Simen Roel Klafstad

How to nurture innovation in academic startups – A qualitative study of successful academic startups

Master's thesis in entrepreneurship, innovation and society
Supervisor: Markus Steen
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Abstract

Due to an increased focus on the importance of entrepreneurship and innovation in society, academic startups have become an essential contributor to local and regional growth. This, in turn, has led to a high increase of entrepreneurial ecosystems providing system components such as networks, universities, government, professional and support services, capital, and talent pool.

This paper explores how academic entrepreneurs, in correlation with the Norwegian innovation system, succeed with their startup. Even though the entrepreneurship and innovation policy of Norway has many factors that indicate that it should be attractive to be an academic entrepreneur, Norway is dependent on entrepreneurs who in fact are willing to take advantage of these benefits. This research project, therefore, focus on how academic entrepreneurial teams structures strategic planning for innovation.

This research project examines the characteristics of successful Norwegian academic startups, with a selection of five startups who achieved success within one year after they had graduated from their master's degrees. Success in this research project is defined as the entrepreneurial team being able to secure their employment through salary from their startup.

Using qualitative method, this research project finds evidence that supports the notion that the composition of academic entrepreneurial teams is typically interdisciplinary and motivated by the opportunity to commercialize their knowledge. Another empirical evidence is that communication and education sharing across the entrepreneurial team is vital for strategic planning for innovation. Also, successful academic startups have close cooperation with customers and a tough go/kill decision-making process. Another key finding of this research project is that the university in the entrepreneurial ecosystem is essential for academic startups to access qualified human capital, mentors and professional contributors.

Sammendrag

På grunn av økt fokus på entreprenørskap og innovasjon i samfunnet, har akademiske oppstartsbedrifter blitt viktige bidragsytere til lokal og regional utvikling. Dette har ført utvikling av entreprenørielle økosystemer bestående av nettverk, universiteter, myndigheter, støttetjenester, kapital og human kapital.

Denne masteroppgaven undersøker hvordan akademiske oppstartsbedrifter lykkes, i samsvar med det norske innovasjonssystemet. Selv om den norske entreprenørskaps og innovasjonspolitikken er tilrettelagt for at det skal være attraktivt å være en akademisk entreprenør, så er Norge avhengig av entreprenører som er villige til å utnytte disse fordelene. Dette forskningsprosjektet fokuserer derfor på hvordan akademiske entreprenørielle «team» strategisk planlegger for innovasjon.

Dette forskningsprosjektet undersøker egenskapene til vellykkede norske akademiske oppstartsbedrifter, med et utvalg av fem oppstarter som har oppnådd suksess innen ett år etter at det entreprenørielle «teamet» ble uteksaminert fra sin mastergrad. Suksess i dette forskningsprosjektet er definert som at entreprenørene kan sikre sin egen sysselsetting gjennom lønn fra oppstartsbedriften.

Ved hjelp av kvalitativ metode finner dette forskningsprosjektet empiriske bevis som støtter at sammensetningen av akademiske entreprenørielle team er tverrfaglige og motivert av muligheten til å kommersialisere sin egen kunnskap. Et annet empirisk funn er at kommunikasjon og kunnskapsdeling på tvers av det entreprenørielle «teamet» er viktig for strategisk planlegging for innovasjon. Vellykkede akademiske oppstartsbedrifter har et nært samarbeid med kunder som er karakterisert av en tøff «go/kill» beslutningsprosess. Det siste funnet i dette forskningsprosjektet viser at universitetet i entreprenørøkosystemet er viktig for akademiske oppstarter gjennom å få tilgang til kvalifisert human kapital, mentorer og faglige bidragsytere.

Preface

I wish to thank my supervisor Markus Steen for providing discussion, valuable insight, and guidance during the research process.

I would also like to thank all of the informants who generously made this master thesis possible by providing their perspectives and knowledge.

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Simen Roel Klafstad

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1 Introduction

1.1 The need for entrepreneurship and innovation policy

Governments and universities stress the importance of entrepreneurship, which has resulted in a heavy focus on how entrepreneurship and innovation can contribute to solving some of the issues we are facing in today's society. In order to reduce the dependency on oil and gas, there has been an increased focus on the diversification of the economy through innovation and entrepreneurship (OECD, 2017). The Government has designed support schemes for entrepreneurs, which are being re-evaluated and improved each year to increase startup activities (Regjeringen, 2015), which is reflected in that the Government has significantly strengthened its commitment to innovation by doubling its focus on entrepreneurship and innovation since 2013. The Norwegian Government has spent almost 10 billion NOK of its state budget to support entrepreneurial activities.

By supporting startups, it will have ripple effects on the creation of new jobs at both the national and regional level (Regjeringen, 2019). Statistics Norway (SSB) has evaluated the Norwegian innovation model, where they study the effects of startup policy instruments concerning public funding to increase value creation and innovation. Their analysis includes Skattefunn, which is a tax relief program for startups, the instruments from Innovation Norway, The Norwegian Research Council, as well as the Guarantee Institute for Export Credit, and Export Credit Norway. The evaluation states that the focus on innovation gives lasting results. Especially they point out that when a startup receives financial support of minimum 1 million NOK from the Government, it scales up to facilitate R&D, prototyping, and pilot projects (Cappelen et al., 2016).

Innovation Norway can be viewed as the biggest resource from the government who provides financial recourses and counseling. The Norwegian Research Council plays a crucial role in implementing financial support for knowledge-based innovation across all disciplines in academia, business and regions. Siva is another agency that plays an essential role in the Norwegian innovation policy. Siva is the Norwegian Government's instrument for the development of new business in Norway by investing in innovative companies and commercial property. Their main goal is to generate profitable development of startups, regional growth, and knowledge environments. There is also a strong specialization of clustering in Norwegian regions that enable regions to focus on their competitive advantage and knowledge sharing across technologies (Isaksen & Onsager, 2010). All in all, the Norwegian Government has a systematic focus on facilitating entrepreneurs to transform their ideas and knowledge to viable businesses (Borlaug, Aanstad, Solberg, & Thune, 2016).

1.2   Academic entrepreneurship and the entrepreneurial ecosystem

Over the last years, Norway has focused more on academic entrepreneurship where universities and higher education play a key role in innovation systems through one of their main missions; generating knowledge outside the educational environments that benefit the social, cultural and economic development (Sataøen, 2018).

In Norway, entrepreneurship is a subject that is being promoted as a focus area as early on as in primary school. Many universities and colleges also offer entrepreneurship and innovation as a separate field of study, both at bachelor and master's degree level (Kunnskapsdepartementet, 2014). OECD (2017) corroborates the promotion of entrepreneurship in academia, by saying that the academic background of entrepreneurs motivates their establishments of startups and entrepreneurial activities in Norway.

 Startups play a vital role in employment growth when the Norwegian economy changes, and one of the main objectives of the Norwegian government is to contribute to improving competitiveness and innovation. Much attention has been drawn to the subject through structural changes and diversification in the economy such as organizing financial support services, research and development, science and technology resources (OECD, 2017).

Entrepreneurship and innovation are essential for economic growth and global development (Dicken, 2015), and student entrepreneurship is a focus area that has evolved rapidly in higher education environments around the world. The literature states that it's a result of entrepreneurship being a catalyst for economic development, renewal, and growth. Another reason for this remarkable growth is that entrepreneurship can be learned by developing entrepreneurial student teams and facilitate a sustainable ecosystem for startups (Nabi, Walmsley, Liñán, Akhtar, & Neame, 2018). Harald Engeset Nybølet (director of the Directorate for Internationalization and Quality Development in Higher Education in Norway) says that entrepreneurship and innovation should be a focus early on in education and that the relationship between university environments and ventures must become tighter. He justifies this by stating that entrepreneurial culture and focus in academia, in general, can provide workability, the establishment of new businesses, and increase active citizenship.

1.3 The research question

According to the World Bank, Norway is one of the world's ten best countries to establish a startup, which is rooted in bureaucracy, trade opportunities, security and taxes (Tobiassen, 2015). Even though Norway has a good innovation policy, only 1 in 10 Norwegian startups achieve success (Bjørnestad, 2015).

This research project explores how academic entrepreneurs, in correlation with the Norwegian innovation system, succeed with their startup. Even though the entrepreneurship and innovation policy of Norway has many factors that indicates that it should be attractive to become an academic entrepreneur, Norway is dependent on entrepreneurs who are willing to take advantage of these benefits. This research project, therefore, focuses on, how academic entrepreneurial team structures strategic planning for innovation.

Discussions regarding communication and knowledge sharing has dominated prior research on successful startups (Szczepańska-Woszczyna, 2014), including the structures, procedures and strategic alliances that follows, and engaging commitment from the entrepreneurial team (Civera, Meoli, & Vismara, 2018).

The challenges regarding developing a startup are often related to identifying the right entrepreneurial team and the idea, and many of the best innovative solutions are collectively defined by having a culture for knowledge sharing. Investing in knowledge management infrastructures from an early phase could, therefore, have a triggering effect regarding mechanisms for the facilitation of innovation (Forbes Coaches Council, 2017).

Further, this research looks at how knowledge-intensive development of startups can be stimulated through strategic planning for innovation. This involves complex sets of processes, resources, and communication between the entrepreneurial team from an early stage which iterates as the startup develops. There's a large body of research stating that there is a positive correlation between facilitating innovation and performance from the entrepreneurial team, but there is less research focusing on the underlying processes for innovation (Watts, Patel, Rothstein, & Natale, 2018).

In order to develop and facilitate entrepreneurial teams in the context of academic entrepreneurship, it is vital to develop interdisciplinary skill sets, financial support, and resources that lower the barrier for academic startups to commercialize their knowledge (Nybølet, 2015). Norway has become a society that focuses on how much value is being produced from knowledge-based business development. In order to achieve this, there has been a more significant focus on how to assist and nurture the knowledge from academic entrepreneurs through education (Nikolaisen, 2017). Innovators and entrepreneurs are not able to develop on their own, therefore, it is essential to facilitate a reliable entrepreneurial ecosystem within academia. Skills and knowledge within a subject are developed over time through education and social interactions.

To summarize one could say that the government has an extensive responsibility to ensure that the right incentives and support structures encourage university staff and students to involve in entrepreneurial activities, including engagement with industry and society. In order to support academic entrepreneurship, higher education institutions need to be innovative and entrepreneurial in their education programs, research projects and interact with the people in the society also outside campus. Some educational institutions have a concrete foundation of initiatives but scaling up and sustaining transformation at institutional and systemic levels requires supporting frameworks for resource allocations, staff incentives, continuous professional development, and the creation of strategic business partnership locally, nationally and globally (OECD & Union, 2018).

Finally, the title of my research project is as follows: How to nurture innovation in academic startups – A qualitative study of successful academic startups.

In order to highlight the title of my research project, the following sub research questions has been defined:

1) What is the right composition of an entrepreneurial team?

2)   To what extent does strategic planning for innovation affects the outcome of academic startups?

3) How does successful academic startups make use of the entrepreneurial ecosystem to cover critical knowledge gaps?

In order to answer my research questions, I have conducted in-depth interviews with academic startups possessing a high degree of innovation from different periods. All of the startups are characterized by receiving a minimum of 1 million NOK funding from an early phase. Critical resources such as the right combination of human capital, mentors, external contributors, and free office spaces are also typical characteristics.

The empirical data have been used to analyze successful startups from university environments, that have been through a market-clarification process and is ready for national and international commercialization.

The aim of this master thesis is to contribute expanding the research on the topic of academic startups. Also, worth mentioning is that the majority of existing literature is conducted through quantitative analysis on academic entrepreneurship (Clarysse, Tartari, & Salter, 2011; Grimaldi, Kenney, Siegel, & Wright, 2011; Wright, 2007). By building upon the qualitative method, this research can contribute to understand more in-depth academic entrepreneurship. The second aim of this master thesis is to contribute with valuable information to key personnel who are working with facilitation of entrepreneurship in a university environment.

2 Theoretical framework

This chapter presents the theoretical framework in terms of prior research and will work as the foundation for this research project. Initially, two main themes are presented with a focus of understanding the theoretical framework, as well as the foundation of the master thesis. These are literature regarding innovation and entrepreneurship. Furthermore, the chapter is structured around four main themes, respectively:

- The entrepreneurial ecosystem
- Entrepreneurial motivation
- The entrepreneurial team
- Strategic planning for innovation

The themes shed light on the research questions through theoretical contributions, where the theoretical perspective aligns between the entrepreneurial actor level and structural entrepreneurial ecosystem system perspectives. To express the breadth of the current knowledge-base, including gaps, the theoretical framework of this research is a combination of entrepreneurial strategies and motives, in combination with external factors and framework conditions that stimulate startup activities.

2.1 Innovation and entrepreneurship

Entrepreneurship and innovation involve scoping ideas, and converting them into products/services, closely followed by developing a startup taking the product to the market (Mitra, 2013). The next two sub-chapters goes more into details regarding what the subject's innovation and entrepreneurship entail.

2.1.1 Innovation

Innovation is a term that the Austrian and American economist Joseph Schumpeter defined as the commercial or industrial application of something new. It can be a new product, service, process or production method (Schumpeter, 2017).

According to Schumpeter (1942), innovation can be associated with the capitalization of industries, such as the railroad in the nineteenth century, and the development of the automobile in the twentieth century. Schumpeter (2017) argued that innovation emerged from the commercial and industrial sectors of the economy, and continuously revolutionizes economic structures from within, destroying the old one by creating new solutions. He defined this process as Creative Destruction and is an evolutionary view of the capitalist process. Key factors behind capitalization are customers, consumer goods, new production or transportation methods, new markets and new forms of industrial organizations. (J. Schumpeter, 1942).

Innovation is not a new phenomenon, and according to Fagerberg, Mowery, and Nelson (2005) the term has not received the attention it deserves, but we see a shift today. It is usually large companies that are responsible for innovations in the market today (Ringel, Zablit, Grassl, Manly, & Möller, 2018), but there is a shift, where especially students become entrepreneurs to create innovations. However, according to a survey conducted by the consulting company Menon Business Economics, only one out of ten startups avoids bankruptcy and continues to grow nine years after its creation (Bjørnestad, 2015).

Prior research generally confirms two general areas of knowledge creation to generate and implement innovation; one is a traditional area, also called the Science, Technology, Innovation model (hereafter STI). STI is the consequences of advances in science and technology. The second emphasis learning by doing and using. This can be referred to as the doing, using, interaction (hereafter DUI) (Garud & Karnøe, 2003). STI is a result of investments in research and development, science and technology. The interactions with research institutions and universities generate codified and explicit knowledge, which can be used by the actors involved to create innovation (Fitjar & Rodríguez-Pose, 2013).

In the DUI model, innovation is generated by the capacity to generate solutions that solve existing problems. A typical way of DUI is responding to the challenges made by suppliers, customers, and the market. Innovation is therefore rooted in markets and organizations and is a

result of social interactions between people, both within and outside the firm (Garud & Karnøe, 2003). Interactions generate the tacit knowledge which facilitates the response to user demands and, ultimately, drives innovation within the startup.

According to Fitjar and Rodríguez-Pose (2013), in Norway, innovation has tended to rely more on DUI than on STI. A combination of low R&D expenditure and high productivity is the explanation for Norway's reliance on resource-based industries with many incremental innovations (Fagerberg, Mowery, & Verspagen, 2009). On the other hand, researchers see that the collaboration between industries, universities and research institutes has increased to become a priority in innovation policies (Fitjar & Rodríguez-Pose, 2013).

 Innovation can also be viewed as a sequence of activities involving the acquisition, transfer, and utilization of information; it is driven by the ability to see connections and to spot opportunities and take advantage of them (Abernathy & Clark, 1985). Innovation is not just about opening up new markets – it offers new ways of serving established and mature ones, which can be done by enabling radical new options that stimulate improvements in speed, quality, and effectiveness of services and products (Botstein, 1972). The Internet-based retailer Amazon.com is a perfect example of how innovation has changed how products such as books, music, and travels are sold (Tidd, Bessant, & Pavitt, 2005).

Innovation is exceptionally complex because it involves active management of different activities in the value chain of a startup. Management of innovation requires that the company can execute big strategic and operational decisions, which is reflected that innovators today, are more than twice as likely to outsource activities to the right knowledge source to reach their innovation goals (Ringel et al., 2018).

Prominent, innovative companies typically develop their strategies with a focus on how their knowledge and information can turn into new products and services. This can, for instance, be done by developing test products through digital simulations such as 3D printed prototypes, or minimally viable products in the actual marketplace. To highlight the importance of innovation, it is disruptive innovative solutions from external parties that have made such processes much faster and cheaper than before. Innovative companies today focus on rapid iteration until they find a good product-market-fit, which is a result of prior innovations, that have made it possible

for companies to launch and collect data that they can use to adapt and relaunch. They connect with customers, suppliers, and partners by using innovational platforms to incorporate real-time feedback as they iterate on their development process (Ringel et al., 2018).

2.1.2 Entrepreneurship and the entrepreneur

According to Kuratko and Audretsch (2009), the entrepreneurial theory is about factors that include:

- Initiative taking
- The organizing or reorganizing of social, economic mechanisms to turn resources and situations to practical account
- The acceptance of risk and failure

Based on the mentioned factors above one could say that entrepreneurship is a dynamic process that involves the creation of gradually wealth. The wealth is created by people who believe it is worth taking the risk in terms of equity, time, or investments to create a product or service (Ronstadt, Vesper, & McMullan, 1988). The product or service itself may or may not be unique, but the entrepreneur must somehow infuse the value by securing and allocating the necessary skills and resources (J. B. Cunningham & Lischeron, 1991).

Entrepreneurship is defined as a creative process where something is built or created to provide value. The creation is generally based on the fact that there is an opportunity in an environment, with the purpose to create a social or economic gain (Ries, 2011). A central factor in entrepreneurship is that it involves risks because the newness and diversity make it difficult to simulate the potential value (Johnson, 2001). There is also a close correlation between entrepreneurship and economic growth; entrepreneurship contributes to economic growth by introducing innovations, change, and competition in existing markets (Carree & Thurik, 2010; Wennekers & Thurik, 1999). The degree to which a startup or large corporations act entrepreneurially in terms of innovation is related to their ability to strategize towards innovation. More specific it is about understanding how innovation, networks, internationalization, knowledge, governance, and growth can be utilized to create a higher

quality of entrepreneurial actions (Ireland, Hitt, Camp, & Sexton, 2001; Ireland, Hitt, & Sirmon, 2003).

The meaning of entrepreneurship and its relevance to economic growth is reflected in that there needs to be an entrepreneur who can create value and manage innovation. An entrepreneur is an individual that takes the initiative and responsibility for making things happening in the right direction (Ries, 2011). An entrepreneur also manages the risk attached to processes that follow by being open and able for innovation. The entrepreneur has the persistence to see things through identified roadmaps, even when faced with obstacles and difficulties (Gartner, 1990). They price their products in a competitive marketplace to optimize, if not maximize, value and most importantly generate customers to create value (Mitra, 2012).

According to Cipolla (2004), entrepreneurs are crucial to long-term economic growth because of their adoption of new production techniques, allocation of resources to new possibilities and new markets. Evolutionary economics says that entrepreneurs serve as change agents, who bring new ideas to the market and stimulate growth through competition and value creation (Audretsch, 1995; Jovanovic, 1992). The new value can for instance be an innovation as discussed in subchapter 2.1.1, or a new organization. Often, innovation and the organization coincide through a process that shapes both the individuals involved and the value creation that could be a product or service (Carter, Gartner, & Reynolds, 1996).

In the following chapter, the strategic implications of an entrepreneurial ecosystem are elaborated. This is to be able to see from a system perspective which competencies are needed to contribute to entrepreneurial growth.

2.2 The entrepreneurial ecosystem

Innovation is vital for regions to grow and develop a competitive economy. The globalization with high technological development and societal differentials increases the dependence of the regions potential to generate new ventures (Asheim, Isaksen, & Trippl, 2019). Unfortunately, not all regions succeed with this. The following chapter deals with the theory about dynamics

and factors that should be in place in an entrepreneurial ecosystem so academic startups can succeed with their startup. There are also some common factors between an entrepreneurial ecosystem and a regional innovation system, and therefore this theory chapter is also supplemented with some theory regarding regional innovation systems. Briefly explained, a regional innovation system is the set of organizations and institutions that are engaged in processes of interactive learning, knowledge production and knowledge sharing (Lundvall, Joseph, Chaminade, & Vang, 2011). The geographical anchoring of ventures, organizations, and institutions enables exchange of tacit and explicit knowledge through interactive learning, knowledge production and knowledge sharing. Organizations, such as universities and research institutions, facilitate the exchange in the geographical area and are often called the cornerstone of the regional innovation system (Boschma, 2005)

According to Audretsch, Lehmann, and Menter (2016); J. A. Cunningham, Menter, and Wirsching (2019) entrepreneurial ecosystems are defined as the combination of social, political, economic and cultural factors from a region supporting development and growth of ventures by focusing innovation. Reliable business infrastructures, access to investment capital, innovation culture, supportive policy systems, and universities are being viewed as the key actors in an entrepreneurial ecosystem. Universities within the interdependence of actors and system-level institutional, information and socioeconomic contexts that constitute the entrepreneurial ecosystems through knowledge generation and diffusion, skilled human, capital and promotion (Civera et al., 2018).

Civera et al. (2018) say that entrepreneurship is a critical factor in economic development, and the way entrepreneurs develop, live and explores opportunities is dependent on the local context in which entrepreneurs operate. The concept of an entrepreneurial ecosystem is that certain boundaries exist outside the venture but within the regional context which can contribute to increasing the competitiveness of a new venture (Civera et al., 2018). The entrepreneurial ecosystem can also be viewed through the Triple Helix model of knowledge production.

As theorized by Etzkowitz and Leydesdorff (2000) Triple Helix is the combination of universities, industries, and government, and is based on the interactions between those actors

and how their related roles evolve to adopt mutual characteristics. The universities engage in knowledge/research production, industry produce products and services, and lastly, the government regulates the markets (Carayannis & Rakhmatullin, 2014). In order to create startups in an academic environment, the university has been addressed as the principal agent because their knowledge creation and diffusion results in knowledge spillover to the local environment and the entrepreneurial ecosystem (Mitra, 2013). Universities can also support and develop the entrepreneurial ecosystem by removing institutional barriers by for instance providing networking events and incubation facilities. Startups will then be able to provide new ideas and technologies for other economic actors within the entrepreneurial ecosystem. They apply scientific knowledge and contribute to social and economic growth; therefore, academic startups can be viewed as a vital component of an entrepreneurial ecosystem.

An entrepreneurial ecosystem represents a diverse set of inter-dependent actors within a geographical region that influence the formation and future trajectory of the entire group of actors and potentially the entire economy. These actors can be viewed through a set of components which in turn through interaction generates new ventures over time (Van de Ven, 1993). According to (Cohen, 2006) these actors are the set of components:

- Informal network
- Formal network
- University
- Government
- Professional and support services
- Capital services
- Talent pool

Cohen (2006) illustrates the importance of why startups need to utilize a geographical region to identify the available components in the Entrepreneurial Ecosystem. Including these components, social networks play a crucial role in role in supporting and facilitating entrepreneurship in a region (Birley, 1985). The strength of local networks is vital for startups to gain access to stakeholders that have an understanding of the issues the startup is trying to solve, and the unique challenges they will face along the way (Isaak, 2016).

2.2.1　Informal networks

Startups rely on informal networks because they contribute with advice and mentoring. This is an essential piece of the entrepreneurial ecosystem because these individuals have a significant impact on the entrepreneurial ecosystem through their behavior and values (Korhonen, 2004). According to Cohen (2006), this can be viewed as a Value-Based Network where the main goal is to develop and promote a sustainable business culture through knowledge sharing and network effects.

2.2.2　Formal networks

This is the presence of a research university, regional government agencies, professional and support services (e.g., lawyers, accountants, consultants, suppliers), capital sources (e.g., venture capitalists, business angels and banks), talent pool and large corporations (Cohen, 2006). The components of the formal network play an essential role in startups growth and development in the entrepreneurial ecosystem (Neck, Meyer, Cohen, & Corbett, 2004).

2.2.3　Research University

The role that a research university plays in an entrepreneurial ecosystem is to provide interdisciplinary expertise from different disciplines (Korhonen, 2004). Interdisciplinarity intends to contribute to sustainable development. Therefore, it is essential that the faculties involved in the entrepreneurial ecosystem have sustainability in their mind and are to develop and facilitate academic startups (Mihelcic et al., 2003).

Policymakers also see academic startups as one of the most promising ways of commercializing research results and regional economic growth (Ndonzuau, Pirnay, & Surlemont, 2002). Academic Startups are ventures originating from universities and created by academic personnel or students (Civera et al., 2018; Müller, 2010). Their goal is to bring technological knowledge to the market (Fini, Grimaldi, Santoni, & Sobrero, 2011), and are often considered as fruitful mechanisms for commercializing academic knowledge, promoting innovation and stimulating economic growth (Clarysse & Moray, 2004; Ferretti, Ferri, Fiorentino, Parmentola, & Sapio, 2018). Academic startups have become an increasingly popular way of commercializing research results/knowledge and can be seen as a technology transfer mechanism for the university. Consequently, technology transfer offices play a crucial role

when it comes to helping the startup from conceptualization to commercialization. The primary purpose of the technology transfer offices (TTOs) is to promote the transfer of technology from the university through the provision of seed capital and equity financing to startup companies using university technology; filing, prosecution, maintenance of patents, and licensing of patents (Clarysse & Moray, 2004).

The relationship between the university and academic startup has to be more than technology transfer; startups also need material and financial resources, which can be provided from universities in the form of incubators, prototype labs, measurements instrument and laboratory equipment (Ndonzuau et al., 2002). Concerning the financial resources, the challenge is not to find financial resources but to find the recourses which are not conservative in the valuation of the startup and is willing to take a high risk without asking for the high expected return on investments (Ndonzuau et al., 2002). Investing in primarily academic startups is a high risk which can put the entrepreneurial team in a position where they lose control over the venture because of diluted shares. It can be a problem when the business grows, and the venture requires new capital (Ndonzuau et al., 2002). Conflicting interests may arise in the relationship between the university and the academic startup because the majority of the rights and power lies in the hands of the financial backer and not the students (Ndonzuau et al., 2002). Financial resources that addresses knowledge gaps and facilitation of technology recourses can have a significant impact on academic startups because it strengthens the value of the company before engaging with investors (Clarysse, Wright, Lockett, Mustar, & Knockaert, 2007). Given rapid market pivots and high competition, academic startups have to be surrounded and consist of experienced and skilled people to avoid making critical mistakes (Ndonzuau et al., 2002).

Startups originating from a university environment are often characterized by advanced technologies that are attractive in international niche markets, which makes them natural candidates for internationalization. According to academics such as McDougall, Shane, and Oviatt (1994); Rennie (1993) these kinds of startups can also be viewed as a born global. A born global is a startup from or near their establishment, seek international performance from the application of knowledge-based resources to the sale of outputs in multiple countries. This theoretical perspective is essential for the selection of the informants presented in the method chapter. The reason for this is that one of the criteria is a focus on international strategy from

day one. Being a born global put the startup in a position where they can target new, emerging and frequently international markets and sell their product abroad rapid after the establishment of the venture (Civera et al., 2018). Some of today's scholars explain the internationalization of academic startups by using the network approach theory and rely it on dependency from resources controlled by other institutions, who play a crucial role in the learning and development of academic spinoffs. Network effects can help to identify opportunities in the internationalization process (Civera et al., 2018; Styles & Genua, 2008). The advantage of academic startups is that they are often connected to a parent institution, for instance, a university that provides specific information, identification of opportunities, and rapid access to markets (Civera et al., 2018). Because of innovation policies from the government, universities are forced to focus on their capacity to identify ideas and assess their potential (Roberts & Malonet, 1996).

2.3   Entrepreneurial team from a university environment

In the context of entrepreneurship and innovation, many nations, regions, and associated universities have adopted policies to stimulate entrepreneurial activities, hoping to facilitate economic growth (Grimaldi et al., 2011). Examples of such system perspectives were presented in the previous chapter. In order for the entrepreneurial ecosystem to have an impact on economic development, the entrepreneurial team from a university environment comes into play. They are the ones who use the resources from the entrepreneurial ecosystem to contribute to economic growth through developing startups. Without the entrepreneurs, many of the perspectives in the entrepreneurial ecosystem might have lost their effect. This chapter presents the theoretical factors regarding what motivates these entrepreneurs, their characteristics, size, and evolution.

2.3.1   Entrepreneurial motivation

First of all, motivation can be defined as a goal-oriented behavior that is driven by achievement (Hytti, Stenholm, Heinonen, & Seikkula-Leino, 2010). In regard of entrepreneurial motivation in academia, motivation is system-oriented, meaning that a feedback process which is essential in academic environments, can either encourage or discourage the behavior (Katz, 2003). In this context, the distinction between motivation can be categorized as general or situational motivation. General motivation is about the stability of behavior, which represents the average

level. Situational motivation is specific to a particular situation, where intrinsic or extrinsic factors create motives and generate targeted behavior (Krapp, Hidi, & Renninger, 1992). Based on this one could say that motivation is always either intrinsic or extrinsic factors as the primary source of motivation. Intrinsic motivation derives from the individual's personal need that is affected by cognitive factors; this can, for instance, be the academic entrepreneur's inner motivation to learn. Eccentric, on the other hand, can be driven by the entrepreneur's motivation by being rewarded after doing tasks (Good & Brophy, 1990).

According to Hayter (2011) entrepreneurs from a university environment has profit maximization (extrinsic motivation) as a foundation for becoming an entrepreneur, but not as the primary motivation of becoming an entrepreneur. High technology entrepreneurs are often motivated by intrinsic motivational factors such as independence, challenges, and dissemination of their work by converting theory into practice (Corman, Perles, & Yancini, 1988; Hessels, Van Gelderen, & Thurik, 2008; Roberts, 1991; Wiklund, Davidsson, & Delmar, 2003). Academic entrepreneurs are also motivated by their environment that provides co-students and role models (Bercovitz & Feldman, 2008; Stuart & Ding, 2006). An entrepreneurial education program can, for instance, be such an environment, previous research shows that these kinds of environments are shaping the candidate's attitudes and motivation towards engaging with startups (Dreisler, Blenker, & Nielsen, 2003; Fayolle, 2005; Klapper, 2004; Peterman & Kennedy, 2003). This also reflected in that the entrepreneurial motivation and behavior can be encouraged via courses and assignments focusing on opportunity scoping activities, problem-solving, and experimental learning methods (Hytti, Stenholm, Heinonen, & Seikkula-Leino, 2010).

2.3.2 Characteristics of entrepreneurial teams from a university environment

Startups from universities show some characteristics, which make them differ from other startups. Usually, the entrepreneurial team know each other from before through the university, and often there is a lead entrepreneur who was a project manager in a school assignment before the startup. Moreover, the entrepreneurial team has little contacts outside their knowledge field; they also have little industrial experience. Nikiforou, Zabara, Clarysse, and Gruber (2018) says that most academic startups tend to start without human capital possessing relevant industrial experience. Investors, therefore, are critical against these kinds of ventures and are more likely

to engage with academic startups if they can participate with a functionally professional team at the management level that replaces the original management (Clarysse & Moray, 2004).

Academics such as Bjørnåli and Aspelund (2012) says that academic startups are more likely to succeed with international sales and strategic alliances with entrepreneurial teams having interdisciplinary knowledge, and board members that have various functional backgrounds (Bjørnåli & Aspelund, 2012). Academic Start-ups tend to strategize towards rapid internationalization because of their need to capitalize on their knowledge or technology. Therefore, it is essential to build effective sales and marketing teams to get a broad range of market-related information. This will qualify the startup to take critical decisions regarding which markets to target, how to enter these markets, and how to develop viable business activities in them (Bjørnåli & Aspelund, 2012).

Even though academic startups have great potential they often only consist of recourses embedded in their entrepreneurial team, including their technology and knowledge (Bjørnåli & Aspelund, 2012). Academic startups tend to have resource limitations, which generally can be solved through strategic alliances. The problem is that strategic alliances often are established after long and dedicated work from the entrepreneurial team and the board of directors, and startups often are too small to attract attention from the right resources (Bjørnåli & Aspelund, 2012)

Prior research has shown that venture capitalist who invest in the early stage of a startup use the business experience of the entrepreneurial team as a primary criterion to consider investment (Clarysse & Moray, 2004). As a result of this many startups do not receive funding due to lack of experienced management (Cyr, Johnson, & Welbourne, 2000; Roure & Keeley, 1990). In the early stage of a venture, the main activities are related to the further development of the technology or service using potential customers as a significant source of knowledge and information. Therefore, technical business development is an essential task of the CEO, and some startups solve this by hiring a CEO from outside of the startup. When doing so, it is essential that this person can understand the technology and have the ability to develop the business himself (Clarysse & Moray, 2004).

A critical fact is that the entrepreneurial team has to accept the arrival of an outside CEO, which might be a stressful situation at the start of the venture (Clarysse & Moray, 2004). Instead of hiring a CEO in an early phase, it can be more useful to get a coach that the entrepreneurial team can benefit from through feedback and knowledge sharing. This will make it possible for the entrepreneurial team to develop their skillset and competences to run the operations and development themselves (Audet & Couteret, 2012). A professional CEO might be considered as more relevant when the startup generates revenues, and breakeven is realized. The coach can be a person who has experience with entrepreneurial teams and investor relations and should be able to transfer the business expectations of the financial source to strategic choices (Clarysse & Moray, 2004). It is imperative that these strategic choices are comprehensible for technical entrepreneurs. The primary pitfall of having a coach is when the coach is considered to be the CEO, and the entrepreneurial team get rid of their responsibilities and view the coach as a resource who can solve all of their problems (Clarysse & Moray, 2004).

In the commercialization process, the main critical factors for startups is connected to uncertainties regarding the market and the technology. In the initial phase, the entrepreneurial team starts with research regarding proof of concept where they are mostly involved in the technical phases of the startup. Typical focus areas here is prototype development and product development. Closely followed by the entrepreneurs need to choose a market entry for their product or service and develop their startup in line with the market. In this phase, academic startups face challenges that include team formation and their functionalities, this often because they lack commercial skillsets and industrial experience. Researchers, therefore, argue that startups from university environments need to recruit business and market-related competences to take the startup from product development to commercialization (Lockett, Wright, & Franklin, 2003).

2.3.3 Team size of the entrepreneurial team

The size of the entrepreneurial team in a startup is dependent on a variety of capabilities that are required to commercialize the product or service, prior research says that usually, one single person does not possess all of the necessary skillsets (Nikiforou et al., 2018). Besides, most academic startups are created and managed by large entrepreneurial teams, which makes them more attractive to investors and public funding (Nikiforou et al., 2018). Academic startups also tend to focus more on the importance of team management than regular startups (Nikiforou et al., 2018).

Startups with large teams tend to achieve higher growth because of their capabilities to successfully bring innovation to the market. A large entrepreneurial team is not only positive because it also involves several coordination issues that need to be handled through the development process. Large teams may also experience a lack of need to follow up with each other, which can lead to reduced reciprocity and likelihood of free passengers. Therefore, it may be advisable to reveal at an early stage what knowledge resources are available in the startup and what should be taken into account when recruiting new team members and mentors (Bjørnåli & Aspelund, 2012; Visintin & Pittino, 2014).

2.3.4 Team evolution

The first step in the process of startups is to screen the recourses that are necessary to launch the startup (Vohora, Wright, & Lockett, 2004). When the necessary resources are defined, financial recourses in combination with the entrepreneurial team often tend to be the most critical part (Moray & Clarysse, 2005). One could, therefore, say that the formation of the entrepreneurial team plays a vital role for investors, banks and other sources of capital (Vanaelst et al., 2006).

First of all, the entrepreneurial team which is a term that is well used in this research project, is defined as two or more individuals who together have established a firm in which they have financial interests (Kamm, Shuman, Seeger, & Nurick, 1990). To give a more explicit description of the term entrepreneurial team, one could say that they are the people who have a direct influence on strategic choices (Gartner, Shaver, Gatewood, & Katz, 1994).

According to (Vanaelst et al., 2006) the heterogeneity of the entrepreneurial team changes as it evolves through the different stages of the development process. In particular, Vanaelst et al. (2006) point out that new team members that are brought in during these processes bring in different kinds of experiences, but they do not introduce new views on doing business. As academic startups progress through the commercialization process, they face critical processes that need to be handled by developing new skillsets (Van Knippenberg & Schippers, 2007). Such development can be strongly influenced by the network ties of the entrepreneurial team and external recruitment (Nikiforou et al., 2018). Clarysse and Moray (2004) say that in the early development phase of the venture the entrepreneurial team tends to develop a champion role that provides meaning and energy to the academic startup. The role of the champion is to nurture commitment in the team, driving the idea forward and assemble the entrepreneurial team based on the required competencies (Rasmussen & Wright, 2015). What is very interesting is that since people are different, each entrepreneurial team has their own view on how a team should operate together to achieve their goals. The sum of the different views can be seen in the organizational culture of the entrepreneurial team. Van Muijen (1999) categorizes the different views into four extreme scopes which are the support oriented, rules-oriented, goal oriented, and innovation-oriented.

The support oriented entrepreneurial team find perceptions such as participation, cooperation, people based, mutual trust, team spirit, and individual growth as very important. The communication in the team is often verbal and informal. Team loyalty is much appreciated, and the decisions are often made informal within the team. The rule-oriented team has a high focus on control and their communication is often written down with a top-down approach. Their working processes are hierarchical, and they find respect for authority as necessary. Goal oriented entrepreneurial teams also focus on control, but they find concepts like rationality, performance indicators, accomplishment, accountability, and contingent reward as a driving factor for their motivation. The innovation oriented entrepreneurial team has a high focus on searching for new information in the environment, creativity, openness to change, experimentation and anticipation of their driving factors for entrepreneurial teamwork motivation. A typical characteristic of innovation-oriented teams is that control is neither possible nor required, because commitment and involvement are expected (Van Muijen, 1999).

2.4 From idea generation to profitable business

This chapter builds upon business development theory from Robert G. Cooper and supports this with startup development theory. The combination of business development and startup theory is intended to provide a more predictable basis for comparison.

First, this chapter presents focus areas in the process of idea generation to a profitable business. It is closely followed by Robert G Cooper and Kleinschmidt (1996) study of 161 ventures where they have defined four critical drivers for successful innovation.

An innovative startup must meet the customer's requirements, perform to specifications, tidy profit, safe to operate, including to have minimal negative impact on the environment during production, use or disposal (Kim & Mauborgne, 2000). In order to manage a quality product or service, a startup can use a variety of tools and structured techniques that can bring the elements of the product life-cycle from conception through prototyping to a final product-market-fit situation (Rahman, Tahiduzzaman, & Dey, 2018). This is a very complicated task, especially for academic startups, usually, it requires significant investments and academic startups have a limited period to turn their idea into a profitable business (Trimi & Berbegal-Mirabent, 2012). In addition, many academic startups move from idea generation right into product development with little or no assessment. The results of this approach are usually devastating.

Inadequate pre-research is a significant source of failure for starts ups when developing their product or service (Robert G. Cooper & Kleinschmidt, 2007). In the best product development processes, Robert G. Cooper and Kleinschmidt (2007) says that startups have conducted both specific market and technical assessments. This can be done through repeated validated experimentation where the business development process is extremely iterative based on continuously user feedback (Ries, 2011). As soon as possible the product is launched as a minimum viable product (hereafter MVP), and the experimentation process takes place. The purpose is to interact with early adopters who are willing to pay for the MVP, further on involve them in the development process.

In order to develop a thriving innovation, it is vital to have a close collaboration between user and innovator; a well-defined market need; a technical champion; secure internal communication; and highly developed screening and testing procedures (Townsend, 1976).

According to Globe, Levy, and Schwartz (1973), the characteristics of successful innovations are dominated by internal and technical factors. This can, for instance, be recognition of a professional opportunity; market need; proficient R&D management; well-executed venture decisions; ample development resources; and a technology entrepreneur. In order to achieve this it is crucial to have a viable company/ product fit. Meaning that the people behind the company can utilize technical know-how and has a high degree of knowledge within both the business market and the product technology (Kulvik, 1977).

Robert G Cooper and Kleinschmidt (1987) have investigated successful innovations based on the characteristics from Globe et al. (1973) which showed a close link to market needs; effective communication; efficient development; a market orientation; and the role of key individuals, as the critical factors for success. For successful startups, the market's needs are typically recognized in an early phase by assessing the market potential, customer needs and requirements (Robert G. Cooper & Kleinschmidt, 2007). This is where the iteration takes place and the focus is to make the technical breakthrough suit an identified market need (Robert G Cooper & Kleinschmidt, 1987). After that successful startup tends to conduct detailed market studies to pin down exact customer needs, competitive analysis, and concept testing. In order to satisfy the voice of the customer, the product specifications need to meet the precise description of what the product has to do. The product specifications are simply the set of individual specifications based on feedback from potential customers.

Rahman et al. (2018) claim that the process of establishing targeted customer specifications can be broken down in these following steps:

1. Preparation of the list of metrics

2. Collection of the competitive benchmarking information

3. Setting ideal and marginally acceptable target values for each metric

4. Reflection on the results and the process

Followed by a detailed technical assessment with a determination of the technical route, risks, patent possibilities, capital requirements, timing, and required recourses. This can, for instance, be done by defining an approximate description of the technology and its working principles. When this is done, the startup has a concept that can be exposed to potential customers as a sketch or as a rough three-dimensional model with a brief textual description (Rahman et al., 2018). This can also be viewed as a Concept selection process. This is an integral part of the product development process. It is the process of evaluating concepts concerning customer needs and other criteria, comparing the relative strengths and weakness of the concepts, and select one or more concepts for further investigation, testing, or development (Rahman et al., 2018). One effective method for concept selection is prototyping and testing in respect of customer feedback. The purpose is to gather and evaluate information from potential customers on how to improve and iterate the technology, including the estimation of sales and improvement of strategic networking. According to Rahman et al. (2018), this can be managed by applying a six-step method;

1. Define the purpose of the testing
2. Choosing a survey population and framework
3. Communicate the concept
4. Measuring customer feedback
5. Interpreting the results
6. Reflect and evaluate the results

Based on the actions above a profitability analysis is conducted to evaluate if the totality of the startup is worth moving on with (Robert G. Cooper & Kleinschmidt, 2007). For successful startups, Robert G Cooper and Kleinschmidt (1987) identify this as a goal-directed, stepwise process, involving a series of information acquisition activities and evaluation points. Included

in this goal-directed process, there are factors such as extensive market inputs, marketing research. Especially at the beginning of the project market inputs and marketing research plays a crucial role in shaping the success of the startup. In order to develop a thriving innovation, it is vital to have a close collaboration between user and innovator; a well-defined market need; a technical champion; secure internal communication; and highly developed screening and testing procedures (Townsend, 1976).

Another critical characteristic of successful startups is that they manage their product development processes with a strong go/kill decision points throughout the processes. Many startups move too far into the development process without serious scrutiny, and very often it is not before the commercialization that the hard truths are recognized. This can, for instance, be that the market is not as large as expected, or that the costs are higher than potential revenue (Robert G. Cooper & Kleinschmidt, 2007). The lack of strong go/kill decision points is often the reason for many product failures, wasted resources, and a lack of focus. Robert G. Cooper and Kleinschmidt (2007) say that in proper processes startups have designed a process in the form of strong review points or gates to develop an influential go/kill culture.

2.4.1 Key drivers for successful innovation

Innovation is one of the essential factors for competitive advantage for startups today, which can be stimulated by creating an environment that promotes the process of transforming creative ideas into successful products (Hill, Brandeau, Truelove, & Lineback, 2014). A study of 161 ventures that was conducted by Robert G Cooper and Kleinschmidt (1996) defined the critical success for successful innovation. This was done by measuring nine different performance factors which through careful analysis was defined to four key drivers for successful innovation; a high-quality new product process; the new product strategy for the business unit; resource availability; and R&D spending levels. The key factors are further concretized and illustrated in the figure below.

Figure 1 The Innovation Diamond (Cooper & Kleinschmidt, 1996)

Even though the key factors were defined in 1996, it has resulted in major benchmarks for new product development and is used today to see how top innovative ventures achieve success. Robert G. Cooper and Kleinschmidt (2007) have accomplished countless benchmarking studies of successful innovation, where this model turns out to be the one that repeats itself in several best practice ventures.

2.4.1.1 *Product innovation and technology strategy for the business*

Many successful ventures possess an innovation strategy driven by the management team and their vision for the future. According to Robert G. Cooper and Kleinschmidt (2007) an ideal innovation strategy consists of several factors, focusing on their business's goals for product innovation and how the innovation links into its overall business goals. The areas of strategic focus are often concentrated on R&D efforts and how the venture can win and improve in all of their areas in the value chain. Another critical factor in the innovation strategy is to draw a roadmap showing the major development initiatives for the product and the technology (Robert G. Cooper & Kleinschmidt, 2007). The innovation strategy can also focus on strategic alliances where different ventures are working together to develop products outside the corporation (Robert G Cooper, 2018).

2.4.1.2 Resources: commitment and portfolio management

Portfolio management and resource allocation are characterized by a constant focus on making sure that the venture has the necessary resources available for product development. This includes scope for human capital in all functional areas (Cooper & Kleinschmidt, 2007), and having a systematic portfolio method that effectively allocates recourses. A typical characteristic is to focus on research and development as an investment (Cooper & Edgett, 2006). Lastly, top innovative startups differ from poor performers by having a much higher proportion of bolder, more extensive and riskier startups (Cooper & Kleinschmidt, 2007).

According to Cooper and Edgett (2006) having a focus on these factors will improve the portfolio management of the venture: when entering the development process, it is essential to have useful information, so it is possible to have a fact-based decision-making process. Information about customers is sensitive; data on customer reaction to the new product; reliable data on market size and estimated revenues for the product or service.

Cooper and Edgett (2006) define the first step in the process of getting better data that can streamline the development process for a Go/Kill gate. The information requirements should be spelled out in the form of gate deliverables for each of the gates in the startup process. Next step is to front-end load the innovation project, which shortly explained is to robustly plan and design the product or service early in the project lifecycle. The reason for this is because the startup can then influence changes and change the design without having substantial costs (Batavia, 2001).

2.4.1.3 The idea to launch system: Stage-gate

Innovative startups tend to have an idea to launch a system, Robert G. Cooper and Kleinschmidt (2007) refer to this as the stage-gate model which is a process that helps the startup to have useful information available at each gate. Critical tasks and specified deliverables define the gates. In turn, this defines what information is needed at each gate. Typically, there are about four gates in a significant project that features well-defined gates from project establishment to launching. Another key factor with these gates is to ensure that the right gatekeepers are attending strategic gate meetings. Gatekeepers are typically an interdisciplinary team of a management group which facilitates the required resources that makes the project move

forward. Robert G Cooper and Edgett (2006) say that the full project team should attend the gate meetings. This should be a transparent decision-making process. Make the decision—Go or Kill—and commit the resources, right at the meeting. The project leader should leave the gate meeting with a decision whether to going or kill (Robert G Cooper & Edgett, 2006)

2.4.1.4 *Climate, culture, teams, and leadership*

All of the steps that are involved from idea generation to launch requires good leadership and an innovation climate (Gumusluoglu & Ilsev, 2009; Jung, Chow, & Wu, 2003). The majority of top ventures has a positive climate and innovation culture. The management typically supports innovation with words, actions and resource commitments. Additionally, top performing innovation ventures hold an official team approach to new product/service development and focus on practical and recourse based interdisciplinary teams that are accountable for the result (Cooper & Kleinschmidt, 2007). A key success factor within the climate and culture is knowledge sharing in the entrepreneurial team, which means that the entrepreneurial team gets the most out of the accumulated knowledge in the startup.

The reason why accumulated knowledge sharing is important is because it contributes to creativity and innovation through involvement of the whole culture, policies, routines, systems and all human capital including external contributors that are involved in the startup (Cabrera & Cabrera, 2005; Damodaran & Olphert, 2000; Davenport & Prusak, 1998). Accumulated knowledge sharing is exceptionally favorable about factors regarding the reduction of production costs, entrepreneurial team development, and the startup's performance. Including to this knowledge sharing has a direct positive effect on team performance, cohesion, member satisfaction, and new knowledge integration (Mesmer-Magnus & DeChurch, 2009). To summarize Kremer, Villamor, and Aguinis (2019) says that it is unlikely that creativity and innovation will take place in the absence of knowledge sharing. In order to manage this, there needs to be an innovation leader that engage in actions and implement interferences that encourage and facilitate knowledge sharing (Hill et al., 2014).

3 Method

In this chapter, I will outline the methodological framework applied in the master thesis for examining the research question. The chapter focuses first on why the research topic is relevant and the choice of research method and design. Further on the focus is how the qualitative method is used to answer the research question, including data requirements and method for data production and analysis. Finally, I will also discuss and clarify ethical issues related to the choice of the methodical approach and the research question.

3.1 Choice of methodology

In this chapter, I will present and explain the choice of research topic and research question. One of the purposes with methodology is to structure one´s actions based on the relevant research question and the answer one wishes to generate. Methodology is primarily related to research and can be viewed as creating a system with the outcome of creating a result. Such as result can for instance be new knowledge, insight, design, intervention or a solution (Jonker & Pennink, 2010, p. 21).

There are mainly two methods in research today, quantitative and qualitative. A quantitative method is based on the fact that social phenomena shows a high degree of stability that makes measurement and quantitative description meaningful. Quantitative research strategy is usually theory-driven, or deductive. The researcher asks questions and deduces hypotheses from one or more theoretical perspectives relevant to the phenomenon studied (Ringdal, 2018). When conducting quantitative method, the researcher focuses on questions related to what, when, whether or not, and how many. The data that is collected through these types of questions refers to numerical data and frequencies (Hay, 2016). Qualitative research on the other hand highlights individual experiences, social processes, and human environments, which is done by questioning why, how, meanings, and looking at processes (Tjora, 2012).

This research project focuses on academic entrepreneurs who has succeeded with their startup within one year after graduation. Therefore, reflecting on experiences and situations through

their journeys will provide deeper understanding of the phenomena. In human geography qualitative research is being used in a wide range in research focusing on human environments and human experiences within a conceptual framework (Hay, 2016, p. 5).

Since I wanted to focus on incidents, experiences, motives, beliefs and behaviors it was a natural choice to use a qualitative methodology in this research (Hay, 2016). By choosing a qualitative method I was able emphasize understandings of the subject instead of focusing on numerical data and frequencies like in quantitative methodology (Hay, 2016). Another reason for why qualitative method has been used is because of the ability to have more interactions and proximity to the one being investigated (Tjora, 2012).

In order to highlight the title of my research project: How to nurture innovation in academic startups – A qualitative study of successful academic startups the following sub research questions has been defined:

1)   What is the right composition of an entrepreneurial team?

2)   To what extent does strategic planning for innovation affects the outcome of academic startups?

3)   How does successful academic startups make use of the entrepreneurial ecosystem to cover critical knowledge gaps?

In order to answer the research question, I have conducted multiple case studies of Norwegian startups from a university environment, and conversations with key actors from the entrepreneurial ecosystem at NTNU, and one investor who has invested in startups from a university environment. I tested the theory by developing the theoretical proportions through the case studies. This enabled me to work in a mode where I test the theory into practice (Hay, 2016) and was able to see where the theory needed to be expanded. Therefore, I used abduction as the approach to the research process where the focus was to test previous theory and searching for negative or forged cases, including using empirical evidence to confirm my chosen theory and research topic (Thomas, 2010).

To answer the research question, I had to gain a deeper understanding of how Startups from a university environment has succeeded within one year after graduation. Another advantage of qualitative data is that information obtained can be discussed and analyzed to assess the essential factors for Norwegian startups (Hay, 2016).

3.2 Research design

Case Studies provide an excellent methodological framework when studying a specific unit to understand a larger class of units (Gerring, 2004; Hay, 2016, p. 130).

A case study is an empirical approach that investigates the occurring phenomenon in depth and within its real context. A case study can be used when the context of a phenomenon is not clearly defined or evident (Yin, 2014). The case can, for instance, be a business, a municipality or a local community. More detailed information about the case selection is described in the chapter below.

In the role as a researcher in this case study it was important to be observant of two things; The result is governed by context, which means that terms describing relationships are only valid under certain circumstances. The other factor that I had to be observant about was to come up with opinions and statements before the case study began. Therefore, I decided to develop formal proportions in advance. These proportions were fundamental theories as to the basis for the case study (Hay, 2016), Another factor I was very aware of was that did not have to re-invent the wheel when developing the theory.

Hay (2016) Emphasizes that qualitative research tends to be cyclical where the theory is formally assumed as hypotheses as one explores deductively by studying the research topic. In practical terms it meant that I worked in an inductive process were the empirical data was used to generate new theory (Yin, 2014) It is essential to keep in mind that if you are to be a good researcher, you must be aware of exciting literature that can help solve the problem (Hay, 2016, pp. 131-138).

Although this study mainly uses a qualitative method, because it attempts to provide insight and understanding in business development, I also used simple descriptive statistics, which contributed to highlighting the overview. Besides, provide a more comprehensive picture of the startups market position and other general factors that were relevant. In this way, qualitative and quantitative methods can complement each other (Hay, 2016). With simple descriptive statistics I was able to collect accounting figures, the amount of financial funding within one year after the entrepreneur's graduation, the number of team members, and sales figures within one year after graduation. The information was obtained from www.proff.no, and financial funding from searching on Dagens Næringsliv, Shifter, and The Norwegian Research Council and Innovation Norway list of financed projects.

3.2.1 Multiple case study

I have conducted a multiple case study of five successful startups originating from university environments in Norway. Choosing a multiple case study have made it possible to look at the development process from idea generation to commercialization for several startups. This has provided a better basis for comparison, which in turn increased the research project's ability to draw analytical overviews based on the findings and the research question (Yin, 2014).

Through comprehensive data collection, multiple cases provided different sources of information (Marshall & Rossman, 2014), which in this research was used to understand differences and similarities between the startups (Stake, 1995). Especially, situations, processes and phenomenon, that has brought them to a viable business (Baxter & Jack, 2008; Yin, 2014).

Multiple case studies were also chosen to see if there was either contrasting results or similar results between the cases, or both. As a researcher, my claim is that there were definite similarities and differences between startups from a thriving university environment. By leaning on this claim, I could clarify whether the findings were valuable or not (Eisenhardt & Graebner, 2007), and by analyzing similarities and differences, I increased the possibilities for giving the literature a critical influence (Vannoni, 2015). Multiple case studies also opened up the possibilities of having more defined theoretical approaches with several empirical data (Baxter & Jack, 2008; Eisenhardt & Graebner, 2007).

3.2.2 Selection of case start ups

The goal of the case selection was to have a selection of unique successful startups, from a university environment, for resourceful theory testing (Seawright & Gerring, 2008).

When having a small selection of cases as in this research, a random case sampling is not a viable approach (Seawright & Gerring, 2008). In order to secure the validity of the research and relevant cases the case selection was strategic with a predetermined list of criterions (Hay, 2016; Yin, 2014). This is also reflected from Tjora (2017) where he describes how to generally choose informants who can comment on the topic in question and that informants should not be drawn randomly to represent a population, as in quantitative surveys.

I wanted to get in touch with startup companies that are or have been in approximately the same situation because it could provide more consistent data with more data on similar experiences. It turned out to be a good strategy because it helped me to uncover their everyday challenges and possible solutions for future ventures from a university environment (Tjora, 2017).

The criterion list was as follows:

- The entrepreneurs had to finish their master's degree, and the development of the startup company had to be started while they were students
- Having a clear strategy for future financing
- The majority of the entrepreneurial team had to work full time with their project
- Received minimum of 1 million NOK in funding
- Had to be of a high degree of innovation, which means that the product or service they develop/develop did not exist in the market from before
- International strategy from day one

The focus on internationalization was especially an essential criterion because of the rapid growth of markets and technologies forces ventures to grow much faster, if internationalization is not a focus, I believe that they are being run away from competitors and new solutions.

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Technologies make everything much more transparent, and once you start a business you are competing with the international market. If you start a business in Norway, a competitor from China or the USA can quickly discover your niche by searching on the internet. Therefore, the ability to accelerate beyond your home market from the beginning is essential. If a startup has these abilities, they are probably more comfortable to meet the challenges that follow when getting international competitors. The underlying processes of what characterizes successful startups from a university environment can, therefore, be viewed as a phenomenon. As mentioned initially there is a significant focus on fostering entrepreneurship in academia both from Innovation Norway, the Norwegian research council and the entrepreneurial ecosystem.

3.3 Interview as research method

In case studies, many different methods of data generation can be used (Tjora, 2017). It can be structured depth interviews, semi-structured or unstructured interviews (Hay, 2016). During this research, it has been conducted depth interviews with a semi-structured interview guide to retrieve data.

My goal of the Semi-structured in-depth interviews was to create a relatively free conversation that circled around some specific themes I decided in advance "(Tjora, 2017, p. 104). The themes can be seen in the next chapter and more detailed in the attached interview guide. The reason for choosing depth interviews was that it gives the informants greater freedom to express their opinions and experiences than just using standardized questionnaires (Yin, 2014), and it was easier to create a good dialogue where the informant felt confident about the situation. During the interviews, I also experienced that there were better opportunities for good reflections around events, phenomena of interest to the study (Hay, 2016, pp. 152-153).

3.3.1 Interview guide

As mentioned, an interview guide was used to facilitate the interviews. As a young researcher doing such a complex study for the first time, the interview guide was a great tool when conducting the interviews. Having an interview guide with overall themes and subtitles was very convenient because it allowed me to move outside the selected questions based on the respondents and the data they provided (Hay, 2016). If the informants considered essential

factors relating to a previous question along the way, it was not a problem to return to a previous topic (Johannessen, Christoffersen, & Tufte, 2011).

It is also worth mentioning that in this case there was a need for relevant information that was not proposed in advance. Consequently, it felt like a very natural choice to practice a semi-structured interview style (Hay, 2016).

A critical factor around this approach is that sometimes the conversations can move far beyond the problem. Then it is essential as an interviewer that you can manage the conversation back on track (Hay, 2016). Amazingly, this problem never occurred. This is probably since my informants had minimal time and therefore agreed in advance to stick to the field of study and not waste time on small talk beyond the study.

Hay (2016) says that the questions in an interview guide may be complete or spoken. Based on this the content and topics in the used interview guide focused on handling the research subject and was divided into six main themes:

- Introduction
- Information about the venture and the background
- Entrepreneurial team and innovation
- The entrepreneurial ecosystem
- Knowledge from outside of the venture
- From product development to commercialization

3.4   Data collection

There has been conducted five successful interviews with startups from a university environment. Whereas four of the interviews was conducted face to face and one was conducted through a telephone interview. All five of the respondents consented to audio recordings. Each of the recorded interviews has been transcribed. Through my experiences from previous research assignment (bachelor thesis), my interviews were very long, up to 2 hours. I was aware that transcribing is a very time-consuming process; consequently, my goal was that each

interview should last for approximately 1 hour. This was a strategic measure so it would not limit my analysis time, including to provide too much data that can be unnecessary. This was tested through my first interview where the interview guide cowered an interview lasting for one hour, which was reflected in the remaining interviews.

The goal was actually to gather data from 10 informants but due to lack of time and finding the right informants prevented this goal. The problem was not getting hold of startups from a university environment. The problem originated in the fact that it was hard to find startups that were successful at the time, and that the diffusion of innovation of their startup had to be of such high quality that they stand out and have a sizeable international potential. This could have been resolved if I had expanded my geographical focus area. Then I could focus outside what was accessed from my entrepreneurial network and what was practical for my location. I could, for instance, have traveled to several startups from university environments from all over Norway and Scandinavia. Again, here is the problem related to the time frame of the research project as well as my financial limitations as a student.

3.4.1 The aim of the data collection

The data collection aimed to develop a better understanding of how ventures from a university environment are developed and organized towards successful commercialization.

It was possible for me to access cases through my network in the entrepreneurial environment in Norway, so the focus has been on collecting data from startups from Norway. Since I wanted to see first-time entrepreneurs from a university environment, data from informants in the age group 20-35 years were gathered, both women and men. The age group was not a strategic choice but was more naturally because of the ages of the informants.

I also supplied with information from older entrepreneurs who have succeeded with a startup in order to draw comparisons with newer ventures. The criteria for which older entrepreneurs I choose was that they have succeeded with a venture from a university environment and that they are still working with something related to startups. This can, for instance, be that they are working as investors or mentors. When using this strategy, it was essential to have the

opportunity for generalization in mind, as I have a relatively close relationship with many entrepreneurs in Norway. Therefore, I was cautious about that I did not have a close relationship with the respondents. Which was mainly due to that I had to keep in mind the research subjectivity when it comes to data analysis and interpretation (Hay, 2016). This is especially important regarding this case because I as a researcher is also an entrepreneur who is a part of NTNU Engage "trampoline project" where I am a part of the innovation environment at NTNU and working with my startup but also my research project at Gründerbrakka.

Gründerbrakka is an incubator for students who are working with their startups. They have access to knowledge sharing, experiences, and mentors. The purpose of the incubator is to provide the necessary knowledge and resource the students need to develop their startup so that they can work full time with the startup after graduation (Gründerbrakka, 2018).

NTNU Engage is an association consisting of the NTNU School of Entrepreneurship, Nord University Business School, NTNU Experts in Teamwork, TrollLABS and Spark NTNU. All of these actors are educational programs focusing on learning for students through developing their projects and reflection upon the processes they go through. The students who are a part of NTNU Engage obligates to engage in their learning, taking responsibility for their learning, and sharing knowledge with other students, previous students, and faculties. The philosophy of NTNU Engage is the combination of development and disseminate action-based learning, student-to-student learning, collaborative skills, rapid prototyping, and student engagement. They provide recourses and activities for students in all disciplines at NTNU to increase the number of students in higher education with entrepreneurial skills (Engage, 2018).

3.5   Analysis of qualitative data

"Qualitative analysis requires intense cognitive work; sensitivity to what exists in empirics beyond issues and expectations; and an ability to work systematically" (Tjora, 2012, p. 174). In other words, much data had to be "digested" when I started the analysis.

Through the analysis of qualitative data, I wanted to clarify and get an overview so that I could present the findings in the best possible way. Tjora (2012) says that the primary goal of qualitative analysis is to put the reader in a position where he or she understands the field of research and acquire new knowledge about the area. The qualitative analysis must be so intuitive that the reader does not need to go through the data that has been used.

When the in-depth interviews were conducted, I used sound recordings to make it more convenient to transcribe the data material. It was crucial to have in mind that it does not exist an objective translation from oral to written (Tjora, 2012). Therefore, I decided to have a strategy for how to transcribe my data, because when doing a transcription, one does not always know what the important topics are and how detailed they should be. Tjora (2017) therefore recommends that as a researcher you should often be slightly more detailed than necessary in the transcription.

When I conducted the transcription, I decided to transcribe everything the respondents said. In order to avoid the effect of transcribing much unnecessary material, I was conscientious about keeping the interviews to professional content and going straight to the point. The interviews were conducted in Norwegian and then translated into English to make it easier to analyze the data since this master thesis was written in English. The transcription was of high quality and carefully designed, which provided a deeper understanding of the material that was researched.

In order to reduce the complexity of the analysis of the qualitative data, I used a step-by-step-deductive, inductive method (from now on SDI). "In the SDI method, I worked in stages from raw data to concepts and theories (Hay, 2016). The upward process is to perceive as inductive working from data to theory. "The downward feedbacks are to be perceived as deductive and checks from the more theoretical to the more empirical" (Tjora, 2012, p. 175).

When the interviews were coded and placed in code groups, the conceptual development started. Here it was possible to see what is linked to already designed theory and what should be further researched.

After getting known with the data material gathered from my interviews, I started the coding process by dividing my transcribed text into smaller units. This was done by textual coding so I could describe what emerged from each interview, which in turn helped me to extract essential aspects that were used further in the analysis (Tjora, 2012). As Thagaard (2013) points out, it is essential that the smaller units are so meaningful that they can be used alone to design the code groups (Tjora, 2012). By doing this, I found central elements and codes, which I divided into code groups that represented my research project. Further, I categorized the codes into code groups with the purpose to eliminate empirical codes and focus on relevant codes for the research question (Tjora, 2012). Through this process, I was able to work in a state of mind where I could uncover patterns in the data material. Further on I could proceed to interpret the data.

SDI provided a good foundation for how to systematize this research project. It made it possible for me to streamline the process of data collected from qualitative interviews through various steps, first of which to generate empirical data in a selection. Then the data was processed to what is called analysis data. Once this was completed, the coding that may be called code grouping began. Concepts emerged from the code grouping so that I could start developing a general theoretical framework. The reason why I wanted to use SDI in this research project is, among other things, because the model contains deductive backlinks. This enabled a quality assurance of the progress of the analysis by conducting a test of each step before I proceeded. Another reason for why I want to use SDI in the analysis was that I produced the empirical data myself; they were not taken from a pre-manufactured large dataset; therefore, it as a natural choice because I needed a useful analysis tool to make the analysis feasible. Lastly, I would like to point out that I did not follow all the steps to the point, but it was practical to have a tool in mind to benefit from an extensive analysis work.

3.6 Ethical considerations

According to Tjora (2012), some general ethical considerations should be implicit in all research; aspects such as trust, confidentiality, respect, and reciprocity. In the role of the researcher, it is essential to be aware of the responsibilities and obligations that you have above the informants.

In my research project, it was vital to safeguard the privacy of the informants, maybe some of them are competitors, or that they do not want to be linked to information they publish. It was therefore essential that I took into account anonymization when presenting the data. It was crucial that the informants are not polluted when the person concerned informed about sensitive or confidential themes. If the informants talked about subjects that he/she did not want to be published, it was taken into account and removed from the transcript. It was essential to remind the informants that they can terminate the interview at any time because it is the interviewer's task is to inform about this, and keep in mind that the informant is a fellow human being and not just an object for information retrieval.

Since I used an audio recorder, it was vital that all the informants were informed and accepted this. This was done through an informed consent which can be viewed more in detail in attachment A. I also had a responsibility not to put the informant in a bad light. If it appeared unclear information in the transcription, it was clarified with the informants. Since I studied startups where there are usually few employees, there was a risk that the informant could be recognized.

3.6.1 Anonymization of the respondents

One problem that arose early during the conduction of the interviews was that the informants wanted to be anonymous. 3 out of 5 informants wanted to be anonymous, and for the sake of tidiness, I, therefore, decided that all the informants should be anonymous.

Hay (2016) says that when doing qualitative methods, you will often get close to the informants by asking very personal questions. Therefore, when conducting qualitative research, it is essential to keep the respondent's confidentiality in mind, especially in this research I have gathered personal information that might harm the respondents in respect of their coworkers, partners, customers, and investors. Maintaining the confidentiality and anonymity of the respondents was not in itself a complicated process. What required a lot of cognitive powers and reflections was how I as a researcher could present rich and detailed data without harming and disclosing the informants.

In order for my research to anonymize my informants and at the same time have reliability, I started reading up on various research articles and master's thesis to see what these had done to protect their informants. I also inquired with my supervisor and former master's students from NTNUS school of entrepreneurship. The reason why I inquired with former master's students from NTNUS School of Entrepreneurship was that they have extensive experience from research projects regarding startups, and some of these are anonymous and confidential. After gaining insight into how and why others use confidentiality and anonymity, I wanted to find an expedient strategy and still maintain the reliability of the case. The reason for this was because a lot of the methods for confidentiality that are being used today has breaches via deductive disclosure.

"Deductive disclosure, also known as internal confidentiality, occurs when the traits of individuals or groups make them identifiable in research reports. For example, if a researcher studying teachers named the school district where the research occurred, someone with knowledge of the school district could likely identify individual teachers based on traits such as age, gender, and several years within the school district" (Kaiser, 2009, p. 1).

In order to prevent deductive disclosure, I have used a strategy that has been developed by Kaiser (2009). The strategy is called an alternative approach where the goal is to be able to share detailed, rich data while at the same time maintain the core data and respecting the respondent's perspectives on how their data are being used. The purpose is to make the respondents better informed of the use of the empirical data, such as who is the audience and how the research result will be shared. Including having an ongoing process with the respondents, which can be viewed as revising the informed consent (Kaiser, 2009).

In order to better inform the respondents of the use of the data I presented to them what kind of data I was going to use, a quotation checklist and an anonymization description of the relevant informant. The anonymization description is viewed in chapter four. The respondents were then able to approve how the empirical data was used, how they are cited and described in the research. When I started on the process of anonymization of the respondents, I experienced the difficulty of how far I should take the anonymization. So, what I did was to ask the respondents about what kind of factors that they were nervous about getting published. It was a clear common denominator among all the respondents that they did not want it to be mentioned by names of team members, company name, or other sensitive information that could reveal or damage the startup company.

3.6.2 Choosing the right audience for the research project

Another method I have used in connection with anonymity and confidentiality is to reflect and present to my respondents, the specific audience this research project is intended. By having a specific audience, I experienced that it was easier for the respondents to answer the interviews with ample data while not revealing their identity. It is also worth mentioning that it is challenging to write for more than one audience. By identifying the primary audience, one can strengthen the task by having a much more focused and specific analysis and writing (Weiss, 1994).

In this process, I reflected on the two following questions;

(I)   why am I writing about this research topic?

(II)   what is the aim of the research topic?

Firstly, the main reason why I write about this research topic is that I am a master student with a genuine interest in developing startups. What interests me is explicitly what characterizes the startups that succeed within one year after graduation. This may also be due to being in a position myself where I develop a startup where the goal is to make it sustainable within one year after graduation. By sustainable I mean that the startup has achieved exceptional sales and that the entrepreneurial team can work full time.

The research topic aims to create some new views and guidelines on how to effectively develop a sustainable academic startup company. Based on these reflections, master students who want to, or are developing a startup alongside their studies are the primary audience that I want to influence and appeal to. For my part, this was also a valuable choice because then I could as a researcher be in a position where I could exchange knowledge that I have experienced and possess with the informants. This also means that my respondents and startups in the same situation are the potential secondary audiences.

3.6.3 Sharing the work with the informants

In order for my informants to have insight into how they are referred to and described in the master's thesis, I decided to share my work with them.

According to Kaiser (2009), sharing the work with your informants can be a challenging process because the respondents might not be interested in academic writing. Therefore, it was decided to delimit the sharing of the work to what genuine concerns the relevant informant. This also felt like a natural choice because the goal of the sharing was to get confirmation from the respondents on how their anonymity and confidentiality was taken care of.

Another underlying factor for this strategic choice was that I wanted my respondents to know how I used their data and how they were portrayed. Anonymization raises the question about the validity of the research, but by sharing the description of the respondents and the data, allowed the respondents to comment on the accurateness of the information (Kaiser, 2009). This also put the respondents in a position where they were able to provide more information besides the interview.

In order to ensure the validity of the research topic, I was very critical of anonymizing my informants, and I was therefore evident with my informants from the start that I would not hide their anonymity behind fictitious factors. The information that has been used in the description of respondents is real information. What has been done in order to manage this is to remove critical factors that can reveal the respondents. Such as names, age, and specific geographical grounding to the university environment (Hay, 2016). This description was then sent to each respondent for approval, and the result was that everyone approved the description without changes.

Afterward, I have reflected on the fact that it was a bit risky to have such a hard guide on the anonymization. This could result in respondents withdrawing from the research along the way. I encountered no opposition to this, but initially, I noticed that the respondents wanted to have access to and approve of what was written about them along the way and approve this before publishing. As an entrepreneur myself, I fully understand this because the data I got access was susceptible and can potentially damage customer relationships, investor relations, and internal team dynamics.

All the respondents from the startups that have been interviewed also have boards consisting of investors and external contributors. If the respondents who were interviewed should not be anonymous, the data I had access to had to be taken up by the board and evaluated whether it could be public or not. This will be an overly complicated and time-consuming process for this research project but might have worked better with a doctoral thesis.

3.7 Quality of the research

When looking at the quality of a qualitative research, the terms reliability, validity and generalizability are often used as indicators for quality (Tjora, 2012).

3.7.1 Reliability

Reliability can be defined as if a research process of data generation and data analysis can be repeated with the same results (Ringdal, 2018). When a researcher conducts a social research project as I have done in my research, the researcher often has some engagement or interest in the field of study. Therefore, one has realized in qualitative research that being neutral or objective cannot exist (Tjora, 2012). With this as a fundamental point of view, one can look at the researcher's knowledge and involvement in the research subject as a resource. How this knowledge is used in the analysis and how the researcher's position characterizes the research topic is essential to reflect upon, and this is where the reliability of the research takes place (Tjora, 2012). It is essential to reflect upon whether one as a researcher has shared interests with the informants, or whether one has specific knowledge and obligation, and how these factors may have influenced access to the research field, choice of informants, data generation, analysis, and the results. Knowledge about the research project is an advantage related to asking detailed questions, but it can also be a disadvantage of having many prerequisites (Tjora, 2012).

As mentioned earlier I am an entrepreneur myself and have a lot of knowledge and interest of the research topic, and I am confident to say that my previous knowledge and commitment to the field had no negative impact on the quality of the research. Instead, it has had a positive impact on the choice of right method and analysis for improving current research on the field (Tjora, 2012).

Also, worth mentioning is that as an entrepreneur I am today in the same situation as my informants' ones were, which is something essential to be aware of and take into account in order strengthen the reliability of the research. Consequently, it was necessary for the analysis part to highlight what kind of information that came from respondents, and what was my analysis. This is something that strengthens the reliability of the research because the respondent's statements are transparent to external readers (Seale, 1999).

Tjora (2012) says that when conducting a qualitative research project, you can ask the following question to exam the reliability; What if another researcher did the same research process, would the result be the same? When asking myself this question I cannot say with 100 % accuracy that this is possible. Some factors might be produced in the same matter, but overall it is tough to say if another researcher would get the same results as I because the results are based on the choices and interpretations that I have done. There is no guarantee that other researchers in the field of entrepreneurship and innovation agree with my choices, which can affect their efforts in getting the same results as me.

It is crucial to be able to explain which factors in the empirical data that emerged because of the researchers and informants involved (Tjora, 2012). In order to clarify these factors, the data collection and analysis in the research process has been reported in a way that is accessible for others (Kirk, Miller, & Miller, 1986) I believe that this increases the reliability of the research because it makes it easier for others to see how the research process was conducted (Yin, 2014).

I conducted detailed within-case analysis of each case in order to define the main themes for the analysis part. The themes were based on the theoretical framework and structured in the same way for each case. Further, the data has been structured in the same way for each case which has enabled me to get a deeper understanding of the main themes. After the main themes were defined, the acquired data was organized in the themes in my analysis chapter. This was a strategic choice to strengthen the reliability and make it easy for others to conduct the research again based on my data (Yin, 2014).

3.7.2 Validity

Validity is related to if the research that is conducted answers to the research question (Tjora, 2012), and to justify if the interpretations from the researcher are valid (Yin, 2014). The most important source of validity is that the research is progressed within the framework of academia that is relevant for the research area (Tjora, 2012).

In this research, I have strengthened the validity of the research by having continually dialogue with my supervisor who has provided feedback with a critical eye. Also, I have been a part of NTNUs incubator for academic startups during the research the process, which has made it possible for me to get confirmation and critics on my research from both startups from a university environment and key actors from the entrepreneurial ecosystem. In order to justify my interpretations, I have supported my argumentations with a theoretical basis. To elucidate the validity of this research the theoretical approach is inspired by the OECD's innovation report of Norway, the Norwegian government's strategies for creating more entrepreneurs and NTNUs strategies for commercializing knowledge and research.

3.7.3 Generalization

Generalization concerns if the data or interpretations are transferable to other research projects, places or situations (Delyser, 2008; Shenton, 2004). Tjora (2012) on the other hand does not agree with this definition because the term generalizability is already well established as a quality indicator in research today, and secondly because in the term transferability there is a reduction of what kind of generalization one can imagine in qualitative studies. Therefore, I have chosen to focus on generalization in which matter this research can be applied to other cases. With this as a starting point we have three forms of generalization that is presented in the following sub chapters; naturalistic generalization, moderate generalization and conceptual generalization (Tjora, 2012).

3.7.3.1 Naturalistic generalization

In a research project, the researcher has to account well about the details that have been studied. This is because the reader is supposed to be able to assess whether the findings are valid, for example for the reader's research (Tjora, 2012). In other words, you can say that in naturalistic

generalization the transferability is dependent on the degree of similarities between the original situations and the situation that the research is transferred (Hoepfl, 1997)

3.7.3.2 *Moderate generalization*

Generalization is viewed in a more quantitative matter, where the researcher describes in which situations the results may be valid (Tjora, 2012).

3.7.3.3 *Conceptual generalization*

As a researcher in a qualitative method, you develop concepts, typologies or theories that will be relevant for other cases then your research (Tjora, 2012).What is being done is that you picture your findings in the forms of models without being directly related to the specific empirical basis in the research (Hay, 2016). My focus has been on presenting the findings through a theoretical framework, which also correlates well with the definition of conceptual generalization. In order to manage this, I have focused on relevance beyond my analysis, which has been done by using earlier research and theories to support the generalization of the case.

Nurius and Tripodi (1985) say conceptual generalization can be approached by considering the extent to which the methods can be used in other places. In this research, I especially want to point out that I believe that this research is generalizable to more significant ventures that are starting new internal projects regarding business development. More detailed about this is presented through the analysis and discussion chapter.

4 Case studies

In this chapter, the case studies of the five different startups from a university environment are presented. Each case is categorized in the same topics in the next chapter, making a comparison between them more accessible.

4.1 The entrepreneurial ecosystem

Since the startups are anonymous, it would be a violation of research ethics to reveal the geographical location of the ecosystem that the startups are affiliated to. What can be mentioned is that today the entrepreneurial ecosystem has a high focus on knowledge sharing and innovation-driven entrepreneurship through research, academic and business. There is a strong interaction between entrepreneurs, ventures, students, professors, public support services and investors. The entrepreneurial ecosystem has been developed over the last decades, and the interaction and presence of the system components were not as active when Alpha startup was established. The presence of the entrepreneurial ecosystem is expressed more in detail in regard to each case in the analysis and discussion chapter.

4.2 Alpha startup

Alpha startup is a leading manufacturer of microcontrollers and advanced computer logic. The respondent from Alpha startup has a Ph.D. in electronics and is currently a CTO, co-founder, and investor. The person has currently many roles in Norwegian businesses today and possesses long experience as an entrepreneur. His/her first startup can be considered one of Norway's biggest technology successes. It is also worth mentioning that he/she is an investor in several startups from a university environment.

4.3 Beta startup

In parallel with master's studies, Beta startup has developed a technology startup company in the field of an electric motor which is of a very high degree of innovation which can help to revolutionize, among other things, the electric car engine. The most significant milestone the

company has achieved today is 34 million NOK in financial support from the EU. This was achieved within one year after graduation.

4.4   Charlie startup

The entrepreneurial team behind Charlie startup consists of former athletes who have developed an innovative MedTech business that focuses on monitoring hydration. They have been granted approximately 2 million NOK in financial support from the Norwegian government and an innovation contract with a value of 15 million NOK. Both of these milestones were achieved within one year after graduation.

4.5   Delta startup

A targeted and strategic startup company from a university environment that has managed to develop an idea to a highly technological product. This has been done in close collaboration with researchers and academic communities in the associated university environment, where the result is a revolutionary MedTech company that can monitor glucose levels in the blood. The startup has received funding of approximately 30 million NOK.

4.6   Echo startup

The startup is a technology company in the camera industry that enables ordinary people to create professional cinematic clips. A dedicated and interdisciplinary entrepreneurial team has developed the venture. Through their period as students, they have won several entrepreneurial competitions in Scandinavia, as well as granted 2 million NOK in financial support from Innovation Norway and the Research Council of Norway. One year after graduation, the startup company has achieved sales of approximately 10 million NOK.

5 Analysis

This chapter presents the results from the case studies and links them to the literature and previous research. The primary purpose of this chapter is to be able to analyse the importance of various factors that characterizes successful academic startups. The analysis is structured around reoccurring themes from the empirical data that correlates with the theoretical framework:

- The entrepreneurial motivation for academic startups
- Evaluation of the business idea
- The entrepreneurial team and challenges
- The entrepreneurial ecosystem and external contributors

Together, these themes will provide theoretical and empirical insight into what characterizes successful academic startups.

5.1 Entrepreneurial motivation

First of all, motivation can be defined as a goal-oriented behavior that is driven by achievement (Hytti, Stenholm, Heinonen, & Seikkula-Leino, 2010). Entrepreneurial motivation in academia is system-oriented, which is characterized by a feedback process that can either encourage or discourage the behavior of the academic entrepreneur (Katz, 2003). In this context, the distinction between motivation can be categorized as general or situational motivation. General motivation is about the stability of behavior, which represents the average level. Situation motivation is specific to a particular situation, where intrinsic or extrinsic factors create motives and generate targeted behavior (Krapp, Hidi, & Renninger, 1992).

The environment where the motivation is nurtured has a significant influence on the goal-oriented behavior of the academic entrepreneur. Briefly summarized two factors of motivation was defined which is intrinsic and extrinsic. In order to distinguish between these two factors for motivation in the analysis, intrinsic factors are driven by inner motivation, meaning that the entrepreneur is genuinely interested in what they are doing, and that the activity is satisfactory in itself. Extrinsic factors, on the other hand, are driven by external motivation such as doing a task or activity only because of a reward or recognition (for instance financial reward).

All of the entrepreneurs in this research possesses a higher education, which means they all possess a master's degree. Some of them have education in the relevant field of their startups, such as Alpha Startup and Delta startup. The rest of the entrepreneurs such as Beta, Charlie, and Echo have an education within business development where they were able to bring their knowledge from their university to the market. The general part that draws similarities across all of the cases is that their education level correlates with their intrinsic motivational level, including being a part of an environment with regular feedback from mentors, customers, and cooperators.

By looking at Alpha startup much of the summer jobs the entrepreneur got were not very exciting and motivating. After graduation, it was a choice between having a well-paid job or to be more on the creative side and start his/her own business. It seems like the combination of having no hard-financial obligations and applying acquired knowledge to innovate a new product was the motivating factor for becoming an academic entrepreneur. This can be directly linked to intrinsic factors where the entrepreneur was triggered by his/her knowledge within the field that could be used to create better solutions.

The entrepreneur behind Beta startup, on the other hand, did not have any educational experience regarding the technology that startup was built upon. Him/her has a bachelor's degree in physics and math and after that being a student at an entrepreneurship program at a university in Norway (**hereafter the entrepreneurship program**), which is a two-year master's degree. The entrepreneurial motivation behind Beta startup can viewed through this quotation: *"When being accepted as a student at the entrepreneurship program you start your venture, and when I was accepted for the study program, I was aware that the startup should be big and bold high-risk, high reward."*

Beta startup started on a case that was presented to the entrepreneurship program. This was a composite material that could be used in electric motors, but there was no solution to produce it. The quotation above points towards the category of extrinsic values for motivation but based on the academic background in physics the entrepreneur was very triggered by the high

complexity of the product and immediately realized that If him/her could find a solution, it will scale up. This is where the intrinsic values of motivation were activated.

The rationale choice of the entrepreneurial motivation for Charlie startup was based on the team's background and interest in the field. The entrepreneurial team develops a product within MedTech, and the entrepreneurs have earlier been professional athletes and possess experience from MedTech projects. The entrepreneurial team values network and relationships as intrinsic motivational factors, which has contributed to building mutual trust in the startup. Given the entrepreneurial team's background as professional athletes, this has also shaped their cognitive minds to be extremely result-oriented, which has also been a driving force for their entrepreneurial motivation. In combination with their ability to be steadfast and persistent, the entrepreneurial team has been motivated and confident in that this is a technology they will be able to develop, even if they do not have an education within the technological domain or long experience of medical technology development.

The entrepreneur behind Delta startup is a doctor and possesses a Ph.D. in clinical medicine, including some management and strategy subjects. The entrepreneurial motivation for Delta startup was intrigued by the intrinsic value of using his/her academic expertise to develop better solutions than was existing on the market: *"So, one can say that the disciplines have triggered the motivation behind being part of the startup".* In addition, it was also clear that his/her knowledge was able to contribute to making other people lives better by creating a better solution in the market.

The CEO behind Echo startup possess two master's degrees, one in business development and one in marketing. Echo startup started as four students who met through their studies at the university, and all of them were not intrigued by getting a job in larger companies. This was in in a sense the motivation for the entrepreneurial motivation behind Echo startup, including their academic background and interest in the field. This is typical factors that Nikiforou, Zabara, Clarysse, and Gruber (2018) points out as entrepreneurial motivational values among academic entrepreneurs. The entrepreneurial motivation behind Echo startup was characterized by

intrinsic values such as their freedom and ability to control their own life. Parallel with this they were motivated by being in a position where they had to be creative in order to reach their goals.

5.1.1.1 *Summary of the entrepreneurial motvation*

All of the entrepreneurs were either motivated through being a part of a university environment that promoted entrepreneurship, or their ability to commercialize their academic expertise. They are characterized by high ambitions, willingness to persistence, and a wish of being on the creative side of a business instead of as an employee. They wanted to do something creative with their lives, and none of the entrepreneurs seemed to be triggered by money. Instead, all of them has intrinsic values in the form of developing new things based on their academic level of stimulation from their university environment. Alpha startup and Delta startup are typically motivated by their academic level, while Beta startup, Charlie startup, and Echo startup were stimulated by crucial personnel, recourses, and co-students with another academic background that they interacted with through their master's program. The last similarity between startup companies is that since they have a higher education, it seems that complex challenges stimulate their cognitive work processes. This is also reflected in the fact that everyone is motivated by developing a startup company instead of going to a company and getting a competitive salary.

5.2 Evaluation of the business idea

When being an entrepreneur, you are driven by the ability to identify an opportunity and turn it into a profitable business idea. In this process, it is essential to identify, pursue and develop critical factors that need to be in place for the startup to succeed. This often happens through research and working with the business idea in correlation with the market. Evaluating a business idea requires knowledge and determination, and especially within creating added value for potential customers. This can, for instance, be that the customer will increase their revenue, provide better customer service, or more efficient operations which in turn will be cost-saving. As an entrepreneur, it is vital to analyze how you meet the criteria that the idea worthwhile to continue focus on.

5.2.1 Alpha startup

Alpha startup evaluated their business idea by developing a market-oriented product and business model, which can be linked to that Townsend (1976) says that innovative startups need a close collaboration between user and innovator. It also seems that the totality of the business case and the right combination of expertise in the entrepreneurial team that covered the technology in their product was outstanding.

The success of Alpha startup could be determined from the technical expertise in the founding team, and their first interaction with the market, including being able to utilize technological knowledge (Kulvik, 1977). This can also be linked up against that Ringel, Zablit, Grassl, Manly, and Möller (2018) says that influential innovators today are more than twice as likely to outsource access to the right knowledge to reach their innovation goals. One could say this were the foundational factors for how they executed their business strategy. Alpha startup operated within the microcontroller industry, and everybody in the entrepreneurial team had a master's degree in electrical engineering. So, from the beginning, the startup was based on the knowledge that regarded their technology. As defined by Schumpeter (1942) from an early phase the entrepreneurial team behind Alpha startup saw that they were able to innovate existing products and make them even better.

In order to become a successful entrepreneur, the product or service has to be continually developed, and the business development must correlate with this. An option is always to pull out the plug and go into harvest mode. At this point, the product might be able to live in the market for some years, but at some point, the market response will stagnate, and you are in the death spiral. As pointed out by Alpha startup: *"Sometimes you have to conduct larger development processes, a bit of the problem is that looks like you are standing still, but it must be done periodically."*

Alpha startup evaluated their business idea by developing a 3-5-year innovation platform that was the "state of the art." The reason for the horizon is that Alpha startup focused on incrementally better products on their platform, and when they needed more radical changes, they develop the whole platform over some time. By reflecting upon this in regard to the theoretical framework, Alpha startup is the only case that has mapped out its development

process over a long-time horizon. Therefore, it is important to mention that Cooper (2018) says that major innovation ventures maps out their development process over a five-to-seven-year horizon. Alpha startup had a robust innovation strategy that was based on continually developing the product. This can be linked to that Rahman et al. (2018) says that in order to manage a quality product a variety of tools and structured techniques can bring all the elements of the product life-cycle from conception through prototyping to a final product-market-fit situation. This statement can be further investigated by taking a look at the innovation diamond in the theoretical framework (Cooper & Kleinschmidt, 1996).

Alpha startup developed its product by engaging with potential customers from an early stage. They started to sell their product without having a final product. They went to customers and sold in their concept to clarify the market and to be able to develop the product based on customer needs. The evaluation process for Alpha startup was to conduct detailed market and technical pre-research before engaging the physical work of the product development (Cooper & Kleinschmidt, 2007). By having this focus Alpha startup was able to develop a new product innovation strategy that laid the foundation for their resource management.

Cooper and Kleinschmidt (2007) argue that successful startups possess a product innovation strategy, driven by the leadership and its strategic vision for the startup. The innovation strategy in the context of Alpha startup included the product technology which defined the major development initiatives, including having a clear vision for the time horizon for their development process. As a startup, Alpha startup was very careful about creating a quality product or service that met the market requirements. The product that Alpha startup developed was very current when it was launched in 1995, but today the same product would never survive in the market because as pointed out but Rahman et al. (2018) yesterday's customer needs are not the same as today.

Even though Alpha startup developed a product that would not survive in the market today, they had a clear product strategy. They were in the electronic industry where you have to develop your product continually, so you do not get run off by competitors. Therefore, Alpha startup had a continuous focus on learning from customers by getting feedback. Specifically,

they focused on what was missing, if there were things with the product that was not appropriate. So, the innovation strategy for Alpha startup was to have a constant focus on improvement based on customer needs and technological possibilities.

5.2.2 Beta startup

Being able to focus on allocation of recourses from both funding and human capital in all functional areas to improve the product development process, was viewed as essential to evaluate the business idea for Beta startup (Cooper & Kleinschmidt, 2007). Beta startup focused on building up an incredibly extensive network that has been maintained for a long time. The network consists of different people with skillsets that could be interesting for their project. Their network consists of professors from the university, knowledge within intellectual property rights, electrical engines, and finance. They have also used the Innovation Norway mentor program, but the majority of the relationships in the network has been established from people whom Beta startup have called throughout the time.

Beta startup is a motor company, and from an early phase, they have focused on mapping out what kind of companies who have been in the same position and established contact with them. The strategy behind this was to contact key people from these companies who had been in a startup period to teach from their mistakes. The strong representation of external actors made it possible for Beta startup to build a systematic approach to the management of their resources. Cooper and Edgett (2006) define this as a startup that sees R&D as an investment.

5.2.3 Charlie startup

The Entrepreneurial team behind Charlie Startup met each other through the NTNU School of Entrepreneurship and got an excellent relationship from the beginning: *"We felt, in a sense that our team have the network to develop this startup. We felt that this was something we could achieve without knowing how difficult it is to make such a type of technology"*.

As a student at the entrepreneurship program, one of the main subjects is to validate if a business idea is viable or not. This is an intensive process where the students are forced to initiate contact with the market from the initial phase (Globe et al., 1973). In order to validate the business idea,

the Entrepreneurial team investigated what kind of technology they needed to develop to create a functional product and exposed it to potential customers. In the best product development processes, Cooper and Kleinschmidt (2007) say this a method that is being used to achieve bot specific market and technical assessments. At this point one person also distinguished himself as a champion role, as described by Clarysse and Moray (2004) and Rasmussen and Wright (2015) in theory chapter about team formation and evolution.

From an early phase Charlie startup satisfied three of Townsend (1976) characteristics of a successfully innovative venture which was:

- Close collaboration between user and innovator
- Well-defined market needs
- A technical champion
- A highly developed screening and testing procedures

The entrepreneurial team behind Charlie startup consisted of team members that worked well together because of the same interests and shared a shared vision, which in turn has made the communication between the cofounders effective. Worth mentioning is when the startup recruited more team members their flat management structure was confusing because people didn't know which person to address as the CEO.

"We were very concerned with verifying the willingness to pay, and the willingness to pay by actually contributing with investment in the form of development capital."

What Charlie startup meant by the statement above is that the entrepreneurial team did not have any development expertise. Therefore, they were looking for development partners and used this as an integral part of their evaluation process of the business idea. Charlie startup got out of their office before even having a product and tested the willingness to pay. By doing this Charlie startup avoided inadequate pre-research as warned by Cooper and Kleinschmidt (2007). They focused on selling what they were doing and spent little time on qualifying ideas internally before trying to sell. They did in-house brainstorming to figure what could be something, and when they figured that out, they wrapped up a PowerPoint and started to sell their concept.

After many rounds of iteration on the business concept, they finally figured which concept the market demanded, a body-borne technology to prevent dehydration. As argued by Townsend (1976) Charlie startup had a close collaboration between user and innovator. It was with this concept that Trondheim and Oslo municipality said that they want to participate and contribute with development, and Charlie startup had identified a clear market need (Cooper & Kleinschmidt, 1987), which also according to Globe et al. (1973) is one of the six characteristics of successful innovation. Charlie startup evaluated the potential of their business idea by focusing on fast iterations with a strict go/kill culture (Cooper & Kleinschmidt, 2007).

"We were naive, but I am thrilled we started with what we did. Things changed very fast, and now we do not run technology for athletes, which was the plan in the first place."

Charlie startup has been very market-oriented and spent much time verifying the business case before investing a lot of money and recourses. First, they did feasibility studies on technology. In this process, they presented many concepts to potential large customers, but they were told to come back when they had something that could be tested. Based on this Charlie startup did not feel that there was no willingness from parties to invest to solve the problem. What Charlie startup then did was to iterate until they found out that much of their technology could be used to measure hydration, so they continued towards the sports market with inadequate response. After no luck they turned around and looked at dehydration among elders, which is a huge problem, and contacted some municipalities in Norway and got an excellent response. A month later, Charlie startup was granted an innovation partnership offer to create new solutions to prevent dehydration among elderlies with a limit of 15 million NOK to address the issue. This was the breaking point for the evaluation of the business idea for Charlie startup. Suddenly they were on the opposite side of the problem that they had struggled with from the beginning, and therefore the entrepreneurial team decided to go all in on the business idea.

Charlie startup had a very dedicated strategy and process for how they wanted to assess the business idea. According to Cooper and Kleinschmidt (1987), successful startups have a clear tendency to conduct detailed market studies to specify product/service attributes in an early phase. By looking at the theoretical framework much suggests that Charlie startup is the case that is most distinguished and has defined their market need and product specifications most effectively (Rahman et al., 2018).

5.2.4   Delta startup

From an early phase, the entrepreneur behind Delta startup contacted a person who had experience from a competing company. Talking to someone who had worked with partial the same technology in the past gave a significant benefit because via this person Delta startup came in contact with many other experts in the industry.

After this process, Delta startup began to actively engage with people who had worked with former competitors or similar technology. This was very important for Delta startup in order to understand how they could develop their project. Since others have worked with the technology without succeeding, it was possible for Delta startup to discover critical factors in an early phase that they could otherwise have discovered much later in the development*: "this accelerated the project very much, so I would say that this has been extremely valuable in pointing the case into observing the challenges we then discovered in 2014 which we really would not have discovered sooner in recent times".*

5.2.5   Echo startup

Echo startup has gradually evaluated their business idea through close cooperation with external contributors, their entrepreneurial ecosystem and an initial focus on selling a large quantity of their product through a crowdfunding campaign.

It was primarily through the crowdfunding campaign they evaluated their business idea. In a short time, they pre-sold products for well over one million Norwegian kroner, which was far above the entrepreneurial team's expectations. In this process, they proved for themselves that they were able to focus on the right things by developing a product that customers were willing to prepay for. An exciting reminder is that among the entrepreneurs in this research, Echo startup is the only one who evaluated their business idea through a crowdfunding campaign.

5.2.6   Summary of evaluation of the business idea

To summarize, in the initial phase of evaluating the business there is apparent similarities between the cases of doing an in-depth market analysis. Specifically, there has been a clear

focus on engaging with customers who are willing to contribute by buying the product in an early phase, in fact, as early as in the concept phase.

The next step, it is clear that it has played a significant role is to build a strategy in close correlation with an execution plan to see what kind of resources the startup needs to maximize their potential. Closely followed, it seems like it has been necessary for the cases to evaluate the business idea by having a strict go/kill decision process in order to develop the product in terms of the customer requirements. In close correlation with market needs external contributors has been helpful for the cases to define potential technological solutions. Lastly, capital has played a significant role by making it possible for the startups to conduct the necessary customer activities to evaluate their business idea.

5.3 The entrepreneurial team and challenges

Developing a startup is not a one-person job; it requires a comprehensive set of skills needed to commercialize a product or service. Startups from universities show some characteristics, for instance, that the entrepreneurial team knows each other from before through the university.

The entrepreneurial teams in this study show that the team size is dependent on the complexity of the startup. The more complex the technology is the more external partners, and agencies are included. Whether it is an academic startup or a regular startup, one thing is sure, there must be an entrepreneurial team that customers and financial recourses such as investors, banks and public funding believes in. Beside the importance of whether the entrepreneurial team covers the essential knowledge areas needed to develop the startup, and whether they have entered the right strategic alliances with, for example, customers and production partners. This is where the importance of a champion role takes place because the champion role in the startup can map and analyze which resources and human capital the entrepreneurial team must possess. Especially in order for the product or service to be taken from conceptualization to production and delivery to customer through an active process.

5.3.1 Alpha startup

When Alpha startup decided that they were going to create an entirely new product they looked on individual elements on the product to identify the right knowledge*: "In terms of knowledge that differentiated the product, we had to make sure we had this in-house".*

Specifically, they looked at what kind of components that were off-the-shelf, and individual modules in the product that had to be custom made. After they had identified the components and how to acquire them, they evaluated what was not very complicated engineering but would take some time, and what was core functionalities. Then they balanced the knowledge by buying components and outsourced basic tasks they could themselves but didn't provide value creation, so they solely focused on the development. At an early stage, they revealed what knowledge resources are available in the startup and what should be taken into account when recruiting new team members and mentors.

The entrepreneurial team behind Alpha startup was a pure engineering team originating from a university environment that was self-taught in business development. By being a pure engineering team within electronics, Alpha startup was able to turn their technical knowledge into a commercial product. As described by Civera, Meoli, and Vismara (2018); (Müller, 2010) academic startups from a university seek to commercialize their knowledge.

During their studies, the entrepreneurial team behind Alpha startup used a large part of existing processor technology, and they quickly saw that they could create at least as good or even better products. Also, there was slightly different qualities and characteristics between the entrepreneurial team concerning human types. Alpha startup was a small startup with growing opportunities for developing skills in business development. When the startup experienced growth, it opened possibilities for the entrepreneurial team to develop their skillsets. In this case, the majority of the entrepreneurial team had a desire to develop their skillsets within business development to capitalize better on their knowledge.

Eventually, Alpha startup recruit some staff functions. First, there was an HR team that had an HR background, and two economists who were economists concerning running finance and towards corporate. It was only after Alpha startup became a large corporation that they started to refill the team without engineering background: *"In a startup, one must always consider when hiring someone; what is the background that the person should have, and with this case, it took a long time before it was not within engineering. First, we focused on increasing the core competencies of the entrepreneurial team"*.

For Alpha startup, it was vital to have an excellent idea to build on, and that the entrepreneurial team was able to turn the idea into a product. In order to manage this, it is vital to have initial contact with the market with as few recourses as possible. What is unique with the entrepreneurial team behind Alpha startup is that they developed the necessary skillsets that they did not possess. As mentioned earlier they developed their skillsets within business development, but they also developed their financial- and legal- skills. In the case of Alpha startup, they focused on having an interdisciplinary team in the sense that they had the areas mentioned above represented within the core team. In an early phase, one cannot afford specialization; therefore, Alpha startup felt it was essential to represent specializations in as few people as possible.

At the early phases in a startup, there is incredibly effective communication because there are so few team members and the structures are very transparent. As the startup grows their effective communication stagnates, that is when one understands the value of having a system of communication in place. For Alpha startup, it was essential that the team members were working together in the same office and having enough capital for salary. By being able to work together every day without any of the team members having a part-time job they managed to maintain effective communication. One could say that the entrepreneurial team behind Alpha had a strict go/kill decision process from the initial phase to ensure that the entrepreneurial team made the right choices from an early stage (Cooper & Kleinschmidt, 2007). This made it possible for the entrepreneurial team to validate their work along the way.

5.3.2   Beta startup

Beta startup has had a rather small focus on commercialization until now: *"What happened when we received heavy funding was that we were able to build a large team."*

It has been more about it confirming the technology in general, which in practical terms means that the startup has solely brought in people that are specialist in designing and building the technology they focus on. Beta startup wanted to build up expertise in the areas the entrepreneurs lacked competencies. By receiving funds in a critical period, Beta startup was able to set up a factory with the necessary knowledge they needed for commercialization. They have the technical expertise to design the product, and they have a specified product development process. When specs come in from customers, it goes down to three engineers that focus on the engine design and mechanical design. After that, the production process goes further on another engineering team that focuses on the production method and equipment. Based on this Beta startup have all the knowledge they need on technical design, building, testing and selling the product (Cooper & Kleinschmidt, 2007).

On the management side Beta startup has brought in an expert on building teams, this person is not involved in the product development, but focuses on what each individual in the entrepreneurial team are good and bad at. Based on this he/she gets the technical people to work together by ensuring that the entrepreneurial team moves in the same direction. This dedicated person organizes the team and can be viewed as a chief operating officer, he/she is an engineer and has worked as a CTO in an electric car company before joining Beta startup. The entrepreneur behind Beta startup is working as a CEO with a focus on developing the startup with a sales division that consists of industry experts who have many years of experience. These are typical features that successful academic startups who accomplish international sales are possessing or focusing on from an early phase (Bjørnåli & Aspelund, 2012).

The challenges Beta startup has had regarding the entrepreneurial team is managing the work processes, communication and make the entrepreneurial team to use the same documentation methods*: "I recommend having a person with the sole task of organizing the team and ensuring that people do their job."*

5.3.3 Charlie startup

Initially, Charlie startup consisted of three entrepreneurs without any roles with the mission to find an idea that was worth continuing with. Which means the individuals in the entrepreneurial team did tasks based on what one was best to do. At this stage, person X stood out as a clear CEO type. This person was the one who ran the most important presentations and nurtured commitment in the team and as mentioned by Rasmussen and Wright (2015) was driving the idea forward. Person Y moved more towards the product development and focused upon user testing, while person Z has worked more towards business development, financing, and market strategies, and follow-up of customers.

Even though the entrepreneurs behind Charlie startup has defined roles today, they are still making strategic decisions as a team. In order for Charlie startup to be able to produce their product in-house, they have expanded the entrepreneurial team with a software department with three people and a hardware department with four people. Since they are a MedTech startup, they have two people working on risk control of medical equipment. Finally, they have expanded the team with a COO who has the responsibility for daily operations. The reason for bringing in the COO was first of all that the entrepreneurial team was not very good at daily operations. They like to be entrepreneurs and are skilled at finding opportunities, evaluate them and starting the journey towards commercialization.

Without an interdisciplinary team, Charlie startup would not be capable of developing and commercializing their product. It includes so many different technological domains, and within MedTech, it requires very much in terms of safety requirements. Based on this one could say that Charlie startup was dependent on an interdisciplinary team from day one to succeed with their project.

Until recently Charlie startup has had an unformal way of making decisions, but as the organization started to grow, they experienced that employees were uncertain about which person they should contact or relate to in different areas. A metaphor here is that when becoming a larger organization, the venture becomes a machine, so if some things do not work you can pull out a string and fix it, you have to continually work on the design of the organization to improve and become more efficient.

Another team challenge for Charlie startup is that as more work there is to be done the more pointed the business will be. You cannot take part in every particular level of the company, which is very hard when being an entrepreneur because you have been involved in all processes from the beginning. A critical factor here is that it seems like it was important for each team member to focus on their area affected other areas in the startup at a higher level.

5.3.4 Delta startup

Delta startup differs most from the other informants by consisting of a CEO and a technology transfer office from a Norwegian university from the beginning. Quickly after the team expanded with a chemist and a bioengineer, all of the team members had a lot of research experience and was supposed to develop the technology, but it took two years of development to find out that they did not have enough knowledge and experience as a first-time entrepreneur. Delta startup experienced that it is incredibly challenging to figure out such things in an early stage. After this Delta, startup strengthened their entrepreneurial team with a Chief Technology Officer and a Chief Product Officer, both with long experience from startup activities. Today the entrepreneurial team consists of an interdisciplinary team of 12 people, a highly dedicated advisory board and a board with active members who are researchers on the field.

5.3.5 Echo startup

"The team's professional background is somewhat homogeneous, which may be because we have met through joint studies".

The entrepreneurial team behind Echo startup has met each other through joint studies and consists of an interdisciplinary team within entrepreneurship and engineering, and marketing. The team is especially characterized by a positive culture that appreciate and promotes a good team spirit. Echo startup has experienced challenges with losing key personnel during critical periods. Including to some external challenges that are very industry-specific. Echo startup develops a hardware product which is reflected in the composition of the entrepreneurial team. The entrepreneurial team consist of a CEO who can viewed as a champion, an engineering team with a solely focus product development and shipping, and a marketing team.

5.3.6 Summary of entrepreneurial team and challenges

To summarize, there are definite similarities between the cases where each team member has played a critical role in the development of the startup. To further elaborate on this the diversity of educational background has provided the entrepreneurial teams with knowledge and network to access necessary human capital. It is also clear that by having human capital in the entrepreneurial team with technology-related educational knowledge provides a good foundation for innovation.

An apparent similarity between the cases is that they show some characteristics which make them different from other startups. The entrepreneurial team knows each other from before through the university, and there was a lead entrepreneur who was a project manager or leader during an assignment before the startup. Moreover, the entrepreneurial team has little contacts with outside their knowledge field; they also have little industrial experience. Nikiforou et al. (2018) say that most academic startups tend to start without human capital possessing relevant industrial experience. Research shows that investors, therefore, are critical against these kinds of ventures and are more likely to engage with academic startups if they can participate with a functionally professional team at the management level that replaces the original management (Clarysse & Moray, 2004).

The majority of the cases also view the importance of having a person with educational experience from management, for instance as a project manager during assignments or another process. Beta startup, Charlie startup, and Echo startup seem to be driven by a champion role who are able to convert theory into practice.

There are also apparent similarities between the teams in regard to communication and knowledge sharing as a team process variable. Meaning that when the entrepreneurial team processes convert team inputs into desirable outcome. All of the cases values and focus on processes that stimulate knowledge sharing across their team members. As the cases experienced growth in terms of more team members, it is clear that these processes need to be more focused and professionalized. Beta Startup suffered significant problems with communications and knowledge sharing as the startup experienced growth, but by having one person with the sole task of managing this the problem was solved.

5.4 The entrepreneurial ecosystem

As mentioned in the theoretical framework an entrepreneurial ecosystem consists of system components which provides knowledge to the startup. More generally, one can say that the entrepreneurial ecosystem constitutes an environment or a context for entrepreneurship.

5.4.1 Alpha startup

The entrepreneurial ecosystem as defined by Audretsch, Lehmann, and Menter (2016); Cunningham, Menter, and Wirsching (2019) consisting of reliable business infrastructures, access to investment capital, innovation culture, supportive policy systems, and universities was non-existing when Alpha startup developed their business. Although the term entrepreneurial ecosystem was not a focus area at the time, Alpha startup had a lot of cooperation and knowledge sharing with the academic environment from their university. Especially within physical electronics and computer architecture, which was the field of expertise in the entrepreneurial team.

By linking Alpha startups practical approach to the theory by Civera et al. (2018) saying that certain boundaries exist outside the startup which can contribute to knowledge creation, one could say that Alpha startup has used the component "university" from today's entrepreneurial ecosystem theory. As discussed by Korhonen (2004) universities role in the entrepreneurial ecosystem is to provide professional expertise within disciplines that startups can use to develop their technology. This can be related to the cooperation Alpha startup had with the different disciplines in order to develop their in-house competencies regarding the technical components in their product. The entrepreneurial team behind Alpha startup consisted of co-students from a current academic environment which was the same academic environment that they cooperated with and had knowledge sharing with. As pointed out by Civera et al. (2018) one of the advantages of being an academic startup is that they are often connected to a parent institution at a university with access to an informal network (Korhonen, 2004) that provides skilled human capital contributing with mentoring, information and identification of opportunities.

5.4.2 Beta startup

Beta startup, on the other hand, has a high focus on obtaining knowledge from the entrepreneurial ecosystem. Including external contributors helping with strategic matters regarding their product and business development. External contributors that have been especially critical from Beta startup is within the fields of:

- Intellectual properties
- Motor production
- Electrical machines and motors

All of these factors can be considered as strategic contributors that Beta startup has been dependent on to acquire the necessary knowledge to develop the startup (Nikiforou et al., 2018). The utilization of the entrepreneurial ecosystem has been so successful for Beta startup that they are still actively focusing on. Since the entrepreneurial team does not have an education within the field that the startup is built upon, they have been dependent on contact with the professors at their respective university, but also other universities in the world. The university in their entrepreneurial ecosystem has contributed with mentoring within business development, free office spaces, entrepreneurial training regarding pitching towards investors and public funding, and network within intellectual property.

According to Cohen (2006) theory about system components in the entrepreneurial ecosystem, Beta startup has used the knowledge from their university to create, disseminate, and further developed this knowledge to an innovative product.

Large leading companies in the production of electric motors have also provided necessary knowledge to further develop the innovation from the university environment, which as according to Korhonen (2004) can be defined as the informal network in the entrepreneurial ecosystem. Through collective behaviour and values Beta startup has initiated cooperation with common corporations in the entrepreneurial ecosystem to fully utilize the informal network defined by Cohen (2006).

5.4.3 Charlie startup

The complexity of the technology behind Charlie startup has forced the entrepreneurs to have a high degree of cooperation with the entrepreneurial ecosystem: *"but one can surely be even more proactive to utilize those environments."*

Relevant university environment has provided vital information and knowledge that Charlie startup did not possess from before. They have used the entrepreneurial ecosystem very well, which is reflected in that they have a good overview of which system components they should related to their issues: *"Our mentors have been game changers for us. We are rookies, so we have to try to harvest knowledge where were we can."*

Charlie startup has been very conscious of what kind of knowledge they need in order to expand their business idea. To accomplish this, they have interacted with mentors that has followed Charlie startup closely over a year and provided them with technical expertise and business development. The cooperation between Charlie startup and their mentors has been so good that their mentors have also become investors and helped them with recruiting technical expertise.

Charlie startup has also been a part of an accelerator programme where they had access to technology mentors, industry experts. Other external contributors are professors from a university in Norway who is a worldwide leader on the technology behind Charlie startup, member organizations such as Norway healthcare and Norwegian smartTech cluster, and clinical environments at a significant Norwegian hospital. Through their study program at their university, they have also had mentors within business development, and in close cooperation with Innovation Norway, they have had mentors who have contributed with access to a talent pool with technical expertise, accountants, legal help and technical expertise. As mentioned by Neck, Meyer, Cohen, and Corbett (2004) in the theory chapter about the entrepreneurial ecosystem, these kinds of contributors play an essential role in startup growth because of their long experiences and knowledge.

5.4.4 Delta startup

Delta startup has been connected to the entrepreneurial ecosystem through discounted offices and cooperation with research institutions and academia (Civera et al., 2018). In the early stages, Delta startup cooperated with a technology transfer office in connection to their university. The purpose of a technology transfer office is to provide and connect skilled human

capital with necessary recourses knowledge to commercialize the startup. Delta startup is the only case in this research project that has cooperated with a technology transfer office, and according to theory by Clarysse and Moray (2004), it has potentially made it possible for Delta startup to receive critical help with patenting.

Delta startup also has an advisory board with experts within the disciplines the startup is based upon. This has been extremely valuable, considering the company's strategy and understanding of what is relevant for their customers. The advisory board has also helped to define the technology, which was hard to define before the advisory board was established. Worth mentioning is also that the advisory board is incredibly professional and have written articles about what the startup is working on.

The technology transfer office Delta startup has cooperated with has provided access to a talent pool through their university, with several master students who have been working on relevant issues regarding their market and technology. Today they are making use of the talent pool from the entrepreneurial ecosystem through working with researchers on the technology. This process can be directly connected to Neck et al. (2004) saying that entrepreneurs need access to qualified human capital to commercialize their product.

Delta startup has had a high dividend by being a part of Alep Oslo and Norway health cluster. Aleap is a non-profit incubator located in Oslo. The focus is on health startups where the purpose is to facilitate innovation and value creation by developing an ecosystem for ambitious health startups who wants to create new products better and faster. By being a part of Alep Delta startup benefited from collaboration in an interdisciplinary environment with a culture defined by proactive knowledge sharing. Norwegian Health Tech is a cluster representing health technologies that facilitate research and development, including industrial cooperation between research, industrial and health personnel. There is a high focus on market-oriented business development by facilitating clinical trials, testing, and verifications. By being a part of the Norwegian Health tech Cluster, Delta startup was in a knowledge transfer environment that stimulated to a high focus on business development and the international market. This was done through cross-sectoral collaboration, and networking and establishing relationships with

relevant stakeholders in a more global perspective. The Norwegian Health Tech cluster mainly focuses on linking startups with preferred partners so that they together can develop the most modern and up-to-date healthcare solution.

5.4.5 Echo startup

In the initial phases, Echo startup actively used mentors from their university with a focus on people who had prior experiences from startups. They started by just calling people that might have the competence in the field the needed help in*:" we have been involved in many processes where we take apart the business and evaluate everything we do. So, we have had many processes with external contributors, but we have not had it continuously. There have been more sprints with now we have to fix things up, and then we fix it and move on".*

As things became more structured, they started to understand which areas they lacked knowledge, and started to engage with Innovation Norway. Professional external mentors have helped Echo startup in many areas where Echo startup has been involved in many programs from Innovation Norway such as Tinc Silicon Valley, Entrepreneurial marketing in the New York and Nhack program in China. The way that Echo startup has used external contributors have been by sitting down to discuss issues with many experts over a long period: *"we have always had the external contributors as intensive processes, and right now we are a part of StartupLab and their accelerator program."*

If Echo startup believe they will achieve learning outcome and are motivated, they have a culture of "going for it". This also affects their possibilities to get the most learning outcome because one is genuinely interested in the topic.

Echo startup is the case that has been most active in using the entrepreneurial ecosystem as defined by Audretsch et al. (2016); Cunningham et al. (2019): *"First and foremost, I think that the entrepreneurial ecosystem at our university is the reason why we have come so far."*

It all started with mentors from their university program and the ripple effects made them establish contact with the right expertise staff, and affiliation with Engage. These are typical features of how a startup can take advantage of the informal networks within an entrepreneurial ecosystem (Korhonen, 2004).

Echo startup has also used some professors within the technical side who are affiliated with the Entrepreneurial team's school assignments. Because everyone on the team is from the same university environment, it has been essential for Echo startup that they could acquire the necessary expertise from the students and professors on campus. The startup was established while the entrepreneurial team was students, so master thesis regarding the startup has been written together with the university and obtained competence from professors. The entrepreneurial team are still interacting with professors for knowledge transfer, where the university provides a workshop with free components, and labs for testing.

By having one-year free office space after graduation with closeness to their university its professional and support services made Echo startup able to get on their feet before going out into the big world: "*If we were to move and pay for an office after graduation it could be the point where we had considered that we might not do this. Because it had just become too much in everything else, so, the trampoline we got there has been very important to get us on our feet*".

This was very critical for Echo startup because they were not in the market at this point, and they had almost no money. This can be viewed as Professional and support services in the entrepreneurial ecosystem associated with echo startup. Key personnel and recourses have provided inputs that have helped the startup with a finished product (Cohen, 2006). During their incubation phase at their university, they have cooperated with the necessary disciplines regarding their product. Schick, Marxen, and Freimann (2002) point out the importance of finding mentors in the startups industry, which can be reflected in Echo startups sole focus on getting advisory from relevant technological disciplines and mentoring from the co-founder's academic background.

5.4.6 Summary of the entrepreneurial ecosystem

A common denominator in all of the startups is that their university in the entrepreneurial ecosystem has a strong focus on sustainability. Mihelcic et al. (2003) say this substantiates the success of universities role to educate future academic entrepreneurs. All of the cases have been tested and developed themselves as academic entrepreneurs in an early phase by starting their academic startups, which has been done by bringing technological knowledge that has been nurtured through their university to the market.

All of the informants except Alpha startup is characterized by the lack of technical expertise which has affected the startups dependence on the entrepreneurial ecosystem. They have had a high focus on gathering knowledge from external contributors from the conceptualizing phase to where they are today, which is evident among through their cooperation with master students regarding technical issues. There is an influential innovation culture in the entrepreneurial ecosystem across all of the cases, and as Civera et al. (2018) explains there are certain boundaries that exist outside the venture but within the regional context that has contributed to increasing the competitiveness of the startups, especially in terms of Beta and Charlie startup. Active use of the university's resources has been a focus in an early phase, and the university has contributed to the entrepreneurial ecosystem by removing institutional barriers and provided knowledge through its network.

To summarize the importance of the entrepreneurial ecosystem, the startups had access to advisory services that included IPR, Business law, Entrepreneurial strategy, design, business planning, financing. The startups have actively relied on their informal network for advisory and mentoring to develop their startup. The formal network as defined by Cohen (2006) is also strongly represented in the case of Echo startup who has been provided free office facilities through their incubator at their university. Through this incubator, they have had access to the Engage network, a center for excellence education in Entrepreneurship.

Being connected to a university provides on-location and closer relations with other students and entrepreneurs, which are likely to increase access in the form of recruiting the technical students that are needed. Newly formed student startups are close and offer expertise continuously in technology development within automation, mechanical design, manufacturing, electric systems, and entrepreneurship. Here the startup has access to a talent pool, which in turn stimulates to interdisciplinary teamwork through cooperation across disciplines which promotes sustainable development for both the startup and the university. As mentioned in theory chapter regarding the entrepreneurial ecosystem, Cohen (2006) defines this as a value-based network. Based on this the staff at their respective university contributes with excellent access to entrepreneurial mentors, academic experts on business development for day-to-day guidance, including the booking of meetings with external contributors within different

disciplines. This also involves an Alumni that contribute with experience in a variety of technological and commercial fields.

5.5 Case analysis summarized

Themes/startups	Alpha startup	Beta startup	Charlie startup	Delta startup	Echo startup
Entrepreneurial motivation	**Academic level:** PhD in electronics. **Other factors:** No hard financial-obligations.	**Academic level:** Master's degree in business development. **Other factors:** The complexity of the business case.	**Academic level:** Master's degree in business development. **Other factors:** The entrepreneurial teams background and interest in the field.	**Academic level:** PhD in clinical medicine. **Other factors:** The urge of commercializing knowledge.	**Academic level:** Double master's degree in business development and marketing. **Other factors:** The urge to create their own job.
Evaluation of the business idea	a market-oriented product and business model.	Network of knowledge recourses.	Early contact with the market.	Interacting with people with prior experience regarding the same technology and failed.	Crowd funding.
The entrepreneurial team and challenges	A pure engineering team from a university.	Business development and engineering.	An interdisciplinary team covering booth the business and technical side of the start-up.	An interdisciplinary team with lack of experience.	An interdisciplinary team covering production, sales and marketing.
The entrepreneurial ecosystem	Knowledge sharing with the academic environment.	Close cooperation with the university, academic environments and large corporations. Innovation Norway. Public funding.	Mentors within technical expertise, Tech clusters and a large customer who also has contributed with market input. Innovation Norway. Public funding.	Cooperation with a technology transfer office. Advisory board with relevant researchers from the university. Innovation Norway. Public funding.	Knowledge transfer with professor and students. material resources from the university. Innovation Norway. Public funding.

6 Discussion

Based on the theoretical framework and the analysis, in this chapter the findings are discussed and what they implicate.

The factors that may be involved during developing a successful academic start-up will be discussed based on the sub research questions mentioned in the introduction chapter. As we have seen in the analysis chapter, these factors can be many and complex. Nevertheless, the analysis has revealed some common topics that are continually being highlighted as crucial for academic startups.

6.1   What is the right composition of an entrepreneurial team?

In the theoretical framework Clarysse and Moray (2004) defines the champion role as a person who takes initiative for the development of the startup. My interpretation is that there has to be a person who stands out as the champion role who naturally focus on the leadership of the startup. More detailed, it is essential that this person manages to create a positive culture of innovation; able to hold the other team members responsible; ensures that the team always has the necessary resources, human capital and funding that is needed to innovate their product or service.

Four out of the five cases stood out as having a champion role from the beginning who is the CEO of the company today. My informants say that this person had a holistic vision for the startup from day one, including ensuring that the entrepreneurial team possess the resources and capital they need at any given time. A clear common factor among all of the cases was that this person was not deeply involved in the product development (meaning that it was not one of the core tasks of this person) but was able to understand the technology behind the product / service to such an extent that he / she could lead the entrepreneurial team forward. The reason for why the CEO was not deeply involved in the product development processes can be explained by that all of the cases had one engineer on their team who was responsible for the

product development process. A common characteristic of all of the engineers was that they are an entrepreneur by heart, meaning that they wanted to create something bigger for themselves and others, and of course a high dream of becoming their own boss. This shows the importance of having a person in the entrepreneurial team who is purely responsible for the product. What could be interesting to do more research on in the future is how the engineer and the CEO cooperates in regards of defining the customer's needs, especially when then CEO is not deeply involved in the product development processes.

Both the empirical data and the theoretical framework supports the fact that successful academic startups are innovation oriented. Van Muijen (1999) says that a typical characteristic of innovation-oriented teams is that control is neither possible nor required, because commitment and involvement is expected. The empirical data doesn't support this statement due to lack of experience in the entrepreneurial team. In other words, my interpretation is that there has to be a champion role that can hold a rigid management structure, as long as it doesn't inhibit the entrepreneurial teams' ability experiment with how they can commercialize their knowledge (Corman, Perles, & Yancini, 1988; Hessels, Van Gelderen, & Thurik, 2008; Roberts, 1991; Wiklund, Davidsson, & Delmar, 2003).

Further, a clear common feature among all the cases that correlates with the theoretical framework was that their entrepreneurial motivation was based on their urge to commercialize acquired knowledge from their university (Nikiforou, Zabara, Clarysse, & Gruber, 2018). The educational choices for the entrepreneurial team was also rooted in their personal interest of their field, and not potential future career or salary. This seems like factors that makes it easier to establish the right entrepreneurial team from an early stage, which in many of these cases started as school assignments, which meant that the entrepreneurs had to test the team dynamics before they intended to start an academic startup (Hytti, Stenholm, Heinonen, & Seikkula-Leino, 2010). Another way of interpreting this is that the entrepreneurial team had extensive experience from working together in previous school assignments and have over time built up a good friendship before deciding to initiate a startup from a university environment. As the friendship shaped itself through social interactions during the studies, much of the friendship bases itself on the common interests in the academic field, which in turn makes it easier to

develop a common vision for a startup, because it is based on their common knowledge and interest of innovating better solutions in the field.

To summarize, the academic background of the entrepreneurial team seems to directly affect their intrinsic motivation innovate better solutions based on their knowledge. The other aspect worth noting is that being a part of an academic environment with a high focus on entrepreneurship in itself can be a motivational factor for becoming an academic entrepreneur (Bercovitz & Feldman, 2008; Stuart & Ding, 2006). This is also reflected in the empirical data where the majority of the academic startups where are a part of an entrepreneurship educational program.

Overall, it seems like interdisciplinarity in the entrepreneurial team is an essential part in shaping a successful entrepreneurial team, but the hard part is to define at which stage in the development process interdisciplinarity is necessary. The empirical data proves differences in terms of what kind of people and skillsets the academic startups possess, something that is not so unnatural because all of the cases in this study operate in different industries and with different technologies. In order to better interpret the timing of interdisciplinarity, I criticize this study because it focuses on a wide variety of startups that make it difficult to draw parallels to which phase the startup should have an interdisciplinary team. What this study shows is that the interdisciplinarity behind the entrepreneurial team depends very much on the complexity of the technology that the startup company develops, which industry they are targeting, existing core competencies, timing of commercialization and growth, and early contact with the market. As mentioned in the analysis chapter Alpha startup was the only case in this research that was a pure engineering team a long time after they had commercialized their product. It was only when the company experienced great growth that they filled up with staff functions such as HR, finance, law, and finance that are academic areas that accompany growth.

In fact, Alpha startup was established in the mid-nineties while the other cases have been established over the last seven years. The empirical data show that the presence of an entrepreneurial ecosystem was weak when Alpha startup was established. My interpretation is that this may have influenced Alpha startup's ability to meet other students outside their field

of knowledge which could complement the entrepreneurial team with finance, business development, sales and market development expertise from an early stage. But there is no empirical evidence that supports the right time of developing an interdisciplinary team.

What is safe to say is that the empirical data contradicts the theoretical framework saying that homogenous entrepreneurial teams results in knowledge gap that will have negative impact in the startup (Bjørnåli & Aspelund, 2012). It can also be interpreted that academic startups with a strong connection between the level of competence needed to the develop their product doesn't need interdisciplinarity in the same degree as others. This can especially be linked to Alpha startup that developed a product that was of very high complexity, and as shown in the analysis chapter the pure engineering team used their competencies from the university to solely focus on developing a new product. High technology products tend to be sold to large companies where knowledge about the technology is the key selling point. Maybe Alpha startup was a special case because of their superior knowledge about the technology, or whether it was how entrepreneurship worked in Norway during nineties. Therefore, maybe one cannot compare the relevance of an interdisciplinary team in Alpha startup with the other cases in this study. According to Nikiforou et al. (2018) The weakness of being a pure engineering team is that you have little contact outside your knowledge field, and that this affects financial resources of being negative to the startup. Alpha startup doesn't match this point of view from the theoretical framework, because as a pure engineering team they were able to become a world-leading manufacturer with their technology before they became an interdisciplinary team Therefore, I am critical of the selection of my cases because these should perhaps have been in the same period, but at the same time this gives a good comparison basis on how startups from a university environment have developed over time.

The empirical data also shows a different point of view on an interdisciplinary composition of the entrepreneurial team. In the early phase of the development process the entrepreneurial team seems to be based on the individuals, who has personal interest in the specific industry and that saw an opportunity in the market. Once an academic startup is moving out into the market to confirm the technology or customer needs, a clear common factor is that everyone has had to bring in more human capital that possesses the needed knowledge gap to develop the product / service. This can be interpreted that the entrepreneurial teams who does not possess education

within their technological domain is more dependent on an interdisciplinary team. This does not necessarily have to be a weakness but based on the empirical data, it requires persistence from an early standpoint. Meaning that there are clear commonalities that successful academic startups have a plan for how the entrepreneurial team should develop in line with the customer side and technology. This involves validating the market in parallel with how the technology can meet customer needs (Rahman, Tahiduzzaman, & Dey, 2018), in combination with a tough go / kill culture (Robert G. Cooper & Kleinschmidt, 2007), my interpretation is that it is clear that these factors enable academic startups to see which areas of knowledge they have to obtain in entrepreneurial team.

The theoretical framework covers the importance of having the right composition of human capital, industrial experience, involved as a top management team (Clarysse & Moray, 2004). The empirical data shows that this is very context dependent, where none of the cases has engaged with a top management who has taken over the management of the startup. Another way of seeing this, is that this theoretical perspective is more appropriate for established ventures who focus more on profitable growth. Therefore, I argue that the effects of entrepreneurial team composition characteristics of academic startups are unique compared to established ventures. One interesting finding in this research is that composition of the entrepreneurial teams is related to the complexity of their product/ service. The results indicate that the composition of the entrepreneurial team from a university environment benefits from having people with education, high degree of knowledge, and interest within the technology and market of the academic startup. By linking this to the statement from Clarysse and Moray (2004) mentioned above, this research argues that replacing the entrepreneurial team with a top management team is not necessarily smart at an early point. This is rooted in that the individual characteristics of the different team members in an academic startup develops a collective culture and a team that could lead the startup to a higher firm-level performance. Based on this research, one can say that the entrepreneurial team needs interdisciplinarity in the sense that it covers the areas of knowledge that the entrepreneurial team has foreseen as necessary to achieve their goals. It seems like interdisciplinarity in the entrepreneurial team nurtures higher quality and more innovative outcomes. This can be explained by the fact majority of the cases in this research didn't covered the necessary areas of knowledge, which increased the importance of having a higher degree of access to a knowledge pool, which in turn makes the company equipped to meet unforeseen challenges (Van Knippenberg & Schippers, 2007).

There is a clear similarity between the empirical data and the theoretical framework that the right composition of an entrepreneurial team in an academic startup consists of people who wants to become entrepreneurs. Meaning that they are willing to take risk and are skilled at finding opportunities and evaluate how they can start the innovation journey (Ronstadt, Vesper, & McMullan, 1988). A critical finding in this study is therefore that interdisciplinarity in the entrepreneurial team is important for startup companies in the sense that the knowledge resources in the company are related to the innovation strategy. In order to develop and manage such a strategy it is clear that the entrepreneurial team needs a champion role who is responsible for facilitating the interdisciplinary team in the right direction.

The findings indicate a high importance of receiving funds in an early stage. This is especially reflected in how the composition of the entrepreneurial team in these cases have developed in a very short time. All of the cases are characterized by having a person (champion role) in the entrepreneurial team that has a constantly focus on future opportunities, which has ensured that the startup company has received capital in critical phases. This has made it possible for the startups to strengthen the necessary knowledge they need for commercialization. This is especially shown in Beta startup, and Charlie Startup, which most likely had failed to develop the startup company without a champion role and an interdisciplinary team based on the opportunities of the startup company. This is mainly due to the fact that none of the team members had any kind of deep knowledge within technology they were developing. In addition, the products are of a high degree of innovation where there are many security requirements from the government. Another interesting reflection that is reflected in all the cases is that in parallel with the acquisition of capital, everyone has tended to acquire extra knowledge from external contributors, such as mentors, professors, student assignments, research environments, large companies. These external contributors show that they relate to specific problems that are relevant in a specific period of time. In all of cases, each team member is responsible for obtaining the knowledge they lack from external contributors, but it shows that it is the champion role that assumes natural responsibility for following up that the team members do this.

To summarize, it is clear that all cases have had a great focus on revealing their lack of knowledge at a very early stage. So that they are able to acquire the knowledge and skills needed to fill the knowledge gaps early on. Although it is clear that the cases had a focus on interdisciplinarity from an early stage, this study is critical of the generalizability of this standpoint. If, for example, one had only focused on student entrepreneurs who are the engineers who commercialized the acquired knowledge through their study program, one might have received another answer. This does not mean that engineering entrepreneurial teams never need interdisciplinarity, but they do not need an interdisciplinary team until further out in the process where greater demands are placed on the administration and facilitation of innovation and development.

On the basis of this research project, one can also say that in the right composition of an entrepreneurial team, it is important to have a large focus on strategic management. As an academic startup, this might be the first experience the entrepreneurial team has with real working life. As an entrepreneur, one is then responsible for shaping how the management, culture and communication should be in the entrepreneurial team (Hill et al., 2014). Again, I would like to highlight the importance of receiving funding in an early phase because all of these cases did not have any management experience which again is reflected that all of the cases have struggled with the same management problems;

- Defining people's skillsets
- Daily operations
- Knowledge sharing and documentation methods
- Effective communication across the entrepreneurial team

Early funding has made it possible for the cases to bring in external contributors such as mentors or human capital who has contributed solve the above problems so that the entrepreneurial team can focus on innovating and developing the startup.

6.2 To what extent does strategic planning for innovation affects the outcome of academic startups?

As mentioned in the introduction chapter prior research says that there is a positive correlation between strategic planning for innovation and performance from the entrepreneurial team, but there is less research focusing on the underlying processes for facilitation of innovation (Watts, Patel, Rothstein, & Natale, 2018), which this sub research question is intended to answer.

The empirical data and the theoretical framework indicates that close collaboration between user and innovator has a significantly positive impact on innovation (Robert G. Cooper & Kleinschmidt, 2007). Firstly, this research shows that close cooperation between the user and the innovator has great importance for giving the necessary information and knowledge the academic startup needs to validate the product/service, in regards of market potential, and the business model. The research project shows that influential innovators uses market potential and the business model as critical validating parameters to develop a sustainable startup.

Human capital in the entrepreneurial team also has a positive impact on how the academic startup strategically plans for innovation. Both the empirical data and theoretical framework supports that having technical expertise within the product/service, gives a much better basis for predicting future issues (Ringel, Zablit, Grassl, Manly, & Möller, 2018; Townsend, 1976). Based on the findings of this research project, this can interpret as a valuable source that can be used as a basis for the innovation strategy.

Since this research project concludes that knowledge and great interest in the field are the primary sources of how academic startups strategically plan for innovation, having experienced human capital in the entrepreneurial team will have a significant influence on the outcome of the innovation strategy (Ndonzuau et al., 2002). It is worth noting that this can also be negative because people with experience in a field often have preferences on how things should be done, which can result in a reluctance to change.

The entrepreneurial team's educational level also affects how an academic startup works strategically with innovation. Through their education level, academic entrepreneurs have access to consultation in the form of external experts from specialist environments that

contribute to concrete issues (Neck, Meyer, Cohen, & Corbett, 2004). This can also be interpreted that in order to create innovation in the future, the entrepreneurial team plays an essential role in developing mechanisms that expand the team's knowledge base.

The empirical data in combination with the theoretical framework supports that the above factors could potentially be the underlying factors used by academic startups to build an innovation platform. How far ahead this innovation platform extends is different between academic startups, but the common factor for all cases is that strategic planning for innovation enables the academic startup to focus on incremental changes, rather than bigger developments process along the way. The time period of the innovation platform should uncertain through this study, but as mentioned in the theoretical framework, Robert G Cooper (2018) says that large international innovative companies have an innovation platform spanning from 5-7 years.

6.3   How does successful academic startups make use of the entrepreneurial Ecosystem to cover critical knowledge gaps?

As mentioned in the theoretical framework an entrepreneurial ecosystem consists of a set of system components (Cohen, 2006), which provides knowledge to cover the lack of expertise in how the entrepreneurial team can turn their academic startup to a sustainable venture.

What this study has done is to build on theory by Cohen (2006) and link it to how academic startups use an entrepreneurial ecosystem to compensate for lack of knowledge, resources, human capital, and funding. Through this study, it is clear that none of the cases have managed to build up all of their knowledge in-house. To what extent, and what kind of knowledge that has been obtained from external sources varies from case to case. The most considerable degree of variation here is due to innovation-grade, technologically complexity and regulations within the industry in which the startup company operates.

Accessing resources from industrial partners and communicating to external investors is a challenge for academic entrepreneurs seeking to gain credibility for their startup, as there is a lack of expertise in the entrepreneurial team. The empirical data supports that can be solved

through collaboration and knowledge sharing with academic communities (Cohen, 2006). The lack of knowledge, experience, and education within the technology that is being developed has resulted in that successful academic entrepreneurs are in frequent contact with professors. An interesting observation through this study is that the academic startups that have had the greatest success and benefited the most from the entrepreneurial ecosystem, have focused on more than just one entrepreneurial ecosystem. They have mapped knowledge gaps and based on this contacted external contributor from ecosystems worldwide with expertise in the missing area.

Except for Alpha startup, none of the cases had a specific education within the technological domain on which the product/service was built upon. Based on this there is a common feature between all of the cases that they have been extremely dependent on their associated university in the entrepreneurial ecosystem. Without access to the knowledge and information that the university provides to the entrepreneurial ecosystem maybe not all of the cases would have managed to develop their academic startup. What is interesting here is to look at Alpha startup where there was no entrepreneurial ecosystem when they developed a startup business. Besides, they were a pure engineering team, so they already had the necessary expertise in-house to develop their technology.

There is a close parallel between the empirical data and theoretical framework that by using the right resources within universities, government, professional and support services, capital services and talent pool, academic startups can cover critical knowledge gaps in both business development and technology (Cabrera & Cabrera, 2005; Damodaran & Olphert, 2000; Davenport & Prusak, 1998). All of the cases have had relevant mentors from their disciplines at their university and has gathered experienced expertise through Innovation Norway's mentoring program which is an incentive from the Norwegian government to provide critical knowledge from experienced entrepreneurs and business leaders. There was no such program when Alpha startup developed their business, but all the other cases have taken advantage of this program, which has also contributed to network spin-offs (Bjørnåli & Aspelund, 2012), such as either new customers, team members, investors or industrial partners.

Academic startups are very concerned with knowledge-oriented business development (Civera, Meoli, & Vismara, 2018; Styles & Genua, 2008) therefore, this study argues that academic

startups have a greater focus on utilizing the entrepreneurial ecosystem compared to non-academic startup companies. By building on this claim, one could say that the empirical data supports that the motivation to acquire new knowledge, and continuously evolve is the fundamental factors to take advantage of the resources in an entrepreneurial ecosystem.

It is also a bright common feature that all the cases have been part of an incubator from an early stage, where they have been given access support services to get out in the market faster than they would make on their own. What one can ask critically about here is whether the cases have participated in the right incubators and at the right time in the development phase. The empirical data and theoretical framework are not able to answer to this, but it is something that could have been interesting to explore further.

Governments have become increasingly interested in contributing to entrepreneurial ecosystems through tax rates and incentives, which is done by providing financial support and grants. In this research the empirical data supports that academic startups strengthen the value of the startup through public funding before engaging with investors (Clarysse, Wright, Lockett, Mustar, & Knockaert, 2007). This is evident in this research project because all of the cases except Alpha startup have received minimum 1 million NOK in financial support from public funding at an early stage. An important note is that this happened before the academic startups started interacting with investors. This has especially strengthened the cases' competitive advantage in the negotiations with investors because, due to that they have already been validated the market. The cases have also extensively used professional support services that have contributed from legal support to IPR and agreements. These support functions have been engaged through their network at the university ecosystem (Neck, Meyer, Cohen, & Corbett, 2004). Meaning, that the cases have increased the severe image on the startup before the meeting with more substantial capital, which in turn stimulates investors to focus more on giving money in the respective entrepreneurial ecosystem. One can look at it as a collective process, the more severe and successful startups there are in one entrepreneurial ecosystem, the more investors and banks are attracted to this environment.

Being part of an entrepreneurial ecosystem and taking advantage of its resources makes it possible for academic startups to access qualified human capital. This is supported by the empirical data to be extremely important for the success of the startups. It can also be interpreted that it is the people behind the academic startups that have provided success and not the product or service itself that has been developed. However, academic entrepreneurs can obtain knowledge, talent pool, capital, and recourses such as office spaces and incubators from a variety of sources. I argue that academic entrepreneurs should access this through the university in the entrepreneurial ecosystem. As pointed out in the theoretical framework by (Civera et al., 2018); Styles and Genua (2008) this enables them to prepare for the vast business world.

It may seem that this research shows that the only role an academic startup company has in an entrepreneurial ecosystem is to make use of the resources, but that is not true. The academic startup must also contribute with knowledge into the ecosystem so that this knowledge can be even better, and useable for other startups through interactive learning (Lundvall, Joseph, Chaminade, & Vang, 2011). The empirical data is an excellent example of this because all of the cases have interacted with several actors in the university through alumni and mentoring towards other academic startups. First of all, they provide insight into the practical application of technical knowledge to other students, which in turn helps to recognize entrepreneurial opportunities.

Finally, it must be pointed out that universities play a crucial role in the entrepreneurial ecosystem, and both the theoretical framework by Audretsch, Lehmann, and Menter (2016); J. A. Cunningham, Menter, and Wirsching (2019) and the empirical data in this research shows stakeholders such as students, faculties; university leaders; investors; advisory boards; local authorities; startups and large corporations are the drivers of the entrepreneurial ecosystem. Therefore, one could say that a successful academic startup has to regularly interact with these parties in order to develop their startup and new ones (Asheim, Isaksen, & Trippl, 2019).

7 Limitations and future research

This study has several limitations. First, the geographical context affects the generalization of the findings to other cultural contexts. This study is limited to Norway where there is, as pointed out in the introduction chapter, a significant focus on academic entrepreneurship and the presence of an entrepreneurial ecosystem. What limits the comparison basis for this research against other countries is that countries are at different stages of economic and institutional development.

Also, worth mentioning is that there are significant differences in national innovation systems, which in turn will influence academic entrepreneurship. Although this is the case, future research can still be directed towards academic entrepreneurs across countries in order to see if there are any clear commonalities in how they use the available resources around them to succeed.

Another interesting factor that could have been interesting to research further is how the cognitive abilities of academic entrepreneurs are affected by the safety that comes from a unique entrepreneurial ecosystem. Furthermore, this can be linked to whether academic entrepreneurs in another country who do not have an equally good safety-net as Norway develops the startup company faster and more efficiently. This may be due to, for example, that they have no other choice because they are dependent on creating their own workplace and income.

Other limitations with this study are that the majority of the cases has been a part of entrepreneurial culture through their university which in turn stimulates their ability to commercialize their knowledge. Possible future research could draw comparisons and differences between an academic startup that is a part of an entrepreneurial program through their studies, with those who are not, such as Alpha startup in this study. It can also be used to conduct a historical analysis of academic startups to see how they have changed parallel to the evolution of the entrepreneurial ecosystem.

It will also be interesting to see how this has affected the composition of the entrepreneurial team. As shown in these cases, after all, Alpha startup was established in the nineties consisting of a purely engineering team.

Due to the scope of this task, I had to limit the study to some extent concerning what was relevant to investigate. Something I would like to have investigated more in depth is how academic startups strategically plan for innovation. This project results in a lot of useful findings in this area, but I think it would have been even more valuable if one had the opportunity to include more cases, if possible, about 50 academic startups. This might have made at better basis for comparison, and one might be able to conclude a clearer strategy for how to strategically plan for innovation. Besides, in order to get the best results, it would be precious to compare how academic startups do this compared to major innovative companies in the current entrepreneurial ecosystem. The large companies have much more knowledge and experience in innovation, and some of them even have big departments that focus solely on innovation. It is also typical that academic startups have little history in this area to refer to, larger companies have been through development processes that require innovation up to several times. This will result in a considerably much more extensive research project and might, therefore, be something suitable for a Ph.D. student.

8 Conclusion

Based on the theoretical framework, the analysis, and the discussion, I draw certain lines that can contribute to determining what characterizes successful academic startups. As this is a significant and comprehensive research question that involves many factors, the following research questions has been addressed:

 1) What is the right composition of an entrepreneurial team?

2) To what extent does strategic planning for innovation affects the outcome of academic startups?

3) How does successful academic startups make use of the entrepreneurial ecosystem to cover critical knowledge gaps?

In terms of RQ1, this study shows that strong leadership in forms of a champion role in the entrepreneurial team is vital to structure and develop an environment and culture that focus on innovation. First of all, one can conclude that the composition of the entrepreneurial team in an academic startup must be motivated by the opportunities to commercialize their knowledge. Closely followed with a champion role that plays a vital role when it comes to communication and knowledge sharing across the entrepreneurial team.

Although an academic startup needs a champion role that drives the future of the startup, this research concludes that the rest of the entrepreneurial can't behave like regular employees. Commitment is a critical factor in the composition of the entrepreneurial team, where each person is responsible for developing their area in line with their startup innovation strategy. All of the cases in this research are interdisciplinary and especially those who do not have a CEO with an engineering background within the technology of their product/service. Therefore, it is concluded that the entrepreneurial team needs interdisciplinarity in the sense that one covers the necessary engineering knowledge needed to develop the product/service.

It is essential to have the necessary knowledge needed to expose the product/service early in the market. If you do not have engineering knowledge within the product technology, the conclusion is that an academic startup can compensate with this by entering into strategic cooperation with experienced industrial partners who have experience in the product technology and the market. What is important here is that the partnership is not motivated by earning money, but by collectively creating the best possible product based on the market needs. This research concludes with having such a focus will stimulate knowledge transfer and knowledge spillover effects.

Briefly summarized, the most important thing is to cover the necessary knowledge within sales development and product development, then when one has gained a foothold in the market one can fill in with staff functions, unless one is in the market that has strict government regulations, such as MedTech.

In regards of RQ2, as mentioned in the introduction by Civera et al. (2018) the challenges regarding innovation are often related to identifying the right entrepreneurial team and the business idea. This research shows that knowledge-intensive development of startups can be stimulated through strategic planning for innovation. This involves complex sets of processes, resources, and communication between the entrepreneurial team from an early stage which iterates as the startup grows. There is much research saying that there is a positive correlation between facilitating for innovation and performance from the entrepreneurial team, but there is less research focusing on the underlying processes for the facilitation of innovation (Watts et al., 2018). The impact of organizational culture on innovation cannot be overstated. Strong leadership that develops a culture supporting innovation is pivotal. An environment that encourages communications and knowledge-sharing across organizational boundaries is vital. A culture is delivered by leadership, but also by the structures and procedures that are put in place. The cases in this research are small startups compared to large corporations, but ideas and improvements are continually pitched and shared across the entrepreneurial team. This is a critical characteristic of academic startups, which puts the startup in a position where they can do incremental changes. It is clear that academic startups have a high focus on knowledge sharing which in turn affects the processes of facilitating networks and new knowledge production within the startup.

It is evident in this research project that the cases have used innovation to bring forward their idea and evolve a marketplace. Especially there is a culture among the cases that encourage collaboration across the entrepreneurial team that has innovation as a core value in their working processes. The research concludes with that the innovation focus needs to be anchored in the people that are leading the entrepreneurial team. Again, the importance of the champion role has to be highlighted, because all of the cases had such as a person who also was the driving force for innovation. The research also shows that a champion role, often as the CEO, has a higher focus on innovation than the rest of the entrepreneurial team. Further, this puts the rest of the team in a position where they are all responsible for innovation in their area and how making sure that this affects the total innovation strategy for the startup.

This study shows that in order to nurture innovation all over the value chain it is vital that the entrepreneurial team communicates, share knowledge and challenge each other, which in turn stimulates effective development processes. Another vital part is that the entrepreneurial team need skillsets within mapping market trends and being able to predict potential innovation outputs in the years to come in their respective industry. This is also reflected in the fact that academic startups have close cooperation with customers in the development of their product/service. In combination with a tough go/kill decision-making process where the entire entrepreneurial team is involved in the process, it turns out to be the driving forces for how the business startups strategically plan for innovation.

Finally, the findings that correlate with RQ3, points out the importance of an academic startup to make use of their entrepreneurial ecosystem. During the early stages successfully, academic startups focus on covering their knowledge gaps from professional and supportive service to obtain fundamental knowledge regarding technology behind their product/service. The empirical data in this research project show that this is something that successful academic startups focus on before they choose to move on with the business idea. This can also be defined as the first validation phase of the business idea. This is often done before the customer contact is initiated. It is no secret that startups need capital in order to grow to develop their business, but the conclusion of this research shows that capable academic startups have a plan and goals attached to their capital requirements. This, in turn, strengthens their position against investors. It also evident that successful academic startups don't feel that they only can access knowledge

from their associated university's entrepreneurial ecosystem but focus on where they can access the right capital and knowledge regarding their industry. This study also concludes that the essential part of the entrepreneurial ecosystem is access to a talent pool of qualified human capital. This is due to that the academic startups in this research has a high focus on developing the business through the right human capital.

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Attachement A: Informed consent

Vil du delta i forskningsprosjektet?

" How to nurture innovation in academic startups"

Formål

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å innhente nødvendig informasjon om hva som karakteriserer oppstartsbedrifter med hurtig og effektiv kommersialisering. I dette skrivet gis det informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Hvem er ansvarlig for forskningsprosjektet?

NTNU, Institutt for geografi, master i entreprenørskap, innovasjon og samfunn.

Simen Roel Klafstad

Hvorfor får du spørsmål om å delta?

Du sitter med relevant kunnskap som kan hjelpe med å besvare forskningsspørsmålet mitt.

Utvalget er trukket fra oppstartsbedrifter som lever/har levd av sitt prosjekt etter graduering. Utvalget er definert ut ifra tips fra møter med veileder og andre nøkkelpersoner fra NTNU, samt egne refleksjoner. Grunnlaget for utvalget av informanter er personer fra bedrifter som kan bidra til å gi nødvendig informasjon som kan styrke mitt kunnskapsgrunnlag for å foreta gode kvalitative analyser.

Hva innebærer det for deg å delta?

Metoden som benyttes i masteroppgaven er dybdeintervju med en semistrukturert intervjuguide. Ved å delta i dybdeintervjuet vil det ta deg ca. 45 minutter og svarene dine blir tatt opp med en lydopptaker og deretter transkribert. Skulle det oppstå informasjon som er uklart i transkriberingen skal dette avklares med informanten. Sitatsjekk vil også benyttes slik at informanten på forhånd kan godkjenne og ha innsyn i hvordan de blir referert til.

Dybdeintervjuet inneholder følgende hovedområder:

- Informasjon om oppstartsbedriften og bakgrunn
- Det entreprenørielle teamet og innovasjon
- Det entreprenørielle økosystemet
- Kunnskap som kommer utenfor oppstartsbedriften

- Fra produktutvikling til kommersialisering
  Det vil også bli samlet informasjonen om informanten fra andre kilder som nettsider, registre og journaler.

Det er frivillig å delta

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

Ditt personvern – hvordan jeg oppbevarer og bruker dine opplysninger

Opplysningene du gir vil kun benyttes til formålene beskrevet i dette skrivet. Jeg behandler opplysningene konfidensielt og i samsvar med personvernregelverket. For å sikre at ingen uvedkommende får tilgang til personopplysningene vil jeg erstatte navn og kontaktopplysninger med en kode som lagres på egen navneliste som lagres på egen navneliste adskilt fra øvrig data. Deltakerne vil kunne gjenkjennes i publikasjonen med navn og selskapsnavn, om ikke dette er ønskelig kan respondenten være anonym.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Prosjektet skal etter planen avsluttes 15.05.2019. *personopplysninger og lydopptak vil da slettes. Gjennom prosjektperioden har også veileder tilgang til opplysningene.*

Informanten sine rettigheter:

Så lenge du kan identifiseres i datamaterialet har du følgende rettigheter:

- Innsyn i hvilke personopplysninger som er registrert om deg
- Å få rettet personopplysninger om deg
- Få slettet personopplysninger om deg
- Få utlevert en kopi av dine personopplysninger
- Å sene klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger

På oppdrag fra Simen Roel Klafstad masterstudent entreprenørskap, innovasjon og samfunn, NTNU, har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?

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

- *Simen Roel Klafstad (masterstudent)* ved 91 64 24 58 eller simen@alpilox.com
- *Markus Steen (veileder) ved 90 64 54 96 markus.steen@sintef.no*
- NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen

Simen Roel Klafstad

Masterstudent

Jeg har mottatt og forstått informasjon om prosjektet (how to nurture innovation in academic startups), og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i *dybdeintervju*
- ☐ *at opplysninger om meg publiseres slik at jeg kan gjenkjennes via navn, selskapsnavn og selskapets geografiske forankring)*
- ☐ *At min informasjon kan siteres (Ønsker respondenten å sjekke sitatene må det informeres om fra vedkommende)*

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. *15.05.2019*

(Signert av prosjektdeltaker, dato)

Attachment B: Interview guide

Introduction

Information about the research topic

- Master thesis in entrepreneurship, innovation and society
- Research questions
- Explain the purpose of the interview and Inform about anonymity and sound recording.
- Ask if something is unclear and if the respondent has any questions
- Start recording

Information about the venture and the background

- What is your role in the venture?
- How did you start the venture?
- Why did you start the venture?
- What do you define as a successful start-up?
- What is your education and academic experience?
- How have you perceived the role of a business manager, coach or mentor and board of directors?

Entrepreneurial team and innovation

- How have/did you structured the entrepreneurial team towards commercialization after graduation?
- What is your view on effective interdisciplinary management?
- Entrepreneurial Team opportunities and challenges in a startup?
- How do you identify key people with expertise that could assist your project to succeed?
- How have you focused on motivating your entrepreneurial team to nurture innovation in the startup?

The entrepreneurial ecosystem

- How did/do you utilize the entrepreneurial ecosystem?
- What will you say has been the most helpful part in the entrepreneurial system, and why?
- In what extent has the entrepreneurial ecosystem contributed with knowledge transfer and knowledge spillover for your venture?
- What have you done to validate the knowledge from the entrepreneurial ecosystem?

knowledge from outside of the venture

- What kind of external sources of knowledge has contributed to the development of your startup?
- How did/does your company collect this knowledge?
- What challenges have you had related to identification of the right sources of knowledge?
- Challenges regarding implementing this knowledge and apply it to commercial?
- Did you have a strategy for evaluating the knowledge and how to apply it for commercial purposes?

From product development to commercialization

- What are the most important prerequisites you have experienced bringing the venture to a viable business after graduation?

   Touchpoints

- How have you structured feature planning for the product/service and the venture?
- What kind of product functionalities should be exposed to users and customers to gather critical feedback?
- How did you identify Customer Needs and the first customer that was willing to pay?
- What did you do when you defined the final product or service specifications?

Simen Roel Klafstad

How to nurture innovation in academic startups – A qualitative study of successful academic startups

NTNU
Norwegian University of
Science and Technology