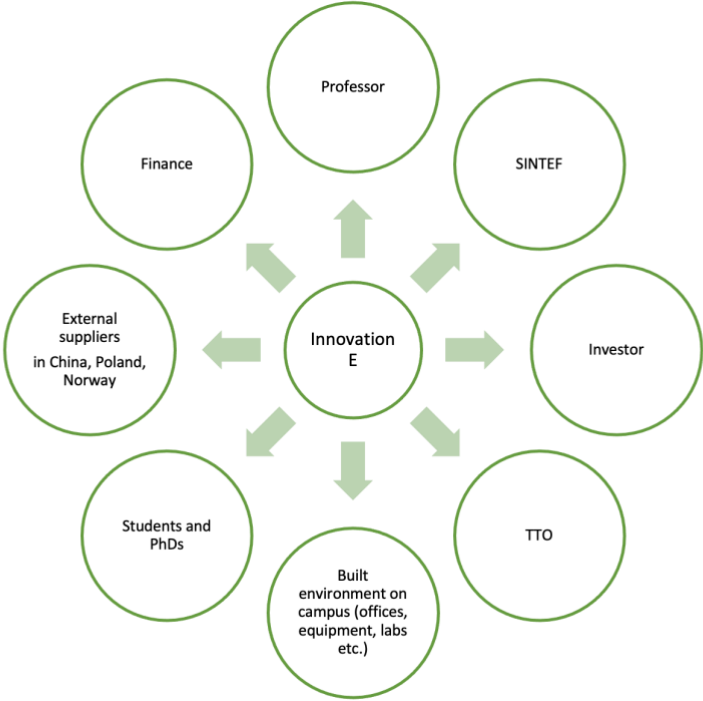


Figure 6: Visualization of actors involved in innovation E

4.1.6 Summary of the Cases, their Actors and Networks

As I have highlighted before, these cases cannot be statistically representative for innovations at NTNU, but there may be some patterns that can be identified in terms of actors and networks, and understanding how actors connect, what supports them and what hinders them in the process in terms of spatial contexts. I would like to draw attention to the following differences and similarities between these cases in that regard:

1. Campus play a role in all phases of the processes presented here through the knowledge its actors produce, infrastructure (rooms, labs, equipment), financing opportunities, innovation ecosystem (TTO, hubs etc), management support and external partners (like SINTEF for instance, or others that may have been initiated based on personal connections but have become institutionalized). Therefore, in the following section I will elaborate in more detail on the elements that make campus a place for innovation based on the data generated for this thesis and other studies.
2. The networks that evolve through the different phases, from idea to commercialization are wide-reaching on local, regional, national and international level and many are based on personal contacts built over time creating trust and relations between individuals. In spite of the wide reaching networks, in four out of five cases the main office of the spin-off is in Trondheim (or Trøndelag) at the time of the interviews and the geographical proximity to NTNU and its expertise is said to be important. Hence, in the following section I will elaborate further on the role of proximity between actors in the innovation process, as well as the relationship between campus and Trondheim.
3. Only one case is a result of interdisciplinary collaboration between different faculties at NTNU. This may or may not be representative for innovations in general at NTNU, but it points to an untapped potential in terms of connecting different knowledge for innovations. I will therefore explore further some of the current barriers to interdisciplinary collaboration at NTNU as presented in the data.

By exploring these three findings in more detail, I will also respond to the overarching research question: What is the role of place in innovation processes at NTNU? And how important is proximity to other actors for interdisciplinary collaboration and innovation at NTNU?

4.2 Making Campus a Place for Innovation

In chapter 3, I argued that campus is a place in the multi-dimensional meaning of the word: An open, dynamic and relational place created by its human and more-than-human actors through meetings and connections in ongoing processes of always becoming, building on the theoretical framework on relational place (Cresswell, 2015; Massey, 2005). Campus is a place that includes location, locale and sense-of-place (Aure et al., 2015; Cresswell, 2015; Massey, 2005), and I highlighted the importance of social practices in place-making on campus (Aure et al., 2015; Simonsen, 2012). Innovation activities are examples of practices that contribute to place-making on campus, but performing the practices in and of themselves do not necessarily make campus a place for innovation in a multidimensional approach. The other elements of place need to

engage as well, and in the following I will explore this further based on the generated data for this thesis. I will start by discussing the status of innovation practices at NTNU today, and how that is connected to values, power and place-making.

4.2.1 The Status of Innovation Practices at NTNU

At NTNU today, innovation activities may not be seen as the main practices of the university, but they are gaining traction. If one looks up NTNU online, and goes to the public website it becomes clear that innovation is a part of the NTNU brand and of its public profile, and it has a prominent place in its strategy (NTNU, 2018, p. 16). That being said, the understanding of what innovation means, and how it applies to different parts of the university may not be uniform.

This is reflected in my conversations with the informants. Informant 3 put it this way:

“Innovation is a challenging subject to talk about, because the semantic is very broad and people have different definitions and experiences, so NTNU is sort of in a phase of maturing in that sense.”

This issue of a broad semantic is having an impact on the conversations we have about innovation (see chapter 2). Meyer states that the word innovation has “invaded” the Norwegian society and “expelled” words like modernization, development and progress from our vocabularies, and she connects this with a socio-political change (Meyer, 2007, p. 5). This “invasion” and the fact that the term innovation is used to describe a wide variety of activities make it a contested term, and in the university setting the views differ regarding to what degree and in what way a university and its employees should engage in innovation, especially with regards to innovation understood as commercialization (Tjora, 2019a).

However, in the NTNU strategy for 2018-2025, innovation is listed as one out of five core tasks of NTNU, and the organization states that NTNU is an “an important contributor to research-based sustainable value creation, innovation and increased competitiveness” (NTNU, 2018, p. 25). The three pillars of their innovation strategy are: Collaborating with established business, collaborating with the public sector and helping to create new business (NTNU, 2018). Innovation as described in the strategy, goes beyond just creativity or creating something new, it focuses on collaboration with other entities outside of NTNU and it is connected to sustainable value creation.

A broad semantic can be useful in terms of making more people feel included in the activity, but it can also make it too abstract and hard to integrate into the daily work. Informant 6 said when asked to share his view on innovation at NTNU that he feels like the definition of innovation currently used may be too broad for it to be useful for the actors within NTNU:

“Now, one has arrived at a fairly broad understanding of innovation. I see it as problem solving. You can say that my operational definition of what innovation is in my role, is that one is using research to solve concrete problems and that there is someone who experience that problem. So NTNU has a definition, Innovation Norway has a definition, the Norwegian Research Council has one, and the EU, they are all quite broad these definitions. It’s almost like one needs to narrow it down.”

His point was that it is hard for employees at NTNU to operationalize innovation in their work when the definition is too broad, and for some it may be hard to visualize how to go about “innovating” in their field.

Understanding how to operationalize innovation, or how to be innovative in their daily work can be helped through practices, through experiencing innovation by being part of a process of innovation. Informant 4 shared how his commercialization experience has changed his view on what an innovation is: "So for me innovation previously meant something which is not reported anywhere in the literature, something that is a completely different concept, that's how I saw it." He continues:

"...if I were to compare myself with before I think I didn't have enough knowledge about innovation, I didn't have enough examples to evaluate if what I am working on is innovation, and I think still there is no one way you can define innovation or innovative activity, so that is a bit of an abstract concept."

The fact that it is a broad concept and more than just spin-offs and commercialization is recognized across the board among my informants, and informant 8 underlined this when asked about his definition of innovation:

"In our field it can be new methods, that something is applied, so that's applied research in a way, so new applications of the knowledge that we produce here, and then the lion's share of innovation happens in incumbent firms because we can improve working methods, technology or the way things are done, which may be just as important even if it's less visible".

The lack of visibility that he refers to, or the difficulty of measuring innovation is partly what makes it challenging. Although this thesis does not have its main focus on how NTNU approach innovation on an organizational and policy level, it is important to touch upon this because it relates to place. The organization's approach to innovation as a concept and the activities it involves, sets a certain framework for how actors practice it. In the following I will explore how this has developed over time, and how actors have negotiated space for innovation practices even when it was not necessarily approved of.

4.2.2 Innovation through Systems Norms and Values on Campus

As we saw in chapter 3, the sense of place is created through shared norms and values, and by (b)ordering (Anderson, 2015) and creating inclusion and exclusion – producing the feeling among actors of being "in place" and "out of place" (Cresswell, 1996, 2015). As we saw above, today, innovation activities are practices that are "in place" at NTNU. They are part of the public brand (NTNU, 2021e), of strategy (NTNU, 2018) and included in the plans of the new campus as something it should support (NTNU, 2021a). The value given to innovation as a practice by NTNU as an organization is an important part of the system, norms and values that may support or hinder these activities, and it is an important part of creating campus as a place for innovation.

These values and norms may be expressed through official policies and strategies that guide the works of NTNU, but it may as well be expressed through actors and their support of innovation processes (or lack thereof). My informants shared a variety of examples of how these systems, values and norms come through and impact the innovation process and practices. NTNU has not always been a supportive place for innovation, there was a time when innovation and industry collaboration was "out of place".

Some of the informants I spoke to had been working on innovations within NTNU for decades, and could report that the attitude towards innovation at NTNU seems to have changed over the recent years. 20-30 years ago they felt they were not taken seriously when they were working on innovations, colleagues didn't understand what they were doing or why they would waste time on it. Even more recent innovations met some

resistance internally as they were breaking grounds, doing things differently, and going against the main stream. However, this did not stop them from working on these projects. Informant 1 shares that: "Everyone thought it sounded interesting but they didn't really understand what I was doing". He continues by saying that a few years back he needed to work on his innovation ideas behind the scenes, according to him it was a bit frowned upon because it wasn't really approved academically.

"And then there were quite a few people who thought this was just silly, and they said it very explicitly that you just work with silly stuff, but that changed after we had the big success, but at the start there was a lot of can you just grow up and do proper work" he says, laughing.

Informant 2 expressed similar experiences as mentioned in 4.1.2, although his academic field comes from a tradition of innovation and connecting with the needs of the industry, it wasn't always easy, even if they had a lot of support from the department and faculty to work with innovations.

This shift in the overall institutional support or encouragement of innovation activities as part of the practices of university employees has happened in tandem with an evolving socio-political context. In particular, the views on the connections between universities, industry and commercialization have changed, which Fini et al. (2017) explores further in their study. They state that the commercialization of research, and spin-off creation is a new and to some degree unfamiliar activity in a European context. A major event on policy level in Norway in 2003, inspired by the Bayh-Dole Act in the USA, revoked the "Professor's privilege" as a way to encourage technology transfer activities from public research institutions (Fini et al., 2017). This meant that the Intellectual Property Rights on employees' inventions went from the employees to the employer (Fini et al., 2017; Hvide & Jones, 2018). Whether this actually encouraged more technology transfer activities have been discussed, and in a study of Norway from 2018, researchers found a 50 percent decline in both entrepreneurship and patenting rates by university researchers after the reform, and a decline was also seen in quality measures for university start-ups and patents (Hvide & Jones, 2018). A tool for universities in supporting their employees' on their innovation journeys, is the Technology Transfer Offices (TTO), and Norway established these offices between 2003 and 2005 (Fini et al., 2017). Studies have shown that one of the success factors for a TTO is connected to the culture at the university and how open the scientific environment is towards commercial exploitation of research results (Fini et al., 2017). According to my informants, NTNU is today more open, not just on a policy level, but also on a cultural level, to this type of commercial activities, but they claim that there is still work to be done in terms of creating a more established culture for innovations, especially in the commercialized sense of the word.

Since innovation is so prominently communicated on an institutional level as part of what NTNU does and the value it brings, I wanted to get a sense of how this focus is experienced by actors in their everyday activities. I asked informant 4 if he found that there is a supportive campus culture in terms of innovation, and he answered: "No, compared to several other universities where I have been, NTNU is way behind promoting innovation." He continues:

"...if I were not part of this innovation process, now we are regarded as people who know a lot about innovations which is true, but if we hadn't made the first innovation I think we wouldn't have known what it means. So it's a bit about educating and having innovation as part of teaching. Students take courses in patenting and licensing and things like that, but they are not, I mean innovation should be a general course for everyone. Like what is

innovation should be included in some form in some course across all study programs, and in terms of support there should be more funding for innovative activities. It's important, like there are some small funds, like SPARK and there are some funds from the Pro-Rector for innovation from time to time and small projects but it's not enough. Because if you really want to get the best ideas out and if you really want to impact the local work market or labor market through innovative activities there should be more funding for supporting such innovation."

And he continues:

"I have told (our innovation) story now several times the last year in different formats, and there are many innovative start-ups coming out of NTNU every year, but there is no general awareness at NTNU why this became a start-up. They don't need to present their core idea but the process around it, how did it come about? I don't know about the process of any other start-up besides ours, but I hear that there are so many start-ups. Take Kahoot for example, we get to know that it is so popular but how it started, and how it developed, some kind of story or news or general awareness, that would be nice for at least young researchers. I discuss this with my own PhDs, we discuss innovation, and TTO holds some regular meetings with us now because we are involved in so many different projects that can lead to potential innovations, so we have a strict NDA policy, we have different structures set up, and there is a complete IP policy for our research group. But that's because we are now 'special', but that's not the case for other groups who can be doing even more innovation activities than what we are doing. So this awareness is important I think. Incorporating that and having a follow up and giving place for people to connect."

Informant 4 touches upon many elements of a supportive innovation culture in his quotes above, including financing, meeting places and knowledge sharing. The support from management and leadership is another important element. For innovation C, one of the more recent innovations, the support from the organization and in particular management and the administrative colleagues at the department and faculty was crucial according to my informants. Informant 4 talks about it this way:

"...managing thirty people who are inexperienced in working in an industrial setting, and thinking about time shifts and responsibility and how do you communicate, it was an altogether different level of experience, but there was a lot of support, both from the administrative people and from the department."

Informant 5 who was part of the same innovation also talked about the support that they had received throughout the project from different levels of the institution, especially in terms of articulating support to what they were doing when doubts and critical voices were raised regarding their activities. Informant 2 were expressing similar views and talked about the culture at his department, and how it has changed over the years. According to him a big change in their group culture happened when they had a manager who helped create an identity as a department where everyone was included. Leadership plays an important part in creating these cultures and identities, and in making them inclusive.

The important role of management and leadership in creating the social environment conducive to creativity has been a focus in organizational theory, and the work of Amabile (1997) has been frequently cited in that regard. She argued that the intrinsic motivation is crucial for creativity and although this is part of people's personality her research had found that a person's social environment could have "significant effect on that person's level of intrinsic motivation at any point in time" (Amabile, 1997, p. 40). This means that organizations can encourage intrinsic motivation by paying attention to the social environment. Amabile connects this with management and leadership, and how they can work to enable norms and values that support this and leads to more creativity. Innovation research has also argued for the importance of psychological safety and trust

(Edmondson, 1999) and encouraging a mix of exploration and exploitation activities in order to support creativity and innovation in organizations (Benner & Tushman, 2015). Implementing these activities are also connected to management and leadership.

In other words, there are many different elements affecting the innovation culture at NTNU today, ranging from financing and legal frameworks, to knowledge-sharing and leadership. These elements are part of what makes campus a place for innovation, and by using the multidimensional place approach we can see how these factors that are not material, still have considerable impact on whether practices are encouraged or not, and consequently performed or not.

4.2.3 Materiality in Place Making

So what is the role then of materiality? Does it impact on innovation practices and if so, how? Since the physical buildings and their location have gained so much focus in the discussion about the new campus, it is interesting to look further into how materiality impacts practices.

As discussed in chapter 3, buildings is one of the first words that come to mind when thinking of the word campus. One of the informants put it in the following way when asked what the word campus meant to him: "Large buildings together in a designated area". Campus as a physical place is central to the campus development project at NTNU as well, and a lot of the debates regarding the new campus revolve around issues of the physical place. For example, which areas are local communities losing as new structures are built or expanded as seen in the discussion about the new Ocean Space Centre (Fløttum, 2022; Okstad, 2021; Opheim, 2021a, 2021b), how are buildings constructed in order to include rather than exclude people as in the discussion about people with disabilities (Mikkelsen, 2021), and lastly, will everyone who needs it get a single-office space (Hanger, 2021)? The physical place affects us and my informants brought up a number of different ways that materiality played a role in innovation processes.

All of my informants had used rooms, equipment or tools at NTNU during their innovation process. For some, the function of the room was to have a meeting place, a place to come together as a group, whereas for others the room and its equipment or tools were key to developing the knowledge needed for the idea to move forward. Informant 7 describes the importance of both a physical lab environment and digital tools for their research and innovation: "We have some really amazing labs here that are world leading, we have all kinds of equipment that you can hardly find in other universities." Informant 9 puts it this way:

"We work with models, and improving these models with physics, and to be able to have the model work we need to experiment with the original material, and it takes a lot of tests and we must be very diligent and it is quite comprehensive."

And he continues:

"We need to have more than just a computer in order to do this work properly, we need more advanced equipment in labs in order to test and measure material etc."

It is clear that for the academic fields covered in my data material (ICT, medical, engineering) this is an important factor, and something in which NTNU has invested and that is being successfully used. But if you build something does it mean that people will use it, and will they use it in the intended way?

Hynes & Hynes (2018) presented a study on so-called Makerspace environments in higher education, referring to: "an unstructured fabrication lab outfitted with a variety of tools, software and materials appealing to a spectrum of interests" (p. 868). Their study was done on students from a range of different academic fields, and although with an environmental psychology approach it provided some interesting findings in terms of how people relate to space in creativity and innovation processes. They found that successful creative spaces are created when "those with like-minded interests come together and adapt the building around them to fit their needs" (Hynes & Hynes, 2018, p. 867). The authors also found that just providing the space and the tools did not necessarily mean that the space could cater for a diversity of users and needs. This connects with what we have seen in the theories of place-making. Buildings and the materiality in itself is not enough to change behaviors or direct practices or interaction, because as we have seen it misses the relational aspects that are important in place-making (Berg & Dale, 2015; Cresswell, 2012; Massey, 2005), and actors have agency in terms of defining the use of the physical structures (Cresswell, 2015).

A physical or material campus may not seem very flexible, the structures are there, they are built and defined. However, the innovation processes presented in this thesis showed some examples of how campus can be a flexible physical entity and that the flexibility of the place was an enabling factor for the innovation to progress. The first example is in innovation C where campus at some point in the innovation process started functioning as a production facility. Informant 5 describes it like this:

"So a lot happened in a very short time, and we involved more and more people, and we had about 50 people involved in what we constructed in a very short time, both a production facility and administration, quality control and logistics – it was pretty (laughs) when you think about it, it was pretty intense."

Informant 4 shares his views of the same process:

"We had a whole factory, we had shifts, we had managers, and it was also a fun process and it worked, because we put in the same organizational structure people who had never worked together and who had never worked in an industry because they were mostly master students and PhDs who could not come back to the lab whom we hired at that point into the project so that they could be doing something for the society."

He continues:

"So we were a small factory then, producing these (components), within a university setting. And trying to set up a production line which is not what a university generally does, because in a different case we would have just outsourced this technology to a more established industry."

If we think of the university as "a product of hundreds of years of the practice of education in particular ways" as suggested by Cresswell (2015, p. 68), it is interesting to look at how this type of flexible use of the materiality is handled in the case of NTNU. The negotiation of materiality is not just happening in the cases described here, another example is students' use of learning spaces. Lysø (2021) shows in her Master thesis that students at Dragvoll, one of the campuses at NTNU, negotiate the intended and actual use of learning spaces, in this case the room called Fagland. The social aspects of place-making is key to create Fagland as a place of belonging for the students in her study (Lysø, 2021). In other words, her study shows an example of the physical room being prepared for use, and actors negotiating the use of the room. This flexibility in the materiality is a strength, especially for a campus considering the diverse groups and needs that the materiality is meant to cater for over time.

A similar example came through in the data for this thesis, where a certain type of equipment on campus became a meeting place, an identifier for the group. The room was not the important element, but the equipment was. The equipment was so essential to the work they were doing as a group that it became the center of their actions.

Informant 8 puts it this way:

“There was like a student environment around that (equipment) from which several of our initial employees were recruited, we had a tight collaboration with that group in the (equipment).”

This example illustrates ways of (b)ordering (Anderson, 2015) and place-making through learning and innovation activities (Aure et al., 2015; Cresswell, 2015; Simonsen, 2012), and they are not consciously top-driven place-making processes, they are rather a result of actors coming together in practices, creating a sense of place with the help of materiality.

The data also presented examples of campus becoming office space for spin-offs. This was also a result of flexibility in the materiality, although the material needs were quite similar to what office spaces for academics and NTNU employees would require. However, the flexibility in terms of the systems, norms and values were not necessarily there. As informant 8 puts it: “Having a start-up with many employees in-house demands more than what NTNU and the department... We didn’t have an innovation center in that way.” And he describes how the decision was made to move the spin-off to another location in Trondheim to better provide for the support needed in terms of systems, norms and values. In other words, material flexibility is not the only supportive factor in these processes.

Nonetheless, materiality at NTNU is not always seen as flexible, the experiences vary between my informants. Rooms, or lack thereof can also be a barrier for some processes. In the interview with informant 1, I asked if he had experienced any barriers on campus, in terms of physical spaces or places. He responded that getting lab space has been a challenge sometimes. He explains that there is a cost for rooms, and labs are more expensive than offices and this can be a challenge. He said that he is also curious to see what the new campus will mean in practice, because when they have been merged with other campuses before, NTNU did not scale the rooms accordingly, so all of a sudden more people needed to have lectures later at night because of lack of physical space. Although this challenge was not necessarily connected only to innovation activities but to learning and teaching activities in general, it is a good example of how materiality and structures in some cases are not flexible, and where the actors are not finding ways to negotiate the materiality. This can be seen in relation to power dimensions, and which activities that are seen as prioritized on campus.

These examples suggest that the materiality of which campus is created matters for the activities actors perform on campus. The materiality can limit certain activities, but it can also support and progress them when actors can use it with flexibility. However this flexibility often requires a certain support from systems, norms and values in order to fully accommodate the changing needs. Having room for this type of flexibility in both materiality and systems, have in some of the cases presented here proved to be crucial for progressing the innovation process. And by conceptualizing campus as a place and approaching it in this multidimensional way, one gets a better sense of the elements that are coming together to encourage or discourage certain behaviors or practices.

4.2.4 Campus as a Meeting Place – Bringing Together Diversity

Apart from buildings, the other given when imagining a campus is people, namely students and employees (both academic and administrative). The fact that a campus contains such a diversity of knowledge and resources (expressed through its actors) is one of its biggest strengths when it comes to innovation according to my informants, and also a reason for them to stay at NTNU because it stimulates and motivates them. Diversity of knowledge is also a prerequisite for innovation and something that is encouraged for firms and organizations that want to be more innovative (Cohen & Levinthal, 1990). The diversity however, needs to be balanced according to researchers, it should not be too different because we need to meet in a common understanding and language in order to work together in a meaningful way, at the same time we should not be too similar as we then risk not finding new concepts and ideas (Boschma, 2005). NTNU with its many faculties and areas of expertise has the potential of bringing together people with great expertise, and also combine diverse knowledge bases. In this section I focus on how campus bring together actors within NTNU, and in chapter 4.2.6 I will talk more about the connection with actors outside of NTNU.

As pointed out previously, in the cases presented here, only one innovation was a result of collaboration between two faculties. Most innovation processes happened within the department or faculty, and in research groups. The knowledge base within a department is in these cases different enough to create new ideas, and especially when the wider network is included the diversity becomes evident and resulted in success (see Figures 2-6). However, it also indicates that there is an untapped potential in increased collaboration between different academic fields within NTNU.

In my conversation with informant 9, I asked whether he engaged in internal collaboration at NTNU and he responded:

“The short answer is no. We collaborate more with people internationally except from my own group, we are quite a large group here that work closely together. But apart from that it’s hard to get an overview, and again it’s about trust, about understanding each other, and really understand what the others are working on. You can’t just search for a keyword on the NTNU intranet or website and find a name and a picture and book a meeting and then you’re off. That’s not how it works. There is a lot of alignments that need to happen, in terms of expectations, and understanding each other, and we can believe that we are talking about the same thing, but we use the same term for different concepts, and then you have to start by defining things and you just don’t have time for that. So it becomes more random who you meet, and I am sure there are more people that could be a good match but it comes down to personal chemistry and interests, and then finance is an important element. So it’s a bit random. The way I work it’s usually through relations that I have nurtured by meeting people over the years at conferences and meetings, dedicated meeting places where everything is arranged for making new connections. Where everyone works with similar things. But it’s all about trust, you can’t get good collaborations if you don’t trust each other, and that takes time, and you must invest over time in these relations, and so you need to feel that it’s worth it, because time is precious...”

Creating networks and relationships take time and effort, and is more easily done within each research group than with other academic environments at NTNU. One of the reasons for this could be the epistemological differences between some of the academic environments, and finding the right level of cognitive proximity in order to collaborate in a meaningful way (Boschma, 2005). Freeth and Caniglia (2020) imagines interdisciplinary collaboration as “spaces that comprise epistemic, social, symbolic, spatial, and temporal dimensions and that produce different degrees of comfort and discomfort” (p. 249). They argue that thinking about interdisciplinary collaboration as spaces make it easier to articulate the multidimensional side of it, and see it as

something relational and experiential. The epistemic element is particularly important in this regard, as it focuses on different understandings of which research questions are central, how knowledge should be produced and what constitutes good knowledge (Freeth & Caniglia, 2020). Their concept of collaboration space is very similar to the concept of place that I am presenting in this thesis. What informant 9 describes is a lack of alignment within this collaboration space among actors within NTNU. He also gives prominence to the social and epistemic dimensions when deciding on collaboration partners. What Freeth and Caniglia suggest is that for interdisciplinary collaboration to work, actors may have to accept discomfort, but also that there are benefits of working through those discomforts (Freeth & Caniglia, 2020).

This is echoed by Brandshaug & Sjølie (2021) in their research on interdisciplinary student collaboration based on cases from NTNU. Their study showed that the individuals in the group, experienced increased learning from these "liminal phases" or challenges accompanied by frustration and confusion, when facilitators guided them through it instead of avoiding it (p. 407). They argue that this type of experiences can prepare students for the ambiguity they may face when trying to solve complex problems – both in work life and in higher education. This concept of ambiguity in facing complex problems have been acknowledged in innovation research as a necessary element of successful innovation, and finding ways of balancing the opposing needs of exploration and exploitation, creativity and constraint in teams and organizations (Brun & Sætre, 2009). Ambiguity in this context refers to challenges of different interpretations of the same information, where more data "won't necessarily reduce it; in fact, it might increase it" (Brun & Sætre, 2009, p. 357). The focus then for organizations that want to increase their innovation capacity, is not primarily on how they bring together people of different disciplines so that they can work together, but rather how to facilitate and support actors through the discomfort and ambiguity these processes entail.

Informant 4 talked about how his experience with innovation C, the only innovation among the cases presented here with collaboration across faculties, had made them more aware of the power of interdisciplinary collaboration, the interdisciplinarity was in fact a core essence of the innovation:

"So what we realized is that the innovative activity not only required an idea but also if you want to continue the innovation you need this competence and experience and know how to collaborate across disciplines."

He explained that they are continuing to invest time in knowledge sharing and discussion across groups:

"... in our group we are trying to cut across these bubbles and trying to make people discuss and brainstorm and come up with challenges across disciplines. So we have a lot of concerted efforts to see that it happens, and this is mostly then discussion meetings, inviting them for example to our labs, having our PHDs go out to other labs with other PHDs and peer-peer discussions are what we are focusing quite a lot on."

There are also different cultures or identities connected to the different campuses today, and meeting in collaboration across these cultural difference can sometimes be hard.

Informant 1 puts it this way:

"This is probably not right, but if I was to compare Gløs and Dragvoll, Dragvoll seems much more philosophical and contemplate things more while Gløshaugen is focused on solutions and just goes straight to the issue. And that works well for me, because I can get frustrated if we don't get to the point and just talk around it. I am an engineer-type and want to get things done. But that's obviously not the case for everyone, you will find both types in both places".

The informant underlined that he was drawing on stereotypes of the two campuses, and that this was not necessarily the reality, but it hints at cultural differences between the campuses and between the academic environments belonging to these campuses that I as a student have experienced myself and that I think most people who has been in contact with NTNU would recognize, even without knowing why or from where this idea originates. If we link this back to the challenge of balancing ambiguity, Brun and Sætre (2009) point to the fact that management training and higher education in particular in engineering is focused mainly on reducing ambiguity, whereas for innovation a balance is needed. In that sense, there could be benefits to balancing the competencies of the philosophical contemplator and the solution-oriented engineer.

He continued: "We recently had another campus join us here, and you notice that there is a different culture, more focus on teaching and less on research for instance." I asked him if this merge is something that is difficult to deal with or something that enriches their work environment, and he replied:

"I think both. I think it enriches because you get a different perspective, teaching has always been important to me and they do that very well. At least they have a very conscious approach to teaching. Whereas others can be more you know teaching is something they have to do but the important stuff for them is research. At the same time they may not have the same research experience and it's harder for some of them to get to the right academic level and at the same time they want to have access to the same resources. So the question is if this can become a culture that can benefit from both of these perspectives and skills."

This experience is an interesting example of the effects of co-location of different disciplines and campuses. It highlights both the benefits of bringing together people with different skills, perspectives and knowledge, and it also shows the challenges involved. Now that they have moved in together, how can this new constellation create a culture where they benefit from the diversity? This question will be relevant also for future merges and co-locations. If we think about it from a place perspective, it seems that the geographic proximity is not enough in and of itself but it needs a push from the values, norms, social relations and practices in order to make it a place that supports certain practices, like for instance innovation.

4.2.5 University as Talent Magnet

Even if physical meetings in and of themselves are not enough for creative processes to flourish, we should not underestimate the value of a meeting place. As we saw in section 4.2.3 materiality created meaningful meeting places in the innovation processes. Additionally, in all of the innovation processes presented in 4.1 the students were important actors. What they may lack in expertise, they bring in diversity at least in terms of age. They are also important resources, putting in hours of work in order to make the process move forward. Informant 1 expresses it this way:

"There is one thing that's great at NTNU, at least in my department, it's the access to a number of excellent students. With them one can do tests, create prototypes, do research, and it's a great strength and one of the reasons why I have stayed at NTNU and not gone in to the private sector, it's a win-win situation for the students and us."

Informant 2 supports this view:

"It's really important to have students, especially Master students who can work more over time with a project through their thesis and preferably continue with a PhD. That way we get a lot of research done."

Campus as a meeting place between professors, students and junior researchers is in other words crucial for the innovation activities that my informants describe. Many of the practices that they describe as part of the innovation process were closely connected to the meetings between people happening on campus, and the interactions that this encouraged.

Informant 5 supports this as well by focusing on the expertise of colleagues in his department and beyond:

“When it comes to people, the key to the success of this innovation was that we had all the academic professional environments and the academic knowledge on campus at NTNU. Having these people close was crucial.”

Similarly, informant 8 talks about the benefits of working at NTNU compared to working in a spin-off company:

“...one always works together with others who are excellent, both Masters and PhDs impress me immensely and that is very stimulating. We had a lot of focus on quality in the spin-off but we never got the same level of knowledge there.”

Florida (2004) has argued for the importance of the creative class in local development, a view that has been met with criticism (Peck, 2005), but in terms of his views on the role of the university he used the term talent magnet which may be interesting to look into further. His view was that the university should not be an innovation machine, but rather a talent magnet, being an entity that attracted talents to a place that would then result in positive ripple effects (Dale, 2007; Florida, 2004). My informants talk about the many talents at NTNU as an attraction point that keep them engaged at the university. It is also likely to assume that NTNU is seen as a place of talents by the external entities that collaborate with research groups as informant 9 expressed in the following way:

“That’s what I think is the key to success. Trusting each other and being able to talk about everything, and trust that what we are producing and delivering meets expectations.”

As we saw in the previous section 4.2.4, campus as a meeting place between people and materiality sparks ideas and practices that become innovation processes. Many of the informants recognize the vast diversity of knowledge as a strength and as something that defines NTNU campus as a place, it stimulates them and encourage them to continue with their practices and their interactions with other actors. And the result is knowledge that they don’t find elsewhere, it’s a result of the unique combination of all the elements that make up the place campus. However, these meetings are rarely described as random happenings that appear out of the blue, rather they are described as a result of intentional action(s) made by an actor. People may happen to be in the same place, but that does not necessarily mean that they will automatically interact. For example, professors ask students to participate in their research or prototyping (informant 1 and 2), an email is sent to ask for innovative inputs (informant 4 and 5), colleagues meet in the hallway to discuss the feasibility of an idea that then later becomes the starting point of an innovative process (informant 5). The data material carries a number of examples of these types of intentional actions of an actor that creates connections and interactions through campus NTNU. The importance of the individual in these processes is also demonstrated in studies by Fini et al. (2017) where they argued that the creation of high-performing spin-offs are often more a result of individual and group level characteristics than formal structures and policies.

As we saw in chapter 2.3.2, in ANT, the agency of actants in a network is at the core of the approach. Agency is a result of achievements of actors in networks, and a product of

being connected and not an individual or system trait (Cresswell, 2012). Human intentionality is not the important factor, but rather whether it would make a difference if an object was removed from a network (Cresswell, 2012; Latour, 2005). This is an interesting proposal as it underlines not only the willingness to make something happen, but the ability to actually produce a result, or an action that leads to other actions by other actants that leads to a result. In the cases presented in this thesis it is clear that it would make a difference if any parts of the network had been removed, but maybe the parts could have been replaced and still lead to an innovation, a slightly different innovation. But that also poses the question which Cresswell (2012) adequately articulates: "what elements in a network can be replaced and what elements have the power to do the replacing?" (p. 254).

4.2.6 Connecting the Outside with the Inside

As we saw in chapter 2, places are constituted as normative places where it is possible for people, things, animals, activities to be considered "in place" or "out of place", and that this acknowledges that "the inside of place includes the outside within it" (Cresswell, 2012, p. 221).

When talking about innovation on campus and at NTNU, it became clear that the outside of campus plays an important role in innovation processes. One thing that came across in several of the interviews was the purpose of innovation. Why is innovation important and what is it for. As discussed in 4.2.1 many seemed to agree that innovation is about solving problems in new ways, adding new value. However, it seems that this problem is always coming from the outside of the university world, outside of campus. Even in the strategy NTNU talks about the three pillars of their innovation strategy being collaboration with established business, collaboration with the public sector and helping to create new business (NTNU, 2018). What this indicates is that when it comes to innovation, the problem holder is on the outside of campus and of NTNU. It is found in partner industries or in society at large. When talking to my informants I got the sense that because academics are focused on theories and specialized knowledge, and operating within the university setting, they may not be familiar with the challenges that industry or public sector experience, nor see the connection with their own expertise. Often they become aware by having close ties with industry for instance, and helping the industry to innovate and solve the problems they experience. It was argued that without connecting the outside and the inside of the campus world the university will be less efficient in helping to solve wicked problems, and for some of my informants the only relevant problem holder for innovations is someone on the outside.

Informant 6 shared his thoughts on it:

"I see that the employees who have worked outside of the university or who do research in collaboration (with the outside), that they create an identification with a problem that leads to them taking a step out of the researcher role and start to build bridges between their field of expertise and the problem out there."

In the interview we dug into this issue of problem formulation and inside versus outside. He said:

"...one needs problems to solve, and someone needs to have this problem, so it's hard to even understand what are the relevant issues if one never meets the people that have those problems."

And he continued:

"...but if one never steps one foot outside of the door, you know what I mean? And sitting at Dragvoll, out in the countryside, it's fine for research but one becomes literally isolated. So there is something with that exposure, mutual exposure that is very important and that is missing."

Informant 3 is making similar arguments: "The last step after one has defined something new and useful is to have someone actually apply it. That's definitely not NTNU unless we speak of internal innovation. And then the need for a connection with someone out in private sector comes up."

Several of the informants either had experience of employment outside of the university or a long-term collaboration with industry partners, and referred to this experience as beneficial in innovation processes or their work at the university. Informant 8 put it this way:

"I worked in the industry and there you had to deliver, if you didn't the firm would be out of business, there is no time to sit and wonder if something is good enough, it just has to be delivered, and that attitude has been good to bring with me both in innovation processes and at the university. Structuring a project, experience of working in projects, put together a project that works, how to set milestone and deadlines and follow up so that they actually happen, that's not the university's strongest side."

And informant 2 said that he had throughout his career worked closely with industry partners and this had helped him think about innovations and commercialization, and creating something useful for the industry. These experiences point to two things, the first is that working in another organization outside of academia develops people's skillsets, they perform and learn new practices that they later bring back to academia and their research and innovation work. The other is that by being exposed to the issues and challenges that firms experience they find that their knowledge and expertise have something to offer with regards to finding solutions.

This view on inside versus outside in terms of problem formulation is most likely connected to the way innovation is defined by these actors – as something new that adds value and is commercialized, so their inputs should be seen in that context. Many made the distinction between innovation and research, as two separate activities that are intertwined. You can do research without innovation (in the commercialized sense of the term), but not the other way around – the expertise gained from research is key to impactful innovations. In research the problem formulation may very well happen on campus, because it is drawn from theoretical and empirical knowledge and expertise, but for innovation the focus on problem solving of a concrete challenge experienced by someone demands a connection to the outside world as the innovation and values created should not benefit NTNU per se, but society. This division is reflected in the debates about the role of universities in society, and the role of knowledge and science, and it also includes views on how a university should connect with society. If we go back to Humboldt's principles for science the university campus should be isolated from society in order to achieve a high level of independence (Tjora, 2019a). This was quite a different approach than the one used today in arguing for a campus that is integrated into the city center. Tjora (2019a) also points to the development of what has been called the market-, industry- or business university, which he claims illustrates the role of the university in society, a role where knowledge that can be used for innovation and industry development gets high priority. In other words, this debate is not new, and will probably always exist and should exist as the context around us change. In the end it may not be a question of either/or as there is room and need for both, but there will be a

question of prioritization and resources. And that brings us back to power as a dimension of place and place making.

Anderson states that in taking and making place different groups will arrange, manage, shape and transform places so that they align with their belief system and political values (Anderson, 2015). Places are the tangible expressions of power, and power can in principle be performed by everyone, but not everyone has the power to transform place (Anderson, 2015). Through domination and resistance places and meanings are contested, and power creates, stabilizes and destroys the (b)orders of place (Anderson, 2015). Campus as a place is always becoming, and whatever happens to be the dominating power will influence the making of campus as a place – and as a place for innovation. However, power is also contested and transgressed, often through practices. “The clearer the established meaning and practices of a particular place the easier it is to transgress the expectations that come with that place” (Cresswell, 2015, p. 166) What Cresswell argues here is that places do not have meaning that are intrinsic - meanings are created by people with more power than others to define what is appropriate (Cresswell, 2015).

4.3 Geographic Proximity a Prerequisite?

As we have seen in the previous section, collaboration in these cases depends a lot on your network and connections, and the proximity dimensions are mentioned when people talk about how and with whom they connect, both internally at NTNU and externally. It relates to both campus as a place, and campus as a place in a place (Trondheim) – which were the original question for the research project that this thesis is a part of (Fremtidens Campus, 2021). In the discussions around the campus project, there is a lot of focus on co-location and the positive effects that this will have on the operations of NTNU and collaborations between actors (NTNU, 2016), but also criticisms of this perspective arguing that this on its own is not going to solve issues of collaboration (although it may solve other issues) (Johansen, 2021; Sørensen & Lagesen, 2022). There is also focus on the benefits of being closer to the city, immersed in the central core of Trondheim. This is said to increase the attraction level of campus especially for students who wants to be closer to the city center, and also connect actors on campus with external partners in the center (NTNU, 2016). Acknowledging that there may be many other relevant and prioritized reasons for co-location and closeness to the city center, the following discussion focuses on these two measures as potential tools for increasing collaboration and innovation between actors.

4.3.1 Proximity Between Actors at NTNU

The cognitive proximity between actors has been said to be a foundation for learning and innovation – although with a balance, not too much and not too little (Boschma, 2005). This was confirmed by some of my informants in the data presented above, when the epistemological gap was too wide it was challenging to establish partnerships. Boschma’s conclusion is that the other dimensions of proximity (geographical, social, organizational and institutional) are mechanisms that can bring together actors within and between organizations and they often work in complementary ways (Boschma, 2005). The identification and application of these dimensions continue to be relevant today, especially in light of globalization and our interconnectedness. He acknowledges that there are many benefits of geographic proximity for learning and innovation, but the other dimensions can act as a substitute for geographic proximity, and therefore geographic proximity is not mandatory for learning and innovation (Boschma, 2005). The

social dimensions are particularly important here, especially when we look at networks and personal contacts where it has been demonstrated to be a driver of knowledge sharing and also resulting in higher production of knowledge (Boschma, 2005). As we saw in 4.1 the networks involved in the innovation processes presented here had elements of all these proximity dimensions: These dimensions were relevant to different degrees, depending on the case and the phases of the process.

For several of the informants, geographic proximity to partners and colleagues in the innovation and collaboration process was mentioned as something positive. Informant 5 for instance said that:

“a key for us has been that we have had the academic expertise and knowledge that we needed on campus, at NTNU and St. Olav. The fact that these are so close was pivotal”.

He continued:

“We had never been working as a factory before, so the key as I said, we have the competence, we have the proximity, we are only 30 meters from (our colleagues). The day the email went out, I walked 30 meters and we had a meeting in the hallway with the managers of the other group, it lasted ten minutes and we said yes, let’s try this.”

The support he got for the idea from colleagues that he met with physically helped push the idea forward.

When asked if physical meetings were important for collaboration informant 9 answered:

“The short answer is yes. When building relations, it’s different to actually meet someone in person, there is body language and a different presence in the conversation, right. Because even if you and I are sitting here now talking (via Zoom) all of a sudden I look at something that is in my window frame, or someone walks past my door, there are disturbances right, and these, well this is not my area of expertise but there are a lot of things that interfere and it’s more than just looking at a screen.”

He continues:

“It was nice with the TTO process to be close to them and just walk down and meet up. But personally I don’t understand, I mean if I had a person at Dragvoll that I could collaborate with I would just take bus number 3 to Dragvoll, or if this person was in the city I would do the same, or bike or walk. I don’t think co-location in itself will spark all this new collaboration, you can make that happen anyway. If it’s a good collaboration it may be worth even a couple of hours on a plane.”

So if we presume that geographical distance is not a barrier for internal collaboration today, what is then holding actors back?

Informant 9 underlined the importance of meeting physically to build relations and trust, and then digital tools can be useful for shorter meetings and keeping in touch through the process. Informant 1 had similar thoughts on this. He said:

“This may not be what you want to hear (laughs) but to me campus doesn’t really mean anything, it’s the person, so where they sit whether it’s Dragvoll or Kalvskinnet or Gjøvik or Ålesund or Oslo or anywhere, it doesn’t really matter.”

He continued:

“If there is a person that I need to talk to, I just search the NTNU website and where this person sits is not important to me. What is important is to find the right person and the right competence in an easy way, that’s much more important. And that’s not always easy, but it usually happens by asking someone I know in that academic group, and then you go from person to person until you find the right one. It’s the networking that’s important to me more than their location”.

Just like informant 9, informant 1 also stressed the importance of an initial meeting in person at the start of any collaboration, and shared an example of when that did not happen and the collaboration just never took off. Informant 1 also mentioned the geographical proximity to TTO as a positive element to the innovation process as it allowed him to just pass by once a week and talk during the process. Informant 2 also said that meeting in person was very important, maybe less so now as we have all the technology to support more distant connections, but he still saw it as important.

Being able to meet face to face during the process is seen as a positive thing for most of my informants, and they meet face to face to establish connection and build trust. However, the need for a permanent geographic proximity in order to meet face to face is not seen as a necessity, rather a temporary geographic proximity can help establish the collaboration and process, this is also supported by other studies (see Torre & Rallet, 2005 for examples). This temporary geographic proximity can happen for instance at a conference, event, social gathering or planned meeting to mention some examples that came out in the data. Ferru and Rallet (2016) argued that “the presence in space of a researcher or an engineer must not be with the location of the establishment to which he belongs” (p. 115). They continue:

“Places continue to be important, but because of the material possibilities that they offer agents to be able to combine the various spatial scales of their partnership relations: transportation and communication, professional connectivity platforms, infrastructure for meetings and so on” (Ferru & Rallet, 2016, p. 115).

They argue for a multi-scale approach since innovation processes have become more complex and cannot be represented in a simple way (Ferru & Rallet, 2016).

What is expressed through the data presented here and the literature mentioned above is that proximity is a situated concept – what is close and what is far are relative terms as we discussed in chapter 2. Proximity is a representation that responds to social determinants rather than geographic (Ferru & Rallet, 2016). Informant 1 said:

“...you can never be geographically close to all the relevant people, that’s just not possible, and if you have to walk to the next building or take a bus or do it digitally, for me it doesn’t matter.”

Informant 3 said a similar thing, referring to people in the same building as he is currently located: “There are NTNU employees that I never see because they work on the other side of the building”. Informant 6 also acknowledges that just being geographically close does not mean instant connection:

“...but if one sits in opposite ends of the city, in the opposite ends of the building, there is an immense distance to conquer in order for people to feel as part of a community, and I think that’s the difficult part.”

The views on co-location’s influence on innovation were not uniform among my informants. Informant 1 for instance, did not think co-location would have any effect on innovation, whereas informant 6 found it very important for innovation. His argument was that for innovation processes, the chemistry between people is key, both between the people you work with and the people you work for. He argued that as long as you’re not confronted with something it’s easy to ignore it, but as soon as you are faced with something you can no longer ignore it. As discussed previously, co-location may have some benefits but in terms of learning and innovation it is not a necessity. On the other hand, innovation does not happen in isolation either. Dahl argues that one cannot see knowledge production as separate from society, and research shows that there has

always been some form of integration between the two (Dahl, 2019). He underlines that if we want to find solutions to the global challenges of today the issue is more a lack of integration between the university and society than the internal organization (Dahl, 2019). This brings us to the issue of campus as a place in a place.

4.3.2 Campus as a Place in a Place – Connecting to Trondheim

The issue of co-location is not a new phenomenon for NTNU, and neither are the arguments used to promote it. When Dragvoll was first designed, the architect recognized that the location was isolated from the city center and from Gløshaugen, but expressed that he expected the city to develop further as a consequence of Dragvoll and that this would eventually make the new campus more integrated with the city (Dahl, 2019). This didn't really materialize as he expected. In 2004-2006 a plan for co-location of NTNU and what was then known as HiST was debated, and the arguments then were connected to developing Trondheim as a "knowledge city" by connecting different types of knowledge and giving different actors a place to meet (Dale, 2007). The city needed to develop so that it could promote innovation and knowledge sharing, and to achieve this it needed to promote diversity and become an attractive place to live, much inspired by the Triple Helix model and Richard Florida's work on the creative class (Dale, 2007). Universities were seen as engines in these knowledge cities, attracting talents and stimulating creativity through the connection between different parts of the university and the external parts of the city and region (Dale, 2007).

This connection to Trondheim and the region overall is important in the innovation work that NTNU is promoting today. As we saw in the strategy, the pillars of the work in that area focuses on collaboration with outside partners (in Trondheim and beyond), and in the cases presented in this thesis the new firms were in most cases closely connected to the city or the region. Informant 3 said that it's easier to start off locally in terms of both culture, communication and costs.

Informant 6 said that with regards to interdisciplinarity and even more with regards to innovation, "it's pivotal to force people together, it's a prerequisite, maybe not enough on its own..." He continued:

"The researchers need to get closer physically in order to get closer academically, and it's the same with the city. People can say what they want, but the proximity to the city that is an important step in getting closer to the issues, and it's also about having a place where you can invite people to. I know of people who works in the city center who thinks it's very far to go to Gløshaugen."

Understanding what the needs are is key to successful collaboration and application of research in industry, something Atta-Owusu showed in his PhD thesis, stating that research excellence is not enough in itself in terms of attracting firm-university collaboration (Atta-Owusu, 2021). He refers studies that state that even in science-intensive industries, firms may not even collaborate with excellent universities if there is a mismatch between their knowledge needs and what the universities produce (Atta-Owusu, 2021). Although this focuses on firms, it is likely that the same goes for public sector and other organizations that may benefit from a closer collaboration with universities.

Informant 3 also talks about the importance of not just being close to each other within NTNU because "we are not innovating for each other", but also to the partners or the issues at the core of their work. He also underlines the importance of long-term connections with external partners and the industry, and creating networks is essential

for innovations and contributing to society in a meaningful way. One way that NTNU is connecting with outside partners, on local, regional and national level is through the movement of PhDs and Master students. Many informants talked about this movement between industry and the university as an important part of knowledge transfer between the inside and the outside, bringing research to the industry and the practical challenges of the industry into the academic environment. This is another way of achieving a temporal geographic proximity as discussed above. Additionally, having the spin-off firms in the city or the region was seen as a positive thing, as it kept the relations between the expertise at NTNU and the firms close. Similarly, Atta-Owusu and Fittjar (2022) found that “academics with a strong sense of local attachment and extensive social networks engage more with local partners” (p. 1). They also found that informal networks were crucial in the local engagement of academics because it provided social capital and opportunities for collaboration. Both informant 2 and informant 8 gave examples of how personal local networks and contacts had influenced the decisions of moving firm activity to the city/region, indicating that these mechanisms are at work also in the cases presented here.

In a study looking at the effect of regional collaboration through clusters and local networks for economic development in Norway, Fitjar and Rodríguez-Pose (2015) conclude that promoting regional collaboration may prove counter-productive and focus should rather be on developing global pipelines. However, Trondheim is an exception in this case because they see it as an R&D intensive region where regional collaboration may be a possible strategy (Fitjar & Rodríguez-Pose, 2015). In another study comparing Trondheim and Delft, van Geenhuizen and Soetanto (2013) found that the network profile of spin-off firms in Trondheim tended to include strong relations with the local university, research organization, and a few large firms outside the region. The findings of these studies indicate that Trondheim is in a particular situation when it comes to spin-offs and their connections to the city and region, and that these specificities go beyond the fact that it is connected to a university (so is Delft) and that it is in Norway (so is Oslo, Bergen, Stavanger and Kristiansand). One interpretation could be that this is a result of the combination of the elements that make Trondheim a place, in which NTNU campus as a place has an important role.

Although integrating the city more with campus may have its benefits, it also has disadvantages in terms of less space for the activities of the university and its actors, and conflicts over the use of public space as discussed in chapter 4.2.3. As we have seen in the discussion of the internal connections within NTNU, the geographical proximity has been seen as more of a nice to have than a must have in terms of learning and innovation. Similarly it seems that integrating the materiality into the city center, does not mean that the city and the university will automatically integrate in activities for learning and innovation unless it also takes into account other dimensions of place and place-making. A more wholistic focus including these other elements of place development may prove more fruitful in that regard.

4.4 Summary

In this chapter I have presented some of the key findings from my data with regards to place, proximity and innovation with the aim of responding to my research question: What is the role of place in innovation processes at NTNU?

The data shows how actors have come together in networks to create successful innovations, and that place through its location, materiality, social relations, and

practices have influenced the innovation process – sometimes creating barriers and sometimes acting as an enabler. An innovation as presented in this data is highly connected to and dependent on its place in terms of its people, built environment, finance, emotions, norms, practices, location, power and values as illustrated in Figure 7. Therefore, it may be relevant to look at place development in a multidimensional way if one wants to enable and encourage activities that lead to innovations.

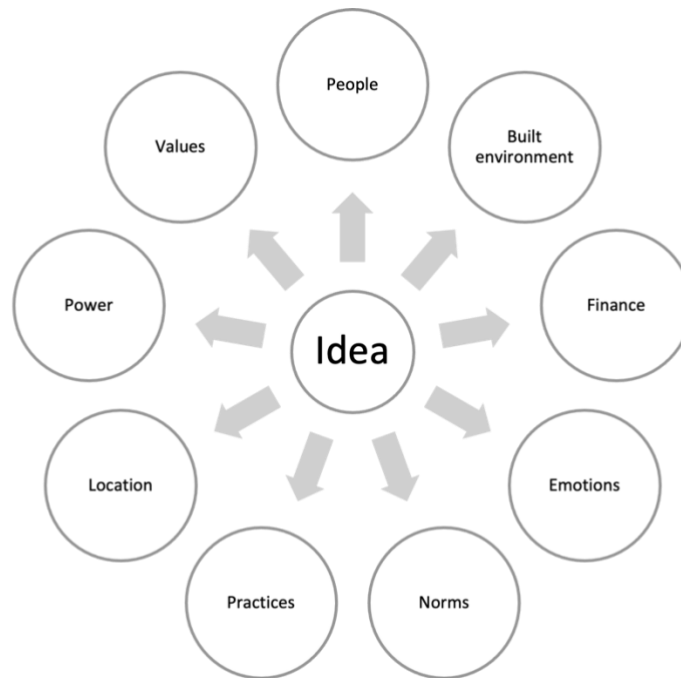


Figure 7: Visualization of relationship between idea and place

Additionally, the data and the literature do not support the need for permanent geographic proximity in order to increase collaboration for innovations. There is support for temporary forms of geographic proximity through face-to-face interaction. When it comes to challenges with interdisciplinary collaboration, these may seem to be more linked to differences in epistemological and social spaces.

5 Conclusions

In this thesis I set out to explore: What is the role of place in innovation processes at NTNU?

In order to answer this question, I started by asking, how do actors in innovation processes at NTNU collaborate and connect with other actors inside and outside of NTNU? I then went on to ask how do actors at NTNU create place in relation to these processes? And lastly, how important is proximity to other actors for collaboration and innovation at NTNU? By seeking answers to these questions I hoped to bring empirical findings that could help illustrate, support and challenge some of the geographical theories on place, innovation and proximity. I also hoped to find data and answers that could be useful for NTNU and other universities that embark upon campus development projects and have innovation ambitions in terms of understanding the relationship between campus and innovation.

In my analysis I used primary data from interviews with employees at NTNU who had been involved in innovation processes, and secondary data from NTNU's public website, official documents and media articles. I found that place has an essential role in innovation processes at NTNU through its people, built environment, finance, emotions, norms, practices, location, power and values. The idea and its development process is dependent on its place as shown in fig xx, something which Kramvig and Førde (2012, 2015) also argue for. The networks and connections that are made through the innovation processes, are also place-based and they rely heavily on social relations and personal contacts. Place through its location, materiality, social relations, and practices have influenced the innovation process – sometimes creating barriers and sometimes acting as an enabler.

Another finding is that actors create place through their innovation processes. Through their practices and relations with other actors and actants they make campus a place for innovation. These practices are sometimes supported by other elements of place such as values, norms and power, but their practices are also at times transgressing the meaning of campus as a place. If the dominating power believes campus should be a place for other activities, then innovation practices may become contested. Innovation practices at NTNU have gone from being mostly "out of place" to now being mostly "in place", but as places are always becoming this may fluctuate in response to changes in the understanding of the role of universities and campus in society.

Lastly, with regards to the role of proximity in innovation processes at NTNU, physical meetings and geographic proximity was seen as important by most of my informants. However, there was skepticism towards the effect of co-location on interdisciplinary collaboration. The data supported the need for temporary geographical proximity for innovation processes, but neither the data nor the literature supports co-location as a mean to achieving this. Co-location may have other desired effects, but in terms of increasing collaboration, and in particular collaboration for innovation, a number of other measures would need to be considered that can tackle issues of how to collaborate through epistemic differences, and establishing social relations among actors inside and outside of campus. It was argued that if we want to solve the wicked problems of today

and the future, then integration between the university and society should be in focus more than the internal organization and collaboration within different parts of the university (Dahl, 2019).

Research has often focused on the actors' capacities, the entrepreneurs ability to see an innovation through from idea to commercialization, and place has often been seen as a static component, taken for granted and seen as representing either barriers or opportunities for innovation (Kramvig & Førde, 2012). However, with a multidimensional approach to place it becomes an actor in socio-cultural life (Kramvig & Førde, 2012). The multidimensional understanding of place can help us identify the different elements that create place and see how they work together in shaping the context actors operate in. By looking at place through its materiality, the location, the relations, the practices, the emotions, the norms and values – all of the elements that have been discussed in this thesis – it becomes less abstract. It can also enrich the understanding of proximity dimensions, where they sometimes can seem situated or relative.

The primary data for this thesis has been limited, and I decided to focus on a narrow definition of innovation in order to manage the scope of work within the framework of this thesis. In order to gain a richer understanding of innovation processes at NTNU, it would be interesting to generate data on other innovation processes, not only those leading to spin-offs. By studying a more diverse set of innovation practices at the university and using a multi-dimensional approach to place, we could learn more about which elements support and constrain these practices. This information could prove useful for future campus development, especially if one has the ambition of developing campus as a place for innovation.

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Appendices

Appendix 1: Email to participants (Norwegian and English)

Appendix 2: Information letter English

Appendix 3: Informasjonsbrev norsk

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Appendix 6: List of spin-offs on TTOs website

Appendix 1: Email to participants (Norwegian and English)

Forespørsel om intervju for masterprosjekt ved NTNU (English below)

Hei,

Mitt navn er Beate Westby Stålsett og jeg er masterstudent ved Institutt for geografi ved NTNU, på programmet Entreprenørskap, innovasjon og samfunn. Jeg skriver for tiden min master oppgave som en del av Fremtidens Campus der jeg fokuserer på campus sin rolle i innovasjonsprosesser på NTNU med fokus på aktør-nettverk og nærhet mellom aktører i innovasjonsprosessen. Som en del av min datainnsamling ønsker jeg å intervju personer som har vært involvert i innovasjonsprosesser rundt etablerte NTNU innovasjoner, og ditt navn er nevnt i forbindelse med utviklingen av XXX.

Jeg fant din kontaktinformasjon online, og lurte på om du skulle være interessert i å bli intervjuet av meg for dette prosjektet? Intervjuet kan gjøres online via Zoom eller Teams, eller på Campus i Trondheim hvis du foretrekker det. Det er beregnet å ta cirka 45 minutter. Vedlagt finner du et informasjonsbrev med mer detaljert informasjon.

Hvis du vil la deg intervju, så hadde det vært fint om du kunne svare meg her via mail med en dag og tid som passer for deg.

Vennlig hilsen,

Beate Westby Stålsett

Hi,

My name is Beate Westby Stålsett and I am a Master student at Department of geography at NTNU, where I am studying Entrepreneurship, Innovation and society. I am currently writing my thesis as part of "Fremtidens Campus" (the campus of the future), and I am interested in the role of campus as a place in innovation processes at NTNU, with focus on actor-networks and proximity between actors in the innovation process. As part of my data collection I wish to interview people who have been involved in established NTNU-based innovations, and your name is mentioned as part of the development of XXX.

I found your contact information online, and I was wondering if you would be willing to participate in an interview? The interview can be done on campus or online via Zoom or Teams, and will take approximately 45 minutes. You may find more detailed information attached.

If you agree to participate, it would be great if you could indicate your preferred day and time via email.

Best regards,

Beate Westby Stålsett

Appendix 2: Information letter English

Are you interested in taking part in the research project "A campus that stimulates innovation - Exploring the relationship between place and actors in innovation processes"?

This is an inquiry about participation in a research project where the main purpose is to explore through a human geography lens, the dynamics between the place known as campus NTNU and the actors that interact through campus, in order to understand the relationship between campus and its actors and how the relationship impacts on actors' ability to innovate. In this letter I will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

I am collecting this data as part of my Master thesis at the Department of Geography at NTNU. Through this work, I hope to test if geographical theories can add new insights to what stimulates innovation capacity at NTNU. I also hope to provide data on the impact of proximity on innovation capacity at NTNU. This Master thesis is connected to the research project "Campus as a place and a place in Trondheim city" coordinated by Nina Gunnerud Berg at the Department of Geography at NTNU, and she is also supervising my work

My research question is: How does NTNU campus in Trondheim stimulate innovation?

The following sub questions will guide me in developing data that can help answer this question.

- What are the key elements of the network between actors and actants in an innovation process at NTNU?
- What is the role of space and place in this process?
- What is the role of proximity in an innovation process at NTNU (geographical, social, cognitive etc)?

Who is responsible for the research project?

NTNU is the institution responsible for the project.

Why are you being asked to participate?

You are asked to participate as you have been named as the innovator or one of the innovators in a NTNU-based innovation. Your innovation has been listed as a spin-off on the NTNU Technology Transfer website, and could therefore be considered an established innovation. I will reach out to approximately 30 people who have been involved in established innovations at NTNU and conduct individual interviews with those who agree to participate.

I found your contact details online.

What does participation involve for you?

If you chose to take part in the project, this will involve that you agree to be interviewed by me, either face to face or online via Zoom or Teams depending on your preference and on COVID-related requirements. The interview will take approximately 45 minutes, and will include questions about the innovation process you went through, focusing on

the role of campus as a place and on proximity between you and other actors/actants in the process. Your answers will be recorded electronically on audio.

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you choose not to participate or later decide to withdraw.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

Apart from myself, only my supervisor will have access to the personal data.

I will replace your name and contact details with a code. The list of names, contact details and respective codes will be stored separately from the rest of the collected data. I will store the data according to NTNU guidelines.

I am not publishing any personal information in my thesis, but considering the focus of my data collection it may not be possible to completely anonymize my informants. I will not publish any details about the innovations unless it is of importance for the analysis, I am only concerned with the process, the network and its relationship to place/space and proximity.

What will happen to your personal data at the end of the research project?

The project is scheduled to end 30 June 2022. The data will not be archived.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with the Department of Geography at NTNU, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- Department of Geography at NTNU via Nina Gunnerud Berg, by email nina.gunnerud.berg@ntnu.no or by telephone +47 73 59 17 96
- NSD – The Norwegian Centre for Research Data AS, by email: personverntjenester@nsd.no or by telephone: +47 55 58 21 17.

Yours sincerely,
Beate Westby Stålsett
(Master student)

Consent form

I have received and understood information about the project "A campus that stimulates innovation - Exploring the relationship between place and actors in innovation processes" and have been given the opportunity to ask questions. I give consent:

- to participate in an interview
- for information about me/myself to be published in a way that I may be recognised, see more details under heading: **Your personal privacy**

I give consent for my personal data to be processed until the end date of the project, approx. 30 June 2022.

(Signed by participant, date)

Appendix 3: Informasjonsbrev norsk

Vil du delta i forskningsprosjektet "A campus that stimulates innovation -

Exploring the relationship between place and actors in innovation processes"?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å utforske ved hjelp av samfunnsgeografiske begrepsapparater forholdet mellom campus som sted og aktørene som interagerer der, med fokus på hvordan campus som sted påvirker aktørenes innovasjonsprosesser. I dette skrivet gir jeg deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Jeg samler inn data som en del av min masteroppgave ved Institutt for geografi ved NTNU. Jeg ønsker å teste om samfunnsgeografiske teorier kan gi oss nye innsikter om hva som stimulerer til innovasjon på NTNU. Jeg håper også på å kunne bidra med data om betydelsen av ulike typer av nærhet i innovasjonsprosesser på NTNU. Denne masteroppgaven er knyttet til forskningsprosjektet "Campus as a place and a place in Trondheim city" under ledelse av Nina Gunnerud Berg på Institutt for geografi ved NTNU, og hun veileder også min oppgave.

Min problemstilling er:

Hvordan stimulerer NTNU Campus i Trondheim innovasjon?

- Hvordan ser nettverket av aktører ut i innovasjonsprosesser på NTNU?
- Hvilken rolle spiller sted og rom i disse prosessene?
- Hvilken rolle spiller nærhet (kognitiv, geografisk, sosial etc.) i innovasjonsprosesser på NTNU?

Hvem er ansvarlig for forskningsprosjektet?

Institutt for geografi ved NTNU er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?

Du blir invitert til å delta fordi du er nevnt som opphavspersonen eller en av opphavspersonene bak en NTNU-basert innovasjon. Din innovasjon har blitt listet som en spin-off på NTNU Technology Transfer sine nettsider og kan dermed ansees være en etablert innovasjon. Jeg vil sende forespørsel om deltagelse på intervju til omlag 30 personer som er eller har vært involverte i NTNU-baserte innovasjoner. Intervjuene vil bli gjennomført en-til-en og ikke i grupper.

Jeg fant din epostadresse online.

Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, innebærer det at du stiller til intervju, enten på campus eller online via Zoom eller Teams avhengig av dine preferanser og eventuelle

COVID-relaterte regler. Intervjuet vil ta deg ca. 45 minutter, og inneholder spørsmål om innovasjonsprosessen du har gått gjennom, med fokus på nettverket av aktører involvert i prosessen, campus sin rolle i prosessen samt ulike typer av nærhet mellom deg og de andre aktørene i prosessen. Dine svar blir registrert elektronisk via diktafon.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrevet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. I tillegg til meg er det bare min veileder som vil ha tilgang til personopplysninger.

Navnet og kontaktopplysningene dine vil jeg erstatte med en kode som lagres på egen navneliste adskilt fra øvrige data. Jeg lagrer dataen i henhold til gjeldende retningslinjer fra NTNU.

Jeg kommer ikke til å publisere personopplysninger i min oppgave, men med tanke på fokuset for oppgaven og utvalget så kan jeg ikke garantere at jeg lykkes med å fullstendig anonymisere alle deltagere. Jeg har heller ikke planlagt å publisere detaljer om innovasjonen med mindre det får betydelse for analysen. Jeg er hovedsakelig interessert i prosessen, nettverket og forholdet mellom sted/rom og nærhet.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Opplysningene anonymiseres når prosjektet avsluttes, noe som etter planen er 30 Juni 2022. Personopplysninger og data vil ikke bli arkivert.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke opplysninger vi behandler om deg, og å få utlevert en kopi av opplysningene
- å få rettet opplysninger om deg som er feil eller misvisende
- å få slettet personopplysninger om deg
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger

Hvis du har spørsmål til studien, eller ønsker å vite mer om eller benytte deg av dine rettigheter, ta kontakt med:

Institutt for geografi, Nina Gunnerud Berg, via email nina.gunnerud.berg@ntnu.no eller telefon +47 73 59 17 96.

Hvis du har spørsmål knyttet til NSD sin vurdering av prosjektet, kan du ta kontakt med:

- NSD – Norsk senter for forskningsdata AS på epost (personverntjenester@nsd.no) eller på telefon: 53 21 15 00.

Med vennlig hilsen

Beate Westby Stålsett

(Masterstudent)

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet "A campus that stimulates innovation -

Exploring the relationship between place and actors in innovation processes", og har fått anledning til å stille spørsmål. Jeg samtykker til:

- å delta i intervju
- at opplysninger om meg publiseres slik at jeg kan gjenkjennes, se detaljer under overskriften: Ditt personvern

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

(Signert av prosjektdeltaker, dato)

Appendix 4: Interview guide English

Introduction:

- My name is Beate Stålsett, I am a Master student at the Department of Geography at NTNU.
- This Master thesis will explore the connection between campus and innovation at NTNU. I am researching whether there is a connection between space, place and actors in an innovation process. The main research objective is: To explore through a human geography lens, the dynamics between the place known as campus NTNU and the actors that interact through campus in order to understand the relationship between campus and its actors, and how the relationship impacts on actors' ability to innovate.
- I will be recording the interview, and the data will be handled in accordance with the rules and regulations of NTNU and NSD.
- Have you signed the information letter?
- The interview is scheduled for 45 minutes, and I appreciate that you are taking your time to contribute.

Personal data that may be relevant to capture:

- Name
- Role/title (at the time of the innovation and today)
- Institution/organization (at the time of the innovation and today)
- Email/phone
- Gender (?)
- Age (?)
- Time of innovation process (year(s))
- Education – which institutions?

How did it start:

- Can you tell me about where the innovation process started in your view?
 - How did the idea come to you?
 - Where were you at the time?
 - Who was involved? (Where did they come from? Place, institution, campus)
- What made it possible to focus on the process (financing? Collaboration? Equipment?) Were there any barriers?
- What does innovation mean to you? When did you know that this was worth focusing on?
- When I say campus, what do you think about? What is campus to you?

Proximity:

- Where did you meet your partners/collaborators/facilitators
- Were you and team in the same geographical place during the process? Did it have an impact on the process?
- What connected you? Were you from same organization, same academic field/faculty? Or different organizations? Were your partners connections made from social or formal settings?
- How did you communicate through the process (meetings, emails, phone, lab work, reports, in what language)?
- How did you share ideas, failures, experiments during the process?
- What tools were you actively using and depending on? Were these tools provided by NTNU and accessible through campus?

Campus/place

- What role did NTNU campus play in the process? Were you working on campus, if so could you describe the place/space for me, was it an inspiring place? Did you have an office? Where did you have meetings (inside, outside, rooms, cafes, labs)?
- Did working on campus impact the process in any way (good or bad)?
- Which campus were you working from? Did you connect with colleagues from other NTNU campuses through this process? Or did you find it hard to connect with other campuses, and if so why? Was it easy to connect with partners outside of NTNU (in other academic institutions, organizations, firms)?
- What role did the geographical location of NTNU campus play? Did it matter or have an impact on the process that NTNU is set in Trondheim and Norway?
- Can you describe the campus culture for me in your view? Was it an enabling environment? Were there stumbling blocks?

Final words:

- Can I contact you again if I have follow-up questions?
- Would you like me to share my analysis with you?
- Do you know of any other who I could talk to, someone from your team for instance?
- Thank you again for taking your time, I highly appreciate it

Appendix 5: Intervjuguide norsk

Introduksjon

- Hei, takk for at du tar deg tid til å prate med meg!
- Mitt navn er Beate Westby Stålsett, jeg er masterstudent ved institutt for geografi på NTNU på programmet Entreprenørskap, innovasjon og samfunn
- Som du så i informasjonsbrevet så vil jeg med hjelp av samfunnsgeografiske begrepsapparater utforske forholdet mellom campus som sted og dets aktører, med fokus på hvordan campus som sted påvirker aktørens innovasjonsprosesser.
- Min problemstilling er:
 - Hvordan stimulerer NTNU Campus i Trondheim innovasjon?
 - Hvordan ser nettverket av aktører ut i innovasjonsprosesser på NTNU?
 - Hvilken rolle spiller sted og rom i disse prosessene?
 - Hvilken rolle spiller nærhet (kognitiv, geografisk, sosial etc.) i innovasjonsprosesser på NTNU?
- Jeg kommer til å spille inn lyden av vår samtale, og behandler data som samles inn i linje med retningslinjene hos NTNU og NSD.
- Godkjenner du å bli intervjuet og at opplysninger om deg blir publisert som gjør at du kan potensielt gjenkjennes (jeg kommer ikke til å bruke navn, eller detaljert informasjon om innovasjonene, men fokusere på prosessen. Men jeg har med dette punktet da utvalget er relativt smalt og NTNU er et lite miljø så jeg kan ikke garantere at ingen kommer til å kunne kjenne deg igjen.)
- Intervjuet kommer til å ta cirka 45 minutter

Først vil jeg bare starte med noen personopplysninger

- Navn
- Hvilken innovasjonsprosess vi skal fokusere på i dag
- Rolle/tittel (da og nå)
- Institusjon/organisasjon du jobbet for (da og nå)
- Epost
- Hvilket tidsrom pågikk prosessen?
- Hvilke(n) institusjon(er) har du din utdannelse fra

Hvordan startet det

- Kan du fortelle meg om starten av innovasjonsprosessen?
 - Når og hvor oppstod ideen?
 - Hvem var innblandet? Hvor kom de fra (sted, institusjon)

- Hva gjorde det mulig å fokusere på prosessen? (finansiering, samarbeid, støtte fra fagmiljø, utstyr etc) Hva var eventuelle barrierer?
- Hvilken betydelse legger du i begrepet innovasjon? Når visste du at det her var en god ide som det var verdt å satse på?
- Hvilke assosiasjoner får du når jeg sier campus? Hva er campus for deg?

Nærhet

- Hvordan og hvor møttes du og dine partnere i begynnelsen av prosessen – hva var det som sammenførte dere?
- Var dere på samme geografiske sted i løpet av prosessen? Var det noe dere reflekterte over – hadde det innflytelse på prosessen?
- Hvordan kommuniserte dere gjennom prosessen? (epost, møter, lab, rapporter, hvilket språk etc)
- Hvordan delte dere ideer, feilsteg, eksperimenter i løpet av prosessen?
- Hvilke verktøy var dere avhengig av, og var disse verktøyene tilgjengelige via NTNU og campus?
- Hvilke aktører var dere avhengig av, og var disse aktørene tilgjengelig via NTNU og campus?

Campus som sted

- Spilte campus som sted en rolle i prosessen? Jobbet dere på campus og kan du isåfall beskrive stedet/rommet du/dere brukte? Var det inspirerende elementer på stedet/i rommet?
 - Hvilke campus var involverte? Var det lett å komme i kontakt med aktører på andre campus, hvorfor/hvorfor ikke?
 - Hadde campus en påvirkning på prosessen på en eller annen måte (bra eller dårlig)?
- Hvordan kom dere i kontakt med partnere utenfor campus/NTNU?
- Spilte det en rolle for den prosessen du var involvert i at campus ligger i Trondheim? Og at Trondheim ligger i Norge?
- Er det en campuskultur på ditt campus, og kan du beskrive den for meg? Er det et stimulerende miljø for innovasjon der i dag eller er det barrierer?

Avsluttende ord:

- Tusen takk for at du tok deg tid. Er det noe du føler jeg ikke har dekket som du vil si noe om?
- Kan jeg kontakte deg hvis jeg har oppfølgingsspørsmål?
- Vil du at jeg deler oppgaven med deg når den er klar?
- Er det noen andre som du kjenner som du tenker at jeg bør prate med?

Appendix 6: List of spin-offs on TTOs website

TTO <https://www.ntnutto.no/spin-offer/>

	Innovations	Departments	Year
1	Lybe Scientific	Department of Clinical and Molecular Medicine	2021
2	Digitized intelligent risk indentification	Dpt. of Information Security and Communication Technology	2020
3	Senti Systems	Department of Engineering Cybernetics	2020
4	Nordic Brain Tech	Department of Neuromedicine and Movement Science	2019
5	Mobai	Department of Information Security and Communication	2019
6	Zeabuz	Departments of Engineering Cybernetics, Marine Technology & Electronic Systems	2019
7	Cimon Medical	Department of Circulation and Medical Imaging	2018
8	Graphchain	Department of information security and communication technology	Not known
9	Glucoset	Department of Electronics and Telecommunicatio ns	2014

10	Enodo	Department of Structural Engineering	Not known
11	Seram Coatings	Department of Engineering Design and Materials	2014
12	Scout Drone Inspection	NTNU AMOS and Department of Engineering Cybernetics	2017
13	Playpulse	Department of Computer Science	2016
14	Sounds Good	Department of Language and Literature	2017
15	Eelume	Department of Engineering Cybernetics & AMOS	2015
16	Memoscale	Department of Computer Science	2015
17	Kahoot	Department of Computer and Information Science	2011
18	Eir Solutions	Dept. of Cancer Research and Molecular Medicine & St.Olavs Hospital	2015
19	Solution Seeker	Department of Engineering Cybernetics	2013
20	Ubiq Aerospace / D-ICE	AMOS - Centre for Autonomous Marine Operations and Systems	2017

21	OT Membranes	Department of Chemical Engineering	2016
22	Crayonano	Department of Electronics and Telecommunications	2012
23	Blueye	AMOS - Centre for Autonomous Marine Operations and Systems	2015
24	Heavelock	Department of Engineering Cybernetics	2015
25	ArcIso	Department of Civil and Transport Engineering	2016
26	Rockseis	Department of Petroleum Engineering and Applied Geophysics	2014
27	Ecotone	Department of Biology	2009
28	Optimeering Aqua	Department of Industrial Economics and Technology Management	2015
29	HyBond	Department of Materials Science	2007
30	Bitreactive	Department of Telematics	2011
31	Mito.ai	Department of Computer Science	2016

32	Swing Catalyst	Department of Human Movement Science	2006
33	Protia	Department of Materials Science and Engineering	2008
34	Aptomar	Department of Engineering Cybernetics	2006
35	CerPoTech	Department of Materials Science and Engineering	2007
36	MemfoACT	Department of Chemical Engineering	2008
37	Dynavec	Department of Energy and Process Engineering	2007
38	Secustream	Department of Computer and Information Science	2006
39	Dynamic Rock Support	Department of Geology and Mineral Resources Engineering	2008
40	Serious Games	Department of Computer Science	2016
41	Innsep	Department of Energy and Process Engineering	2011

