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A Multiple-Case Study on How Student Entrepreneurs Conduct Resource Development in Early-Stage Ventures Within a University Ecosystem

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Abstract

Universities are hubs for innovation and entrepreneurship, and there is a deepening focus on entrepreneurial activities and commercialization of university technology. Many students start ventures as part of their study program, or even as a co-curricular activity. Without profound work experience or established professional networks they manage to gather the resources they need for venture creation within the university ecosystem. This thesis embraces *how* student entrepreneurs manage to do that, by addressing two research questions: 1) How do student entrepreneurs go about early-stage resource development?, and 2) What is the role of the student entrepreneur within the entrepreneurial university ecosystem?

The method chosen for exploring the research questions is a qualitative multiple-case study. Four student-driven startups from The Norwegian University of Science and Technology were studied by the use of observations and semi-structured interviews, resulting in a cross-case analysis. Following, the analysis and discussion are carried out within a bricolage-framework that was created to this specific study, based on existing theory. The framework consists of three main elements: 1) Reliance on whatever resources are at hand, 2) Resource recombination for novel uses, and 3) Making do, relating to the student entrepreneur's ability to search for opportunities and solutions rather than acknowledging obstacles.

Findings suggest that student entrepreneurs actively use the "student-label" to build legitimacy towards different stakeholders. Furthermore, they create their own student ecosystem inside the already established university ecosystem, and consider other students and the student ecosystem to be the most valuable resource within the university context. Consequently, a bottom-up approach initiated by students in the development of the entrepreneurial university ecosystem is recognized. We therefore encourage further research on university ecosystems and student entrepreneurship to consider how the students participate in building the university ecosystem bottom-up, and how universities can enable this with physical facilities and economic funding from a top-down perspective. Lastly, student entrepreneurs are recommended to use other student entrepreneurs actively when navigating the university ecosystem, as that proves to be vital in using and developing (the right) resources.

Sammendrag

Universitetet er et knutepunkt for innovasjon og entreprenørskap, og det fokuseres stadig mer på aktiviteter og læring innenfor entreprenørskap, samt kommersialisering av teknologi. Mange studenter starter bedrifter som en del av et studieprogram, eller som en frivillig aktivitet utenom studieprogrammet. Selv uten arbeidserfaring eller et etablert nettverk klarer studenter å samle ressursene de trenger for å bygger bedrifter, innenfor universitetsøkosystemet. Denne oppgaven tar for seg *hvordan* studententreprenører klarer å bygge nye bedrifter ved å svare på følgende forskningsspørsmål: 1) Hvordan går studententreprenører frem i tidligfase-ressursutvikling? Og 2) Hva er studententreprenørens rolle innenfor universitetets entreprenørielle økosystem?

Metoden som er valgt for å besvare forskningsspørsmålene er en kvalitativ multi-case studie. Fire studentdrevne oppstartsbedrifter fra Norges Teknisk-Naturvitenskapelige Universitet har blitt studert gjennom observasjoner og semistrukturerte intervjuer, etterfulgt av en kryss-analyse på tvers av casene. Analysen og diskusjonen bygger på et bricolage-rammeverk som har blitt konstruert for denne spesifikke studien, basert på eksisterende teori. Rammeverket består av tre hovedelementer: 1) Bero på tilgjengelige ressurser, 2) Ressursrekombinasjon for nye bruksområder, og 3) Å gjøre det beste ut av det man har, som relateres til studententreprenørens evne til å søke etter muligheter og løsninger i stedet for å anerkjenne hindringer.

Resultatene tyder på at studentene aktivt bruker "student-kortet" for å bygge legitimitet mot ulike interessenter. Videre bygger studentene sitt eget studentøkosystem inne i det allerede etablerte universitetsøkosystemet, og studententreprenører vurderer andre studenter og studentøkosystemet som den mest verdifulle ressursen i universitetssammenheng. Følgelig anerkjenner vi en nedenfra-opp-tilnærming, initiert av studenter, i utviklingen av det entreprenørielle universitetsøkosystemet. Vi oppfordrer derfor videre forskning på universitetsøkosystemer og studententreprenørskap til å se på hvordan studentene deltar i å bygge universitetsøkosystemet nedenfra-opp, og hvordan universiteter kan fasilitere dette med fysiske fasiliteter og økonomisk finansiering fra et topp-ned-perspektiv. Til slutt anbefales studententreprenører til å bruke hverandre aktivt når de navigerer i universitetets økosystem, da dette viser seg å være avgjørende for å bruke og utvikle (de rette) ressursene.

Preface

Two incredible years at NTNU School of Entrepreneurship have come to an end, and we are proud to finalize our master's degree in entrepreneurship and innovation by delivering this thesis. The journey of the project has been as expected, exactly like a startup-experience. We started out by knowing nothing about the broad scope of the entrepreneurship literature. With high motivation and even higher expectations, we found ourselves in a deep ocean filled with concepts, frameworks and articles. Our studies on student entrepreneurs have granted us an even deeper understanding of our own progress as business founders, and we will keep all learning outcomes with us in our next chapters in life.

We would like to thank our advisors Karolina Lesniak and Roger Sørheim for great discussions throughout the year, constant push and feedback. Thank you for having faith in us, and thank you for taking us to the 3E Conference in Gothenburg in May 2019, where we presented our preliminary findings.

Our friends at NTNU School of Entrepreneurship (NSE) provided a huge motivation throughout the year, and we would like to emphasize the supportive culture we are surrounded by every day. Now, we look forward to becoming parts of the NSE-alumni union and continue to contribute to the NSE-family.

Trondheim 23rd May 2019,

Vilde Bergan & Cathrine Ro Heuch

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List of Abbreviations

Abbreviation	Description
3D-print	Print of an object in three-dimensions
BDO	Company providing auditing, accounting, consulting and legal services
CAD	Computer-aided design (software for 3D-printing)
FAKTRY	Name of an incubator in Trondheim city
FORNY2020	Name of a national soft-funding program
JASUN	Join A Start-up Night (name of an event at NTNU)
NSE	NTNU School of Entrepreneurship
IP	Intellectual property
IoT	Internet of Things
NTNU	Norwegian University of Science and Technology
NTNU TTO	NTNU Technology Transfer Office
RQ	Research question
SINTEF	A Norwegian research institute
T:lab	Name of an incubator in Trøndelag county in Norway
TEB	In Norwegian: Trønder Energi-Bidrag (name of a soft-funding program)
VCP	Venture Creation Program

Chapter 1

Introduction

Entrepreneurship is an important contribution to economic growth (Wong et al. 2005), and universities worldwide have shifted to become more entrepreneurial in their fashion (Etzkowitz et al. 2000). A part of this shift includes focus on facilitating new venture creation among faculty, academics and students. Venture creation is the planning, organizing, and establishing of new organizations (Gartner 1985). Åstebro et al. (2012) found that recent graduates are twice as likely as their professors to pursue new venture creation within three years of graduation. Additionally, Åstebro et al. (2012) recognized that ventures created by these students were of high quality. Admittedly, the question of how students possess these abilities, and go about venture creation arises. Yet, the student entrepreneur is the type of entrepreneur within the university context that has received least attention in the literature. Reynolds (2005) defines student entrepreneurship as any attempt to launch a new venture undertaken by one or several students. Moreover, the majority of the literature within the field of student entrepreneurship concentrate on the perspective of the program leaders and is studied from an educational point of view (Lackéus and Middleton 2015; Politis et al. 2010; Rasmussen and Sørheim 2006).

At the same time, students worldwide start their own successful ventures and develop high-impact businesses. They have few resources and limited experience and networks (Kew et al. 2013). Despite that, many manage to succeed. Student entrepreneurs take action based on what comes to mind, build on the little they know, and acquire what they need. Hayter et al. (2017) acknowledge student entrepreneurs as the main entrepreneurial agent within the university context. Still, *how* student entrepreneurs actually accomplish this, and go about building new ventures is not clearly expressed in the literature. Therefore, we try to understand the students' way of conducting resource development in the early founding stage of a new venture. This briefly means, where and how do they start?

The venture creation phenomenon involves interactions between the individual and the environment (Shook et al. 2003), which is why the interplay between the student entrepreneur and the university ecosystem is important. Stam (2015, p. 1) defines an *entrepreneurial ecosystem* as "an independent set of actors that is governed in such a way that it enables entrepreneurial action". Such ecosystems exist at national, regional and community levels (Morris et al. 2017), and Fetters et al. (2010) have argued for the university environment as a potential entrepreneurial ecosystem. Furthermore, new venture creation by students is influenced by the university context (Wright et al. 2017), and the students' desire to start new ventures is related to available support from their surrounding infrastructure (Ahsan et al. 2018). In that respect, the resources available within the university ecosystem emerge as essential. Resources play an important role in an entrepreneur's ability to, and success in, establishing new ventures (Brush et al. 2001). Simultaneously, finding and using the right resources are identified to be some of the greatest challenges entrepreneurs are faced with (Brush et al. 2001).

When outlining the literature on the fields of student entrepreneurship and university ecosystems, we locate a gap when it comes to explaining how student entrepreneurs act and use resources within the university ecosystem. In addition, Jansen et al. (2015) argue that research on fostering student entrepreneurs in a university context is receiving increased attention, which in turn underpins the relevance of the topic. Thus, the purpose of this study is to better understand the phenomena of early-stage resource development among student entrepreneurs within the university ecosystem. The study focuses on very early-stage venture creation, right after a student team is formed, and the business idea is chosen, which can be understood as the founding stage. The research question (RQ) is two-fold:

RQ 1: How do student entrepreneurs go about early-stage resource development?

RQ 2: What is the role of the student entrepreneur within the entrepreneurial university ecosystem?

Due to the lack of literature within the fields, and the weak bridging between them, the authors introduce *entrepreneurial bricolage* as a means for discussing the connection between the *student entrepreneur* and their resource utilization within the *university ecosystem*. Bricolage is defined as "creating something from nothing by making do with what is at hand to solve problems and uncover opportunities (Baker and Nelson 2001, p. 333)". In other words, entrepreneurial bricolage is a theory that addresses what resources are available to entrepreneurs and their behavior in utilizing them. Therefore, entrepreneurial bricolage is a sensible literature-bridge to enable discussions based on the findings of this qualitative study.

The research was explored by conducting a multiple-case study of four different student startups at The Norwegian University of Science and Technology (NTNU) in Trondheim. Over the time span of two months, the four startups have been observed during team meetings and workshops, accompanied by semi-structured interviews. The ventures were all in their early founding stage, and part of the NTNU university ecosystem. The collected data was coded and analyzed, then discussed within the frames of entrepreneurial bricolage. The study reveals *which* resources the student entrepreneurs use, and common patterns of *how* they develop them. Moreover, the student entrepreneurs' role within the entrepreneurial university ecosystem is highlighted. The study acknowledges them as vital contributors and developers of the very ecosystem within which they operate. The students use each other to find answers, get instant help and guidance to find new resources.

The context of the study is the university ecosystem. The literature on entrepreneurial ecosystems and university ecosystems is used to make a frame of reference for the study. This literature is considered in Chapter 2 Frame of Reference, along with the theoretical framework (bricolage). The research methodology is described in Chapter 3, and the results and associated analysis are presented concurrently in Chapter 4. Lastly, a discussion on the findings in light of current literature is carried out in Chapter 5, rounding up with a conclusion in Chapter 6, which includes implications and suggestions for further research.

Chapter 2

Frame of Reference

Entrepreneurial activities do not happen in isolation (Leighton 1988), hence it becomes important to understand the environmental context of student entrepreneurs. The environmental context includes the entrepreneurial ecosystem in which the students operate, primarily consisting of the university ecosystem.

The frame of reference, to understand how students operate in the university context, is based on literature streams addressing *entrepreneurial ecosystems* and *university-based entrepreneurial ecosystems*. The venture creation phenomena in the university context, and the role of student entrepreneurs are considered. We have chosen to focus on these literature streams because they often include and consider students. Literature on student entrepreneurs and their *use and development of resources* is reviewed within the frames of *entrepreneurial bricolage*.

2.1   Entrepreneurial Ecosystems

In order for entrepreneurs and student entrepreneurs to successfully develop new ventures and innovate, they need to operate in a conducive environment that enables entrepreneurial activities (Maroufkhani et al. 2018). That includes the existence of policy, finance, market, culture, human capital and other necessary support, which are six dimensions making up a self-sustaining entrepreneurial ecosystem (Isenberg 2010). Within an entrepreneurial ecosystem, universities are identified as an important actor and thus become a great part of the ecosystem (Malecki 2018). As argued by Fetters et al. (2010), the university environment can be interpreted as an entrepreneurial ecosystem, and researchers have proceeded to conduct studies on university-based entrepreneurial ecosystems (Fetters et al. 2010; Graham 2014; Rice et al. 2014). Throughout the thesis, this will be referred to as university ecosystems.

2.1.1 University Ecosystems

University ecosystems can be nurtured either top-down, meaning by university administration, or bottom-up, referring to initiatives driven by university grassroots such as students and alumni (Graham 2014). The top-down perspective is the most common lens adopted within studies on university ecosystems (Etzkowitz et al. 2000; Wong et al. 2005; Wright et al. 2017). This educational and administrative point of view mainly focus on how entrepreneurship within the university context can be facilitated in order to commercialize more university technology or raise the quality of entrepreneurship education (Graham 2014; Lackéus and Middleton 2015; Rasmussen and Sørheim 2006).

This focus may originate from the fact that universities are expected to contribute to economic development in addition to their traditional mission including research and teaching (Etzkowitz et al. 2000). Etzkowitz (2001) describes entrepreneurship as being the university's third mandate. In fact, entrepreneurship is one of the largest contributions to economic growth (Wong et al. 2005), and universities can increase entrepreneurial activities both by facilitating new venture creation, and educating candidates or employees to become entrepreneurially minded (Rasmussen and Sørheim 2006).

The university is a natural arena for conducting studies on student entrepreneurs, as the students are physically present in the university ecosystem on a daily basis. They take classes on the university campus and find each other through organizations in relations to the university. It is the closest and most obvious place for the students to gather information and take advantage of provided resources. Thus, it is reasonable to assume that the university ecosystem is influential on the student entrepreneurs, and that makes the literature on university ecosystems relevant. Simultaneously, it is worth noting that the characteristics of the *region* where the university is located also affect the students (Bergmann et al. 2016; Hayter et al. 2017), which is relevant because the university ecosystem often is closely related to its region.

The nature of the university's excellence in science has also shown a significant impact on student entrepreneurship (Beyhan and Findik 2018). Students within universities that have high knowledge production are more likely to improve their competencies within opportunity searching, and the students are more likely exposed to tacit knowledge and introduced to research frontiers (Beyhan and Findik 2018). In fact, Miller and Acs (2017) are among authors who consider student entrepreneurship to be in the center of the university ecosystem, due to their effort to establish high-growth firms. The emphasis on students illustrates the importance of the university ecosystem as a contextual factor when studying student entrepreneurs.

Extending the work of Miller and Acs (2017) on student entrepreneurs as part of the ecosystem, Lahikainen et al. (2019) suggest further research to investigate the student's involvement in the ecosystem equivalent to the role of academic entrepreneurs (university employed faculty members). Lahikainen et al. (2019) even point to students as more capable to become entrepreneurs. They naturally lack industry experience but in contrast, they are knowledgeable and often come up with less demanding business ideas that are more easily commercialized. Therefore, a distinction between student and academic entrepreneurs should be made, due to their divergent participation in the ecosystem (Lahikainen et al. 2019). Looking into how the students actually use the university ecosystem and its provided resources will help develop the literature on the point made by Lahikainen et al. (2019).

Outlining the Ecosystem

Wright et al. (2017) proposed a framework to understand what the university ecosystem ideally should consist of in order to enable students to launch new ventures. The factors that influence the ecosystem and make up the framework, were suggested to be the following: (a) University environment, (b) External context, (c) Evolution (time), (d) Investors, (e) Support mechanisms, (f) Entrepreneurs and (g) Incubators and accelerators. Figure 2.1 shows the ecosystem for student startups, as proposed by Wright et al. (2017), and is further used for analysis in the study.
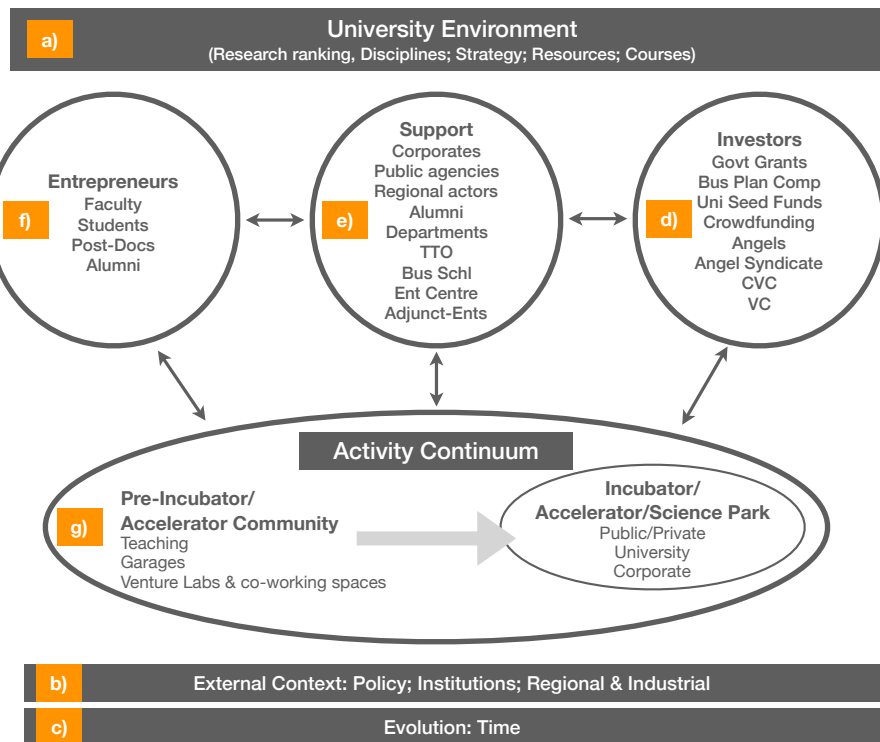
Figure 2.1: Overview of the student ecosystem as suggested by Wright et al. (2017, p. 911)

(a) The university environment is influenced by the nature of the university. This means that the student entrepreneurs might be different based on the type of research carried out at the university, the expertise of the university, whether the university is highly research focused, or focused on arts, social sciences or teaching. A mismatch has been recognized between provided resources available at different universities, due to the nature of the university, and the promotion of entrepreneurship. (b) The external environment includes the impact from local, regional and national objectives and policy towards entrepreneurship. Tight industry linkages can help provide additional resources, which in turn can be available through the university ecosystem. (c) By pointing to evolution in time, the authors refer to several aspects that have comprised time, and thereby favoured entrepreneurship. For instance, changes in regulation for technology transfer between university and inventors, and evolution of the Internet reducing startup costs, have made it easier to stimulate student entre-

preneurship. (d) In addition to venture capitalists and business angles, the university ecosystem can help facilitate startups' growth by providing grants, competitions or university seed funding. (e) Support mechanisms include internal mechanisms (e.g university support from staff in entrepreneurship centers), or external (e.g public sector institutions, or sponsoring from corporations). (f) Entrepreneurs are described as important advisors and motivators to new entrepreneurs. (g) Incubators or accelerator programs can help develop business plans and strengthen the business idea. Wright et al. (2017) argue that the variety of the university context, the university's objectives, and strategies related to academic entrepreneurship, will affect student entrepreneurship. Further research on the topic should, as suggested by Wright et al. (2017), include research on the effectiveness of the ecosystem, how ecosystems emerge deliberately or organically, the life-cycle and the elements of the ecosystem. The ecosystem proposed by Wright et al. (2017) represents a comprehensive view of a student ecosystem. It takes both the university and the regional context into account, and can be transferable when looking into new student ecosystems.

In addition to the factors that make up the suggested ecosystem by Wright et al. (2017), Boh et al. (2016) add which types of factors that generate resources to the literature. Boh et al. (2016) found the following programs and practices to enhance the entrepreneurial effort in the process of commercialization: (1) Project-based classes on technology commercialization, (2) Mentoring programs, (3) Accelerator/incubator programs, (4) Business plan competitions, (5) Entrepreneurship education for students, and (6) Entrepreneurship education for faculty. Elements 1-6 are all part of the university's ecosystem, and facilitate both faculty and student involvement in university commercialization activities.

Furthermore, Boh et al. (2016) point to the contribution from alumni, entrepreneurs and other experts, as an important factor. They usually all take part in several of the alternatives listed, and therefore should be regarded as important factors in the ecosystem. This is supported by Miller and Acs (2017) who found (from a case study at The University of Chicago) the leveraging of alumni to be beneficial for the student entrepreneurs and their firms. Accordingly, Ahsan et al. (2018) found high-level ment-

oring during early-stage startup creation to have a positive effect on the accumulation of resources for the student startup. From their research, Ahsan et al. (2018) suggest that informal mentors (who are self-selected by the students) have a positive effect on the startup, because more voluntary mentors willing to provide advice can be a sign of the startup having a high-quality idea.

The elements proposed by Boh et al. (2016) are intertwined with the factors in the ecosystem of Wright et al. (2017), and thereby emphasize which types of factors are important. Therefore, the factors proposed by Wright et al. (2017) are chosen as a framework when considering the student ecosystem of the university explored in this thesis.

How the Entrepreneurial University Context Affects Students

There is limited research on the university context's effect on student entrepreneurs. However, to illustrate what type of research to build onto, the existing literature is described briefly.

It is acknowledged that the university milieu and culture, and entrepreneurship programs influence student's entrepreneurial behavior and attitude (Boh et al. 2016; Elchardus and Spruyt 2009; Hastie 2007; Pittaway and Cope 2007). However, as well as the university environment can establish a good foundation for entrepreneurial behavior, it can also be a constraint (F. Welter and Smallbone 2011). This is in line with the arguments by Wright et al. (2017) about the nature of the university influencing the students. For instance, a university with limited research on computer science, might not be the most optimal research environment to foster innovation and new ventures within this particular field.

Rideout and Gray (2013) argue that an ecosystem operating at an internal level, such as a university ecosystem, consists of several important factors for nurturing the student entrepreneurial potential. The factors are, for instance, the shared values and norms, the internal infrastructure, and curricular and co-curricular programs (Rideout and Gray 2013). Shared values and norms might have an effect on the entrepreneur-

ial behavior among student entrepreneurs, and will be of special interest to look into in a university ecosystem consisting of several student-driven startups and initiatives. Moreover, the internal infrastructure and the university-provided courses might guide, or directly provide, the students with certain resources.

To better understand how the context influences attitude, motivation, and intentions among student entrepreneurs, Beyhan and Findik (2018) studied linkages between the university-level organizational competencies, and the entrepreneurial competencies of the individual and the number of startups created. The authors argue that "universities are heterogeneous in their resources and competencies" (Beyhan and Findik 2018, p. 1348). These resources and competencies are influential on the student entrepreneur itself, and therefore also on the creation of the startup. Both Beyhan and Findik (2018) and Guerrero et al. (2016) confirmed that informal environmental factors, such as attitudes, actions, skills and role models, are more influential on student entrepreneurship than education and training. The latter argument is relevant when looking at differences between the students that have been part of entrepreneurship education, and the students who have been part of an engineering or business education.

Venture Creation in the University Ecosystem

New venture creation within a university context consists of startups created by university employees, and students, and may embrace both university technology and business ideas that are not owned by the university. Spin-off companies are a significant part of the commercialization of early-stage technologies from the university (Boh et al. 2016). These companies do mainly capitalize on university-based research or technology. Boh et al. (2016) suggest four different pathways for university spin-offs based on a case study of eight U.S. based universities. The four pathways suggested are different in terms of *who* is involved in the spin-off process. The four options are: (1) Faculty member and an experienced entrepreneur, (2) Faculty member and Ph.D./post-doctoral student, (3) Faculty member and Ph.D./post-doctoral student and business school students and (4) Pure student effort. Boh et al. (2016) found that

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graduates and post-doctoral students are "critical participants" in the commercialization of university-based technology, and that student entrepreneurs thereby deserved more attention in the literature and research.

Alongside being critical participants, Hayter et al. (2017) found graduates (Ph.D. students) to play a significant role in acquiring and managing resources in early-stage spin-off companies from universities. They divided findings within "the student role of resource reconfiguration" into 1) opportunity investigation and vetting, and 2) acquiring and managing resources. The graduates in the study used their classmates to find team partners and get advice from students with prior and similar experience. They used business plan competitions to get guidance and advice to refine the business idea. The graduates managed to get new types of resources when interacting with the surrounding ecosystem. The findings from Hayter et al. (2017) are used to draw parallels to students at bachelor and master level, which is the situation of the students in this study.

Student and alumni based spin-offs are as common and successful as those started by faculty members from the university (Åstebro et al. 2012; Grimaldi et al. 2011). There is however no good evidence on how universities in general impact the students' new venture creation (Åstebro et al. 2012). One way to look into this question is to study how entrepreneurship programs influence the students' capabilities and thus the pursue of a new venture.

Two of the cases studied in this thesis consist of students who are part of a particular kind of entrepreneurship education, called "venture creation program". Thus, to better understand the student's university context and their provided resources within the program, a brief introduction to venture creation programs is provided in the following section.

Venture Creation Programs

Barr et al. (2009), Rasmussen and Sørheim (2006) and Siegel and Phan (2005), have recognized that venture creation at universities can be facilitated by "specialized" entrepreneurship education, such as action-based entrepreneurship education. One such

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track is defined as a "venture creation program" (VCP).

A VCP is an entrepreneurship education where new venture creation is taught (Lackéus and Middleton 2015). Lackéus and Middleton (2015, p. 50) defines a VCP in the following way: "A VCP is an entrepreneurship education program which utilizes the on-going creation of a real-life venture as the primary learning vessel (thus involving venture creation as part of the formal curriculum), including an intention to incorporate." Moreover, there is a consensus that certain entrepreneurial skills and attitude, towards entrepreneurial action, are teachable (Gorman et al. 1997; Neck and Greene 2011; Pittaway and Cope 2007; Rae et al. 2012). Lackéus and Middleton (2015, p. 50) further this by proposing that "VCPs are capable of shaping a more entrepreneurial university culture by developing entrepreneurial behavior among involved students". Students enrolled in VCPs create ventures in a facilitated environment where they are encouraged to welcome failure as a way to learn from mistakes (Lackéus and Middleton 2015). Activities that are part of a VCP involve the creation of business plans, market analysis and feasibility studies, planning of marketing and human resources and financial accounting (Lackéus and Middleton 2015). The students in this study, who are part of a VCP, are therefore part of an environment with a lot of program-provided resources, compared to students within non-entrepreneurship studies. There are no pre-made assumptions about the VCP-students, however, this insight will help understand the findings and analysis about the cases represented by the two different student groups.

2.2   Entrepreneurial Bricolage

The entrepreneurship literature lacks extensive research on the connection between student entrepreneurship and the university ecosystem, especially when it comes to explaining *how* student entrepreneurs actually act and use resources within the university ecosystem. Due to weak links between the two streams of literature we introduce *entrepreneurial bricolage* as a basis for facilitating the discussion on how the fields are connected, and how they relate to the findings in this study. Chang and

Rieple (2018) describe entrepreneurial bricolage as an opportunity management behavior used by entrepreneurs when discovering and converging opportunities into something valuable. It relates to how entrepreneurs respond or act when faced with scarce resource environments. Researching how student entrepreneurs use resources available in the university ecosystem within the framework of entrepreneurial bricolage helps understand what resources are available to student entrepreneurs, and provides a logical means of explaining how those resources are used and developed.

2.2.1 Defining Entrepreneurial Bricolage

Lévi-Strauss (1966) states that bricolage is about "making do with whatever is at hand". Bricolage stems from anthropology and was traditionally not linked to entrepreneurship. However, in recent decades, *entrepreneurial bricolage* has been introduced and is increasingly recognized as a theoretical perspective to entrepreneurship (Baker and Nelson 2001; Fisher 2012; C. Welter et al. 2016). Entrepreneurial bricolage refers to making do with limited, available resources and is highly relevant to our study, as we explore how student entrepreneurs use and develop resources within the university ecosystem.

Ever since the introduction of bricolage in 1966 the term has been expanded and redefined numerous times. Baker and Nelson (2001) investigated common definitions and argue that there are three main elements that together make up entrepreneurial bricolage. These elements could be described as behavioral characteristics of entrepreneurial bricolage, and are as follows:

1. *Reliance on the resources at hand*, relating to what available resources within the ecosystem the student entrepreneurs depend on.

2. *Resource recombination for novel uses*, referring to how the student entrepreneurs develop the resources further and find new areas of use.

3. *Making do*, relating to the student entrepreneur's ability to search for opportunities and solutions rather than acknowledging obstacles (such as resource limitations).

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Based on these three elements, Baker and Nelson (2001) define entrepreneurial bricolage as "creating something from nothing by making do with what is at hand to solve problems and uncover opportunities (Baker and Nelson 2001, p. 333)". These elements can be viewed as three types of entrepreneurial bricolage-behavior.

2.2.2 Connecting Entrepreneurial Bricolage to the University Context

Entrepreneurial bricolage addresses how startups are created when resources at hand are limited (Baker and Nelson 2001). This fits very well with the situation in which student entrepreneurs often find themselves, as student entrepreneurs don't have the same access to resources that academic or serial entrepreneurs often do. Youth entrepreneurs across the globe have pointed to lack of financial resources, business skills, knowledge, infrastructure, support structures, mentorship and links to professional networks as barriers for them to succeed as entrepreneurs (Kew et al. 2013). Hence, the question of how student entrepreneurs manage to make something (startups) out of little (limited resources) is appropriately explored and discussed within the frames of entrepreneurial bricolage, categorizing and explaining the student entrepreneurs' behavior.

The Student Entrepreneurs as Bricoleurs

As our research will touch upon the individual entrepreneur's role in resource utilization within startups, it is necessary to distinguish how entrepreneurial bricolage is both about their actions and their identity. Lévi-Strauss (1966) developed the concept of bricolage as a characteristic of "resourcefulness", which the author described as a function of knowledge of one's environment. In that, bricolage clearly derives from a psychological-point of view. Yet, literature on entrepreneurial bricolage has moved towards a classification of actions (Baker and Nelson 2001; Fisher 2012; C. Welter et al. 2016). However, recent literature sheds light back on the role of the individual entrepreneur, and how entrepreneurial bricolage relates to their *identity* (Duymedjian and Rüling 2010). Duymedjian and Rüling (2010) focused on the "bricoleur", meaning the

person behind the actions of bricolage, in their research. The term "bricoleur" was defined by Lévi-Strauss (1966, p. 11) as "someone who works with his hands and uses devious means compared to those of a craftsman".

Although not thoroughly discussed across literature on entrepreneurial bricolage, Halme et al. (2012) circle back to the concept of resourcefulness when describing intrapreneurial bricolage (bricolage-behaviour observed in individuals within large corporations (Halme et al. 2012)), and in that - the bricoleur. They debate the importance of resourcefulness in individuals practicing intrapreneurial bricolage, concluding that resourcefulness is an important characteristic of the bricoleur. Halme et al. (2012) go on to suggest that all individuals might not be able to carry out intrapreneurial bricolage, as resourcefulness is portrayed as a prerequisite.

Students' Resources and Legitimacy

Entrepreneurs are dependant on finding and using the right resources (Brush et al. 2001). Baum and Locke (2004) have defined what they call *the new resource skill*. The new resource skill is meant for the context of entrepreneurship, and is therefore appropriate to introduce to underline why the entrepreneur's resource use and development are vital to startups. Baum and Locke (2004, p. 598) explain the new resource skill as "the ability to acquire and systematize the operating resources *needed* to start and grow an organization". This skill is considered important in succeeding as an entrepreneur. Adding to that, Politis et al. (2010, p. 660) have defined what they call *resource logic*, described as "a set of ideas for how to secure and use resources in the process of starting up and managing a new firm". This implicates that student entrepreneurs in a university milieu have a distinct way of reasoning when it comes to the acquisition and use of resources, compared to non-student entrepreneurs (Politis et al. 2010).

A new venture's growth rely upon its collected resources and support (Fisher et al. 2016). The venture's success in doing so can impact the survival and the growth of the business (Barney 1991). In order for the new venture to acquire the right resources

from its external environment, it needs to build legitimacy towards its stakeholders. Moreover, students and their business venture should have some substance and trustworthiness when approaching stakeholders. A new venture does, however, lack operating history, and therefore, the stakeholders face uncertainty and may be reluctant to make critical resources available (Singh et al. 1986; Zott and Huy 2007). The entrepreneur of a new venture have to overcome the "liability of newness" for the stakeholders to establish trust, and by being perceived as legitimate, the entrepreneur can overcome the newness and increase the chances of survival (Singh et al. 1986; Stinchcombe 1965). It is generally understood that students lack financial resources and work experience.

Consequently, it is important to be perceived as legitimate by the stakeholders to overcome the fact that a new established venture is brand new, without many resources at hand. It lies in the nature of such a venture that the chances of survival are low, and by strengthening their legitimacy, the venture can increase its chances (Singh et al. 1986). Suchman (1995, p. 574) defines legitimacy as the way others view it as "desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions". Zimmerman and Zeitz (2002) argue that legitimacy is an important resource in itself, which is as important as other resources such as capital, technology or people. They argue that legitimacy is necessary to further access other resources. However, this is viewed as a venture's legitimacy in retrospect, assuming that legitimacy is necessary to acquire resources.

2.2.3 Entrepreneurial Bricolage as a Theoretical Framework

With a basis in Baker and Nelson (2001)'s definition of entrepreneurial bricolage we have used their three identified elements describing bricolage-behaviors as a basis for understanding the collected data: (1) Reliance on whatever resources are at hand, (2) Resource recombination for novel uses, and (3) Making do. For the purpose of this thesis we relate these elements to the university ecosystem and the student entrepreneurs. Figure 2.2 was created to outline the practical implication of entrepreneurial bricolage as a theoretical framework to this study. It is specified in means of who is being studied, being *student entrepreneurs*, and context, being *the university ecosystem*,

and in terms of categorization and analysis, being the three *bricolage-behaviors*. By that, figure 2.2 illustrates how entrepreneurial bricolage captures the interplay between the student entrepreneurs and the university ecosystem.

Identifying and making do with resources within the university ecosystem

Use and development of available resources

Recombination of available resources for novel uses

University ecosystem

Student entrepreneurs

University ecosystem

Student entrepreneurs

University ecosystem

•+•=▲

Student entrepreneurs

• ○ ● : Resources
▲ : Old resources used in new ways, creating a new resource
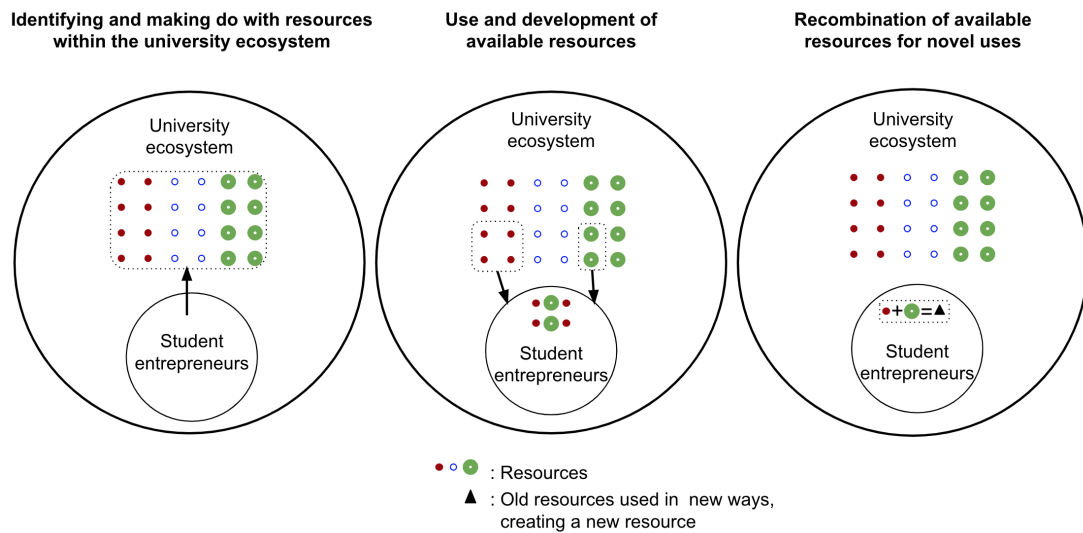
Figure 2.2: Model on how the three elements of entrepreneurial bricolage (making do, resources at hand, and recombination of resources) are used to explain the behavior of student entrepreneurs when utilizing resources within the university ecosystem.

By introducing this bricolage-based model to the context of *student entrepreneurship within the university ecosystem* we address our research questions and identify important aspects of *how* student entrepreneurs use and develop resources. This allows us to investigate the events of resource utilization within a set context, framing the study and providing a logical path for data collection and analysis.

Chapter 3

Research Methodology

The study is carried out as a multiple-case study, where four student startups (further referred to as "cases") have been observed and interviewed. By student startups, we refer to a student-driven venture inside the university ecosystem, where a group of students work on a business idea with the goal of launching a successful company. In addition, secondary sources of data such as e-mails between the cases and external stakeholders have been introduced to the study in order to complete the picture of the cases. In this chapter we outline what research design has been used, how the cases were selected, and we describe the context of the study. Lastly, we go into how the data was collected and later analyzed.

3.1 Research Design

The study serves to discover new aspects of a given situation, namely the student entrepreneurs' resource use and development. The two research questions have been empirically investigated, from which we derive explanations and statements that later can be tested. When conducting research oriented towards exploring and discovering what is new, a qualitative data collection method tends to be more appropriate (Flick 2015). The research method was thereby selected based on the qualitative nature of the research questions, as well as the scope of the thesis. In order to explore the data in the best way, we kept the possibility for redesigning and adjusting the study open.

The applied research design is a multiple-case study, which was chosen due to the limited focus area. Yin (2014, p. 28) defines research design as "a logical plan for getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about these questions". A case study is an appropriate research design when the research intends to answer questions of "how" and "why" (Yin 2014).

Moreover, Yin (2014) suggests that a case study is suitable the more extensive and "in-depth" description to some social phenomenon a study requires. Coinciding with this argumentation by Yin (2014) on why to use case studies, we used a multiple-case study for two main reasons;

1) By using multiple-case studies of student entrepreneurs in different types of ventures within the same university ecosystem we answer how they commonly use available resources.

2) By comparing resource development across cases we understand the differences, and even more so similarities, and have derived empirically grounded statements that later can be tested.

3.1.1 Context of the Study

The study has been conducted within the NTNU university ecosystem, during six weeks in February and March 2019. At NTNU campus Gløshaugen, programs within science, engineering, technology, mathematics and business are run, in addition to one venture creation program called NTNU School of Entrepreneurship (NSE). There are in total 35,500 students in Trondheim, and there are two main student-driven organizations within innovation and entrepreneurship, called Spark and Start NTNU, which promote startup activities and innovation around campus. Spark is a student-to-student entrepreneurship mentoring organization. Students with business ideas get free of charge mentoring sessions by Spark's employed students who possess entrepreneurship experience. A co-working space, also recognized as a small incubator, called Gründerbrakka is available for selected student ventures at campus. As part of the innovation ecosystem, NTNU Technology Trasfer AS serves as the university's agent for commercialization.

Table 3.1 summarizes the main elements of the innovation ecosystem that are relevant for the student entrepreneurs.

Table 3.1: Description of the elements in the university innovation ecosystem at NTNU.

Element	Description
NTNU School of Entrepreneurship (NSE)	A 2-years master's program in entrepreneurship including 34 students in each class. The students have educational background within e.g. engineering, business, arts and social sciences, the majority are between 23-30 years and of Norwegian nationality.
Spark	A mentoring service for students, by students. The student mentors are paid salary by the local power company Trønder Energi. The student startups get free mentoring and access to events such as JASUN (Join A startup Night). They arrange several events with local companies such as the largest Norwegian bank DnB.
Start NTNU	A student union on bachelor-level. The union organizes innovation events, workshops and competitions, and promote innovation activities at the university.
FRAM	A innovation community and a physical space at the campus where all students can come and work. The organisation is student-driven, the space has a small stage for presentations, two meeting rooms and a kitchen. Events by NSE, Spark and Start are often held here.
Gründerbrakka	A student co-workingspace and incubator. The students are granted access to an office after their graduation. Some students have access during their education.

| Engage | Center for Engaged Education Through Entrepreneurship (a center for exellence in education), including research, and innovation initiatives for students. The center facilitates for several student collaborations and initiatives across NSE, Spark and Gründerbrakka. |
| NTNU Technology Transfer Office (TTO) | The university's technology transfer office responsible for commercialization of research and technology development by university employees. |

At NTNU, innovation and entrepreneurship is taught in elective courses, and have received increased attention the last couple of years. Several study programs have started to include entrepreneurship courses and curricular activities fostering entrepreneurship. As a result of the available activities within student entrepreneurship, the student-driven ventures on campus are mainly run by students from NSE, where the students establish ventures as part of their study program, or by students who run ventures as a co-curricular activity on their spare-time. NTNU TTO facilitates technology transfer from the university, and councils academic entrepreneurs (employed researchers and staff at NTNU who have business ideas).

3.1.2 Types of Cases

In order to examine how student entrepreneurs go about resource use and development in early-stage ventures it was natural to select student startups as cases. By asking the startups as a whole to be part of the study, as apposed to individual student entrepreneurs, we ensured that the studied student entrepreneurs related the study to startup-activities rather than student-activities. This was important as the aim was to uncover resource use and development in relation to the student entrepreneurs' ventures. Hence, the cases in the study are startups but the behavior of the student entrepreneurs within the cases is subject to analysis and discussion.

Four different student startups situated in the same university environment, were

studied for approximately one week each. The criteria for the case selection were (1) the student ventures should all be in their early-stage of development (founding stage), (2) the main entrepreneur or project leader had to be a student, (3) the startups should be technology based with either a hardware or software solution, (4) the student entrepreneurs should be at bachelor or master level, and (5) be part of the NTNU ecosystem at campus Gløshaugen.

The four chosen student cases are described in Table 3.2. Two startups build hardware, and the other two develop a software-solution. The size of the teams varies between 2-4 people. Two teams are enrolled at NSE, and the other two are enrolled in other engineering or business programs. All ventures are 2-9 months old. The current and previous education of the students, type of business idea, project status, the number of team members and number of months the venture has existed are listed in Table 3.2. Case C differs from the three other cases in that the venture was founded nine months ago. However, the business idea was recently brought into the university context and has only operated in the ecosystem for six months, as the founder just started studies at the university.

Table 3.2: Characterization of the four cases

	Case A	Case B	Case C	Case D
Education in the team	Entrepreneurship, mechanical engineering, business	Entrepreneurship, innovation, music	Engineering and technology	Engineering (software, hardware, marine), business
Business idea	Hardware for water-room installation	Software for the music industry	B2C hardware for tourism	Software for parking lots
Status	Market and product discovery	Market discovery	Product development and pilot project	Market discovery and pilot project

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Number of team members	2	2	2	4
Months of operation	2	2	9	4

3.2 Data Collection

Data was collected mainly through observations, semi-structured follow-up interviews and secondary data, resulting in within-method triangulation (Flick 2015). Secondary data includes the venture's business plans, funding applications, e-mails with external stakeholders, and other material that was provided by the case-subjects.

Observations and interviews were conducted at NTNU, more specifically in the office space of NSE, at FRAM and at Gründerbrakka. All observations and interviews were recorded and later transcribed. The transcribes were coded and the relevant material was systematized in tables for comparison across the studied cases. Table 3.3 shows how many minutes of voice recording was collected and analyzed from each case.

Table 3.3: Overview of the primary data collected from each case. The date of the data collection, type of data and length of recording are presented for all cases.

Case	Date	Type	Length
A	04/02/19	Observation	19 min
	11/02/19	Semi-struc. interv.	27 min
	12/02/19	Observation	40 min
	13/02/19	Observation	40 min
	14/02/19	Semi-struc. interv.	23 min
	08/04/19	Final interview	28 min
		Total	**2 hours 57 min**
B	04/02/19	Observation	17 min
	26/02/19	Semi-struc. interv.	35 min
	28/02/19	Observation	28 min

	04/03/19	Observation	1 hour 10 min
	06/03/19	Semi-struc. interv	27 min
	10/04/19	Final interview	24 min
		Total	**3 hours 21 min**
C	18/02/19	Semi-struc. interv.	38 min
	20/02/19	Observation	17 min
	20/02/19	Semi-struc. interv.	18 min
	09/04/19	Final interview	13 min
		Total	**1 hours 48 min**
D	06/03/19	Semi-struc. interv.	22 min
	08/03/19	Observation	56 min
	12/03/19	Observation	2 hours 30 min
	09/04/19	Final interview	45 min
		Total	**4 hours 11 min**

There are some variations in the total length of the recordings. This is due to the fact that some observations and interviews were longer. We did not intervene or stop the cases during observations, and finished each observation as the team meeting came to an end. However, the amount of relevant data collected from each case was approximately the same.

3.2.1 Observations

Flick (2015) argues that the most direct access to information on practice and process is provided by the use of observations. In this case, the most suitable would be to conduct focused participant observations, defining a specific event that is to be observed along with how to protocol the observations (Flick 2015). However, participant observation is to be open-ended and flexible to changes serving the purpose of better addressing the research questions (Flick 2015). Anchored in our own startup experiences, team meetings and workshops are considered a suitable arena for observing how the cases use and develop resources. This is because in team meetings current issues within the startup often surface, and possible solutions are discussed. For in-

stance, if a team member brings up that the startup is running out of circuit boards, do they run to a university lab in order to obtain new ones, do they ask someone at the university where to find new ones, or do they order new ones without searching within the university ecosystem? Observations such as these would shed light on the actual practices of resource use and development.

3.2.2 Semi-structured Interviews

Conversations are natural supplements to participant observations (Flick 2015), hence the student entrepreneurs within the cases are relevant interviewees. Interviews are commonly used within case studies, and often resemble conversations rather than strictly structured interviews, and are to be fairly unstructured (Yin 2014). We used open-ended interviews to map information that was not possible to detect through observations. This included information on what they think, what they know, and past resource use and development. Moreover, the interviews served as a supplement to the observations by allowing us to ask follow-up questions on specific observations. The interviews conducted were therefore similar in themes and in broad lines, however, the different cases were also asked customized questions based on observations and the spontaneous direction of the interview.

3.2.3 Secondary Data

Other data sources always comprise a big part of the knowledge process when conducting a participant observation (Flick 2015). It seemed appropriate to include business plans, funding applications, e-mails, and other material that was provided by the case-subjects. This was all data that was produced for other purposes than this study, yet it contributed to a more complete overview of the cases and their resource utilization. Viewing these documents provided a deeper understanding of the cases, and strengthened the observations and interviews by serving as a way of checking the validity of the collected data. However, data from the secondary sources are not included in the presented findings.

3.3 Structuring the Data

In the transcribed text, resources and statements about the students' resource environment, the university ecosystem and the regional ecosystem were highlighted. Then, each highlighted sentence was analyzed within the bricolage-framework. The coding and analysis is conducted simultaneously in Chapter 4. In the following sections the logic behind the coding and analysis will be presented.

3.3.1 Coding

The data was broken down, conceptualized, and put back together within the frames of bricolage. When coding, one is constantly comparing in order to derive meaning from the data, and develops theories based on the process of abstraction (Flick 2015). The coding is based on the "Gioia Methodology" (Gioia et al. 2013), which is a method of structuring qualitative data in a systematic manner. The 1st order code is a direct quote (raw data) from the observations or semi-structured interview. The 2nd order code is the first step in analyzing the meaning of the 1st order code. The 3rd order code is used to analyze a step further, to find a broader meaning of the quote. 3rd order coding is used to find how the students recombine resources for a new purpose, and how they "make do" with their resources at hand, which is in line with entrepreneurial bricolage.

3.3.2 Analysing the Data

The collected data was analyzed within the framework of entrepreneurial bricolage. Entrepreneurial bricolage sheds light on the behavior of the student entrepreneurs. It has proved to be an effective means for analysis, as it allowed focus on the actions connected to the resource use and development. However, it is important to acknowledge that research activities are intertwined, and the research method should not be considered a linear process (Dubois and Gadde 2002). This means that the theoretical framework is dynamic, as collected data will influence the framework. Dubois and

Gadde (2002) define this as "systematic recombination", hence the chosen framework and the use of it have changed during this study, which is in line with what could be expected. Ultimately, a three-stage model has been constructed to analyze the data within the university ecosystem, and is illustrated and described in Figure 2.2 from Chapter 2. It shows how the theoretical framework was used in three different steps to analyze the collected data: (1) Reliance on whatever resources are at hand, (2) Resource recombination for novel uses, and (3) Making do. These behaviors were used as a metric describing different resource-strategies among the student entrepreneurs. It provided valuable reasoning for labeling their actions and comparing the cases in terms of type of behavior.

3.4   Reflections on the Method

Evaluating the quality of the study is important, and one way to do so is to look into the trustworthiness of the research (Halldórsson and Aastrup 2003). Lincoln and Guba (1985) suggest that trustworthiness includes the four elements: credibility, transferability, dependability and confirmability.

Credibility attempts to demonstrate that a true picture of the phenomenon under scrutiny is being presented. According to Halldórsson and Aastrup (2003), credibility is determined by to which degree the respondent's constructions and the researcher's presentation of these correspond. To check this we recorded the meetings that we observed, and the interviews. Moreover, a multiple-case design increases the probability that the results are representable, because a broader data-set contributes to more comparable data.

Transferability is related to showing that findings are applicable in other contexts than the one studied. In a qualitative perspective the estimate of applicability is difficult due to the fact that the context of which the data is collected will be changing over time (Erlandson et al. 1993). However, the knowledge found in one context can be relevant in other settings as well. In that case, the person making that connection must fully understand the initial context of the findings, which is challenging. To deal with

this issue, we have described the characteristics of our context and the assumptions we have made, thoroughly.

Dependability concerns the stability of data over time (Lincoln and Guba 1985). The process of data collection has been affected by the different environments and individuals participating in the study. To raise the dependability of this study, we have structured the collected data according to our theoretical framework, which provides comparability across the cases. We have used peer debriefing as a tool to see if there is a connection between the collected data and the findings.

Confirmability can be described as the objectivity of the study (Halldórsson and Aastrup 2003). The conclusions of our study needs to be supported by the collected data itself, and not colored by our subjective interpretations of the data. Being involved in the NTNU university ecosystem we have been especially alert that we have to let the data speak for itself. Peer debriefing was therefore helpful when addressing the confirmability of the study.

3.4.1 Epistemology

We have preliminary ideas about the university ecosystem at NTNU, and are student entrepreneurs enrolled in a VCP. Conducting research within an ecosystem of which we are part of, results in a constructivist perspective laying the basic foundation of this study. Constructivism is the epistemology of the study, which Flick (2015) refers to as "worldview in social research". It defines what researchers view as knowledge, what results and evidence they accept, and how they proceed in their studies (Flick 2015). Constructivism acknowledges subjectivity as a way to dive deeper into the understanding of the individual phenomenon, and in this case the phenomenon is the resource utilization by student entrepreneurs within the NTNU university ecosystem. This constructivism allows for a deeper understanding of the cases, context and process. It has been vital that we strive to use our knowledge of the field only to navigate better in the collected data, and not to shape the direction or outcome of the study. In that way, constructivism has provided a positive contribution to the study, allowing

for deeper understanding, rather than coloring it.

Chapter 4

Findings and Analysis

The analysis of the collected data is divided into four main sections. First, we look at all the resources available in the ecosystem surrounding the student startups. We highlight what type of resources the students were talking about and categorize these into resource-groups and type of ecosystem in which the resource was found, either the university ecosystem or the regional ecosystem. Secondly, we consider "students as a resource", which we define as a resource originating from a student in the ecosystem (for instance student-to-student mentoring or an event arranged by students). Thirdly, we analyze how the students recombine resources in line with entrepreneurial bricolage-behavior. Finally, we look at the bricolage-behavior of "making do", and how the students go about making do with the resources recognized in their ecosystem.

From all the observations and semi-structured interviews, the coded analysis takes specific resources that the student entrepreneurs themselves mentioned in their conversations into account. In the following sections, the terms student entrepreneurs and cases will be used interchangeably.

4.1   Available Resources in the Ecosystem

An initial analysis of the resource environment has been conducted. Figure 4.1 shows an overview of the resources mentioned and recognized by the student entrepreneurs. It is divided into the regional ecosystem and the university ecosystem, and illustrates what types of resources the students see as available. In order for our findings to be put into the context of an existing framework, we use the student ecosystem proposed by Wright et al. (2017). Figure 4.1 is similar to Figure 2.1 from Chapter 2, however, Figure 4.1 highlights what resources within the university ecosystem were identified by the cases in this study. The underlined resources were mentioned by one or more

cases, while the non-highlighted resources are the original elements from the model by Wright et al. (2017) (Figure 2.1, 2) that were not mentioned.
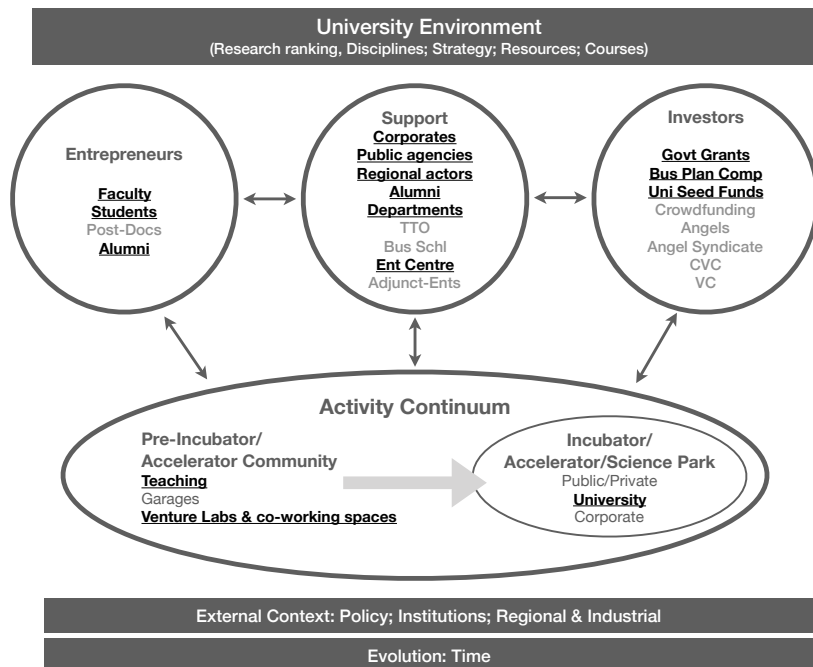
Figure 4.1: The students' resource environment systematized into the suggested student ecosystem by Wright et al. (2017). The highlighted words are the students' recognized resources from the obtained data.

As noted from Figure 4.1, the students mention almost every element of the framework by Wright et al. (2017), with an emphasis on the headline-elements "Entrepreneurs" and "Support". Accordingly, these elements are further elaborated on.

NSE and Spark (a student-to-student-mentoring program) were found to be important hubs for the student entrepreneurs within the university ecosystem. The students within NSE talk about this as their "home" at the university, and their main source of resources within the ecosystem. At the same time, the students outside of NSE talk about Spark in the same way. The NSE-students talked about their provided mentors, alumni network, lawyer and staff. In the Spark network, the students used their personal student mentor and access to recruiting through events. The students recognized the rest of the university ecosystem as consisting of Gründerbrakka (a stu-

dent incubator), professors, peer-students from other study programs and SINTEF (a private research institute). They also had access to university software licenses and 3D-printers. The students outside of NSE did also mention entrepreneurship courses, several of them being co-curricular, providing important access to entrepreneurship knowledge but also a contact point and link to experts who teach the classes.

The recognized regional ecosystem consisted of soft-funding access and mentoring from Innovation Norway, and is naturally the environment of the startups' customers, users and partners. The students had also been in contact with several local consultancies within budgeting, design, product development and IP assistance. In particular one of the cases mentioned several regional entrepreneurship events and competitions, such as Technoport. With that in mind, there are similar resources within the university ecosystem to many of those utilized in the regional ecosystem. As an example (as illustrated in Figure 4.1), none of the students mentioned post-docs, TTO, business schools or angel investors as resources, even though these are all available within the university ecosystem.

The four cases were all different in terms of the number of team members, type of technology, development phase and type of educational background. Even though they were all in an early-stage and students within the same university ecosystem, the awareness and utilization of resources varied between cases. However, some resources were mentioned by all cases, in particular students as a resource. To illustrate the variation, Table 4.1 shows all resources mentioned, and by how many of the cases the resource was mentioned.

Table 4.1: Resources mentioned by the student entrepreneurs in the collected data, the analysed type of resource, and the number of cases that mentioned the particular resource (either 1, 2, 3 or 4 cases).

Resource	Type of resource	Nr. of cases
NSE-students	Students	4
Student entrepreneurs	Students	4
Gründerbrakka	Incubator/co-working space	4
Innovation Norway	Soft-funding (state funded)	4

TEB	Soft-funding (private through Spark)	4
T:lab	Regional incubator	3
Innovation Norway mentor	Mentor	3
Spark-mentor	Student mentor	2
NSE-alumni	Alumni students	2
NSE-staff	Mentors/experts from university	2
NSE-mentor	Mentor from industry	2
JASUN	Student event for recruiting	2
3D-printer 1	Prototyping through Spark	1
3D-printer 2	Prototyping through student union	1
3D-printer 3	Prototyping through study program	1
Spark	Student-union for stud. entrep.	1
Start NTNU	Student union for innovation	1
Abakus Union	Student-union for computer science	1
Omega workshop	Student garage/lab	1
Computer scientist student	Student (masters program)	1
Design student	Student (masters program)	1
Student innovation Facebook-group	Virtual student network on Facebook	1
CAD	Software accessed through NTNU	1
Tripletex	Software licence through NTNU	1
NTNU professors	Domain academic expertise	1
SINTEF researchers	Domain research/industry expertise	1
NTNU IoT-lab	Prototyping, technology expertise	1
NSE IP advisor	Consultancy provided by NSE	1
NTNU Discovery	Soft-funding (through university)	1
FORNY2020	Soft-funding (national research council)	1
Venture Cup	University course	1
Market oriented product development	University course	1
Engage	University center	1
BDO	Consultancy (private)	1

Hamsø	IP consultancy (private)	1
Inventas	Product development (private)	1
FAKTRY	Hardware incubator (private)	1
Connect Trøndelag	Investor network (private)	1
Springbrett	Network event (by Connect Trøndelag)	1
The Creative Business Cup	Startup competition (private)	1
Technoport	Regional innovation event	1
Trondheim Calling	Regional music event	1

It is worth noting two examples from Table 4.1. The university-provided license on Tripletex was actually initiated by students. Acting on that, the university proceeded to establish an agreement with the accounting company to provide the resource to the students. Moreover, the IP consultancy called Hamsø is also a resource that has been included through a student union, where the student union has established agreements with the company to provide discounted prices for student entrepreneurs. These are both examples of how student entrepreneurs introduce resources from the regional ecosystem into the student ecosystem at the university. This, in turn, suggest that student entrepreneurs operate in an university ecosystem different to that of academic entrepreneurs, as they make regional resources available to student entrepreneurs through the university ecosystem.

As recognized in Table 4.1, all the student entrepreneurs talked about NSE-students and other student entrepreneurs (and their startups) as resources within the ecosystem. Gründerbrakka was also mentioned as a means of being a contact point to reach NSE-alumni students and other student startups who have office-space in the incubator. Everyone mentioned Innovation Norway and TEB (in Norwegian: Trønder Energi-Bidrag) as soft-funding options. TEB is the name of the soft-funding program provided by a Norwegian power company called Trønder Energi. In addition to the resources provided through the NSE-ecosystem and the Spark environment, the student entrepreneurs mention student-specific expertise, such as students from study

programs within computer science or design.

Based on all the resources found in Table 4.1, we define fewer and more narrow resource-groups to be: Student, Mentor, Soft-funding, Facilities/equipment, Events, Experts, Consultancy, University center, University course and Incubator. For instance, all resources recognized as being a student-driven resource are now under the broader resource group called "Student". Figure 4.2 shows the resources categorized into the new resource-groups and the ecosystem of which the resource was found.

	Resource	Resource-group (2.order)	Ecosystem (3.order)

University ecosystem

- Resource: NSE-student, Student entrepreneurs, Gründerbrakka, Spark mentor, JASUN, Spark, Start NTNU, Abakus, Omega workshop, Computer science student, Design student, Student innov. Facebook group → **Students**
- TEB, NTNU Discovery → 🟡 **Soft-funding**
- NSE alumni, NSE staff, NSE mentor → 🟦 **Mentor**
- NSE IP advisor, NTNU professors, SINTEF researchers → **Experts**
- NTNU IoT-lab, CAD software, 3D-printers, Tripletex → **Facilities/equipment**
- Engage → **University center**
- Venture Cup, Market oriented product dev. → **University course**

Regional ecosystem

- Innovation Norway, FORNY2020 → 🟡 **Soft-funding**
- Innovation Norway, T:lab → 🟦 **Mentor**
- BDO, Hamsø, Connect Trøndelag, Inventas → **Consultancy**
- Springbrett, The Creative Business Cup, Technoport, Trondheim Calling → **Events**
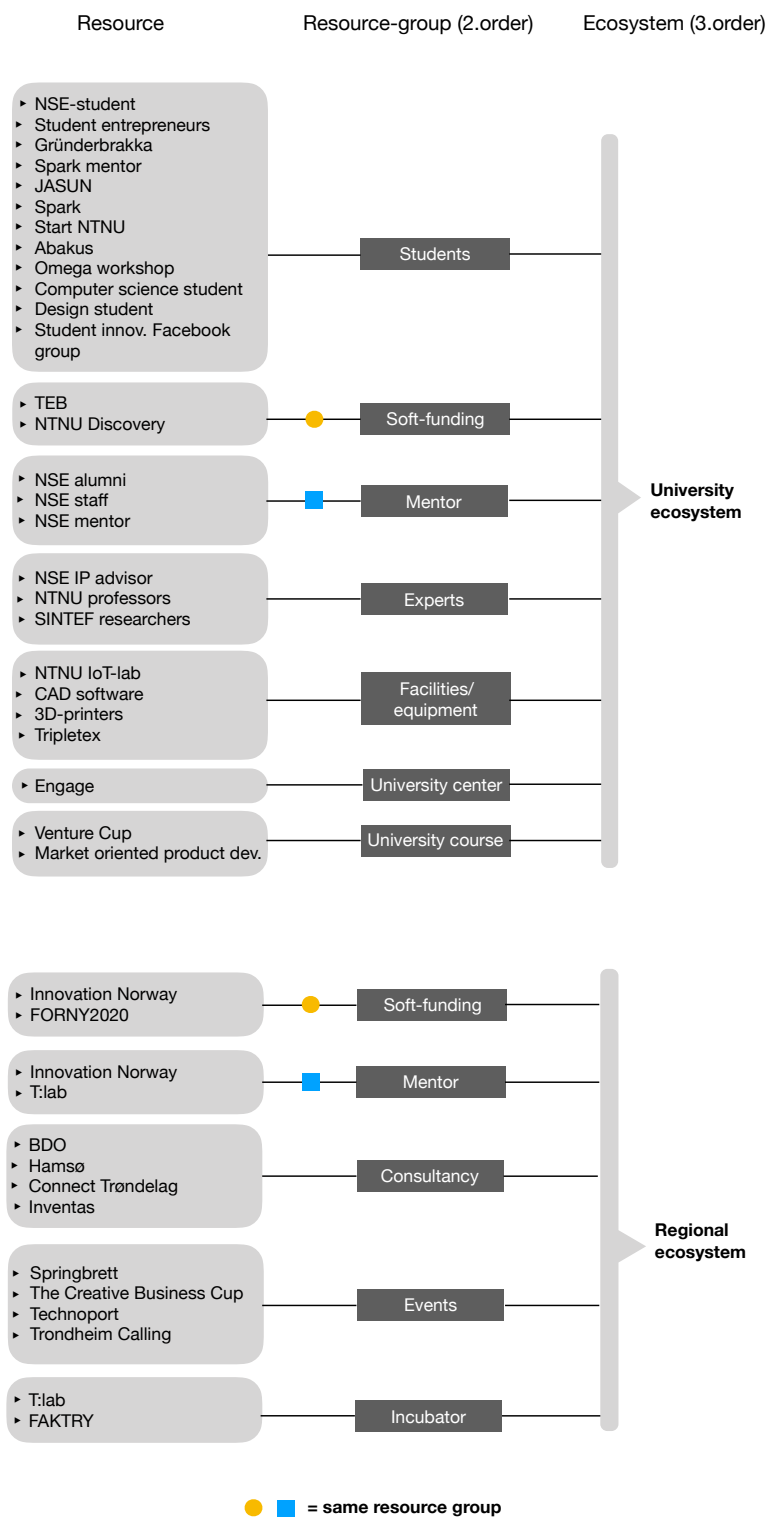- T:lab, FAKTRY → **Incubator**

🟡 🟦 = same resource group

Figure 4.2: Resources categorized in resource-groups and the ecosystem in which it was recognized or used.

From Figure 4.2, we recognize that most resources are found within the university ecosystem. However, resources in the regional ecosystem are also recognized, in particular resources within consultancy, events and incubators.

Table 4.2 shows direct quotes (1.order) from the collected data that contain the resources described in Table 4.1, to illustrate how the resources were mentioned in conversations between the students, during observations and semi-structured interviews. The quotes are labeled with the specific student case to illustrate the variation among the cases, and the corresponding resource group (2.order) as defined in Figure 4.2.

Table 4.2: Selected quotes including a resource (1.order), the case from which the quote was obtained, and the analyzed resource group (2.order).

Example quote and resource (1.order)	Case	Resource-group (2.order)
"We use the network at **NSE** and other **startups**"	A	Student
"We have talked to a **design-student** about making our logo."	B	Student
"We went to **JASUN** and got 2-3 inquiries."	B	Student
"We have to talk to other **startups** and listen to tips and tricks."	D	Student
"We needed a physical location at the campus to store the server, and thus we have office space at **Gründerbrakka**."	D	Student
"First of all, **Start NTNU** had a promotion stand in the two first weeks of the semester."	C	Student
"It's a huge advantage, the resources and the ecosystem at NTNU, especially **NSE** and **Spark**, where we have good help to move forward".	C	Student
"Our **Spark mentor** advised us on resources in the innovation ecosystem."	D	Student
"I have sent out an job advertisement to **Abakus student union**, including what our concept is."	C	Student

"We can write a message in the **student-innovation group** at Facebook."	D	Student
"It's about utilizing the network we are surrounded by, including the **NSE alumni** and **Gründerbrakka** and people who have previously been through similar hardware-cases."	A	Student / mentor
"We get a lot of push in the right direction from the **NSE-staff**."	A	Mentor
"We use our **mentor** provided from **NSE**."	C	Mentor
"We are going to get help with that from **T:lab**."	C	Mentor
"We were granted **mentor**-support from **Innovation Norway**."	C	Mentor
"We have soft-funding possibilities from **NTNU Discovery**."	A	Soft-funding
"Many **5th-graders** [at NSE] have applied for **FORNY**."	A	Student / Soft-funding
"We have got grants for commercialization from **Innovation Norway**."	C	Soft-funding
"We could have used **TEB** but it has not been a good reason to apply yet."	B	Soft-funding
"We can **3D-print** in the room next door"	A	Facilities/equipment
"We can offer **CAD-support**"	A	Facilities/equipment
"We have access to the accounting program **Tripletex** which we get discount on through NTNU."	C	Facilities/equipment
"That's why the **IoT lab** exists, so we can test out our technology."	D	Facilities/equipment
"We know a guy at **SINTEF** who helps us."	A	Experts
"We have gotten our **IP advisor** who is provided by **NSE**."	A	Experts
"We have **professors** who help us with that."	D	Experts

"We can ask about that on our meeting with **BDO** on Wednesday."	A	Consultancy
"We have gotten help with IP through **Hamsø**."	A	Consultancy
"**Inventas** does a lot of prototyping."	A	Consultancy
"We were granted Springbrett [a pitching competition] from **Connect Trøndelag**."	C	Event / Mentor
"**The Creative Business Cup** - I got aware of this event through being here in the ecosystem."	C	Event
"We went to **Trondheim Calling** to meet people in the industry."	B	Event
"It depends on the context, if we are at **Technoport**, we don't need to emphasize that we are students."	A	Event
"We met *Person1* and *Person2* from **Engage** at the event."	B	University center
"Things are more available here. Cool events. **Venture Cup**."	C	University course

Student contact has been recognized as one of the resources that all four cases talked extensively about, and the obtained material shows that the students themselves recognized this as the most important resource in their environment. The quotes (from Table 4.2) also show explicitly how the students talk about other students as a resource in their ecosystem. Therefore, analysis in the following focuses on students as a resource.

4.1.1 Student as a Resource

The importance of being part of a student innovation ecosystem was recognized by all the cases. The peer-to-peer conversations and exchange of knowledge between the students were highlighted in several different ways. Table 4.3 shows quotes from the collected data where the students were asked to mention the most important resource

they have in their ecosystem. This question was posed to all cases as the first question in the final interview.

Table 4.3: Quotes from each case on the question "What is the main contribution from the university ecosystem?".

Case	Quote
A	"From my point of view, it's obvious, it's primarily the other **students**."
B	"Probably the office, to physically be present, where all the **NSE-students** are."
C	"It's probably mentoring from **Spark**, because that is what I have used the most."
D	"**Spark** is the clearest contribution, we got access to **Gründerbrakka** and have received a lot of mentoring."

As noted from the quotes in Table 4.3, all cases mentioned a student-resource as their main contributor from the university ecosystem. This goes to show that other student entrepreneurs are in fact the most important resource available to student entrepreneurs. The students talk heavily about other students and how they help each other in different situations.

However, the student startups were not necessarily oriented about all other startups that exist within the university ecosystem. For instance, the NSE-students knew about NSE-alumni students at Gründerbrakka, but they were not aware of any other student startups in the university ecosystem that were not NSE-based. However, the NSE-students were more than aware of the startups within their own NSE-ecosystem, which they also used on a daily basis. Figure 4.3 shows the observed contact between the cases and other student startups in the ecosystem at NTNU.
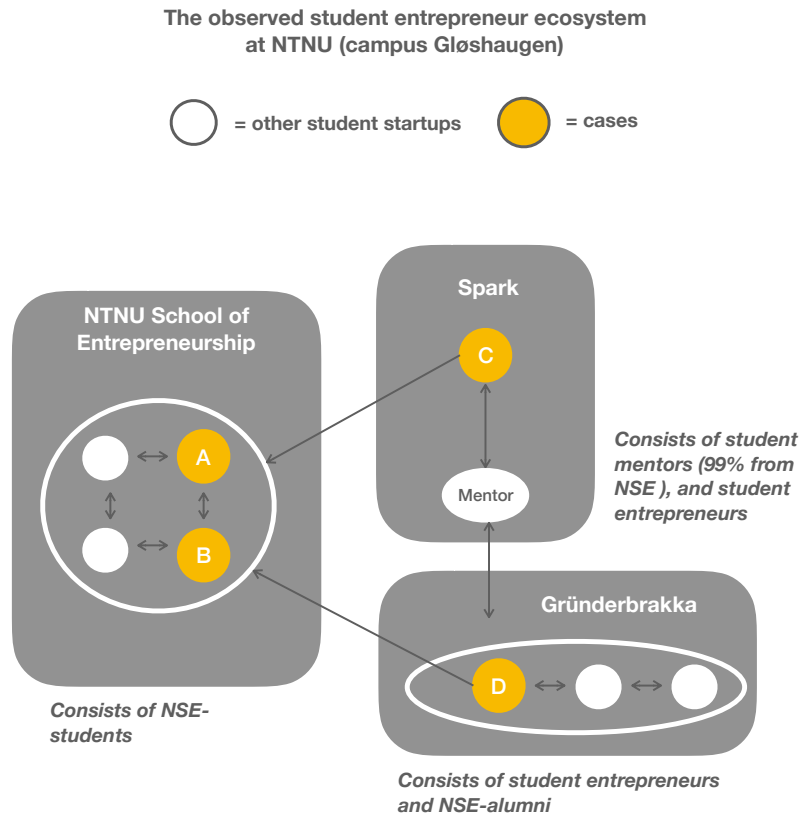
Figure 4.3: The observed division of the student entrepreneurs' ecosystem at the university and how they interact with each other. The one-way arrow represents a one-way use of the parts of the ecosystem, and a two-way arrow represents a two-way use.

Two of the cases were inside the NSE-ecosystem and had considerable contact with the students belonging to the ecosystem, however less contact with students outside. The NSE-students have offices in the same hallway, and the threshold to ask questions is low. When they are in doubt about some part of their business plan, or wondering where to get funding, they tend to ask their classmates. "We usually knock on four different student offices, and get four different answers. We always ask right away, and it can be questions that can't be found on Google". If the classmates do not know the answer, they tend to ask the NSE-staff or NSE-alumni. "The more we ask for help, the more familiar do they become about our startup, which makes them able to help us even more."

In the day-to-day activity of the two cases outside NSE, the student-mentor in Spark was found to be one of the most important resources that the students utilized in their immediate access (ref. quotes from Table 4.3). One of these cases was situated at Gründerbrakka, thus with access to other startups in the incubator. They did also use a Spark mentor, and some of the students had personal relations to NSE-students. The other case not part of NSE used their Spark mentor extensively, and the mentor was a NSE-student, which enabled the student entrepreneurs to get access to information inside the NSE-ecosystem. Our findings point to VCP-students being trusted advisors to other student entrepreneurs, and that student entrepreneurs outside VCPs take action based on the advice of VCP-students and adopt their way of reasoning in the venture creation process. In that, student entrepreneurs are affected by the VCP-students within their ecosystem.

As the students who were not part of the NSE-program were mostly engineering students, we found that they were in closer connections to their study program and thereby had tighter connections to technology experts and professors at the university. A statement made by one of these students was: "I take classes within computer science and I am in close connection to the research frontier". They did also have other engineering students in their immediate access, which made it easier to get quick answers to technology questions, both through university classes and student unions.

Despite lacking entrepreneurship education, one case used mentoring from Spark to acquire soft-funding from Innovation Norway. In that way, the student-resource (Spark) was used to access the regional ecosystem (Innovation Norway). One of the student cases experienced difficulties in receiving funding from Innovation Norway as they expressed concerns with the lack of business developing skills within the student team. Innovation Norway told them to sign up for the mentoring they provide. The startup was reluctant to do so as it cost money. Instead, they used the free student mentoring service Spark, where they received advice on their business model and help on the funding application. In later meetings with Innovation Norway the startup explained that they now receive mentoring, and Innovation Norway proceeded to approve their application for funding.

The example shows how the student entrepreneurs used other students to require a resource. Other similar examples were found in the study, in the sense of how they "recombine" resources for new purposes. Thus, we further elaborate on how the students used resources for "other" purposes, hence recombining resources.

4.2 Recombination of Available Resources by Balancing the Student-label

From Table 4.3, we recognized many different resources, however, not all of them were utilized for the resource's actual purpose. Some were recombined and used for new purposes, also with regard to underlying mechanisms. The analyzed "underlying mechanisms" are all related to some kind of legitimacy claim. The resource that was the most used for other purposes, or the most "recombined" resource, was what we describe as "student-label", namely the characterization of being a student who undergoes education at a university.

When the students tap into the regional ecosystem (e.g. try to find partners and customers), we recognize that they try to build, and sometimes need to build, legitimacy towards the stakeholders to pursue some type of collaboration. We recognize this as a "legitimacy threshold", which exists between the barriers of the university ecosystem and the regional ecosystem. In several of the cases, the students themselves suggest that they need to build some kind of legitimacy to cross the "barrier". Our findings suggest that the students discuss and consider their own legitimacy towards external stakeholders on a regular basis. This is exemplified by a case that used available 3D-printers, not to print items, but to tell an external stakeholder that they had it and could use it. That way the student entrepreneurs used the 3D-printer to build legitimacy rather than actually print something. They had not used the printers yet, nor did they know when they would need them, but the fact that they had access to them was something they felt strengthened their position in the partnership. Furthermore, the case was in discussions regarding a shareholders agreement with an external partner, and used their proximity to SINTEF on campus, their access to business ment-

oring through NSE and their access to funding from TEB as resources to strengthen their position. In their own words, this helped them to be displayed as "more than students". By balancing the student-label, NTNUs reputation, and leveraging other resources in the university ecosystem, they eventually manage to cross the legitimacy threshold. Figure 4.4 illustrates how resource recombination was used by the student entrepreneurs in order to build legitimacy, with the goal of obtaining new resources in the regional ecosystem.
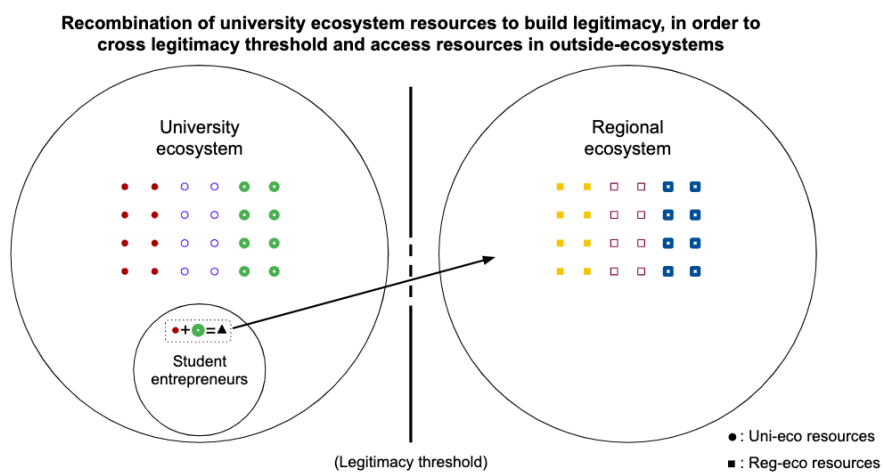

Figure 4.4: Model on how recombination of the available resources within the university ecosystem is used as a way of building legitimacy towards external stakeholders to cross the legitimacy threshold, and in that way getting access to new resources in external ecosystems.

Moreover, it was found that the student entrepreneurs balance the use of the student-label depending on its situational value. Sometimes the student entrepreneurs draw on the student-label whilst other times striving to distance themselves from it, this is due to some potential partners that do not see students as real business partners, but rather young students without much prior knowledge. Consequently, the students try to turn away from this by arguing that they could have been employed, however, that being a student enables access to great resources. The cases do not necessarily build on technology and expertise from the university, even though the venture is technology based. In one of the cases, the technology was found to be rather simple, but the

market introduction of the business idea was challenging. In this case, the students turned away from the student-label, and instead built on previous personal industry experience. The students felt they were taken more seriously once they referred to personal experience within the market segment.

Table 4.4 shows quotes from the obtained material that exemplify the use of the student-label in both a favorable and a non-favorable way (an obstacle).

Table 4.4: Selected quotes from obtained material on the student-label, the analyzed purpose, and underlying mechanism.

Example quote on student-label	Purpose	Underlying mechanism
1.order	2.order	3.order
As a favorable resource		
"When we contact unknown people, they usually don't say no [to talk to us] because we are students from NTNU"	New partnership	Build legitimacy through student-label
"To validate and make ourselves more robust as a student company, we tell that we have professors who can help us."	New customer	Build legitimacy through university
"We have done everything ourselves, however as a student startup, which actually tries to get some money on the table, it's all about building on and obtaining the most validity."	Strengthen position towards external team members	Build legitimacy claims
"Don't know how good it sounds to be students, however, if someone has 'approved' us it will be easier for other people to approve us too. It doesn't help that it's cheaper, the product has to work."	Attract new customers	Build legitimacy by balancing the student-label

"Our partners need to see that we come from the music industry, and not just NTNU."	Attract new partners	Building legitimacy through industry experience
"If we are out talking to people and we say "we are students, we are starting a company", it's easy to be perceived as 'just another student startup'. Therefore, initially it may not sound good, however it helps that we come from NSE and are surrounded by the right ecosystem."	Attract new partners and customers	Building legitimacy as professional entrepreneurs by burying the student-label
"They [the partners] see us as students doing a student project, and that is transparent in the written agreement they have proposed, even though we have talked about it over the three previous meetings. We are not students, however, we are surrounded by students, which gives us advantages."	Be perceived as a "real" startup	Building legitimacy as professional entrepreneurs by burying the student-label

University Reputation as a Resource

In line with the utilization of the student-label, the NTNU-label was also found to be used as a resource by the cases. NTNU is a technology-driven university which promotes research and innovation. In Norway, NTNU is well known for its high-level students, and being in front of technology development. From the following quote, it is worth noting how the student uses the NTNU-label when talking about future customer contact: "It benefits our company to come from NTNU and to be close to SINTEF. We are going to emphasize this when talking to customers, and use the NTNU-label." This was already found to be a critical factor in one of the cases. In communication with a potential pilot-customer, they stressed that they are part of a

strong academic community of researchers and experts within the very field of technology that their startup is operating within. They used this argument extensively when building up their business case towards pilot-customers and partners. The student entrepreneurs explain that the pilot-customer thought this was reassuring, and the "strong academic community" is even mentioned in their formal pilot-customer contract. The students describe their pilot-customer to have more faith in the student venture, because they identified a strong relationship between students, the university expertise, and the available university-resources. However, when asked if the students benefited from the academic community in their product development or day-to-day activities, the students say that they have not really needed help from these experts yet. This shows that the student entrepreneurs found and used a resource within the university ecosystem to build legitimacy even before they needed the resource for its "actual purpose".

4.3   Making do

Throughout the data collection, none of the students have stopped du to resource-obstacles or complained about lacking resources. Rather, when faced with resource-limitations they constantly seek new opportunities, take what they have and find what they need, which is recognized as the bricolage-behavior of "making do". As an example one of the cases sold their solution to a pilot customer before even developing it. Further, they explained that they did not know for sure if they actually would manage to deliver what they had sold, but stressed that if that was what the customers wanted - that was what they would be selling. They would just have to make it work and find a solution to develop their product. The student entrepreneurs did not stop themselves, or considered the lack of resources a limitation. Rather they decided to "make do" with the available resources, and find a way to develop what they need regardless.

Table 4.5 shows examples of how the students talked about particular resources in ways coinciding with "making do". The quote (1.order) has been decoded into a re-

source group (2.order), which comes from the resource groups from Figure 4.1, and the type of making-do-behavior (3.order).

Table 4.5: Exemplary quotes on the use of a resource, its resource group and the analyzed making-do-behavior.

Example quote including the resource	Resource group	Making-do-behavior
1.order	2.order	3.order
”I start to search for resources at NTNU, but I haven't used any yet. I have access to a 3D-printer through my study program.”	Facilities/assets	Mapping out for future value
”We can search for candidates at JASUN, we need more developers eventually.”	Students	Mapping out for future value
”That would only be to contact any NSE-alumni”	Mentor	Mapping our for future value
”We have very limited time from day-to-day. We could have applied for TEB but hasn't been a good reason yet.”	Soft-funding	Mapping our for future value
”If everything goes as planned, we can recruit more students from NTNU. This is the best place to look for people. They are students and young, and many of them look for startups. A lot of the smartest people in Norway are here and they have high ambitions.”	Students	Mapping our for future value
”The right competence is literally next door. Our plan is to build on this, get as much information as possible, and get information that we might not know we needed.”	Experts	Opportunity-seeking
”We can get 1 million NOK from an investor, and then we can work one year, and *then* we can consider those things.”	Soft-funding	Opportunity-seeking

"Looking into the CAD-drawing, we just need access to the files, and start to look at them."	Facilities/ equipment	Problem-solving
"Are there anyone at NSE who have done the same calculations previously?"	Students	Problem-solving
"I am thinking about including a friend/student from my study program in an application for Gründerbrakka. He knows some programming."	Students	Problem-solving

It is clear that the students both use their immediate resources in their ecosystem for direct use in daily problem-solving, in opportunity-seeking and mapping out the resource for future value. The students from NSE are aware of their access to the alumni network and their personal alumni-mentor, however they have not necessarily used it for any particular purpose yet. Still, they manage to map out the future value of the resource (e.g. get mentor advice or industry insight from alumni on a later point in time), and leverage their own resource environment based on this.

The students within the Spark environment are aware of their access to promote their startup at the recruiting event JASUN, which reaches out to NTNU students who want to become part of a startup. Not only do the students map out the future value of JASUN, but they also use this to be perceived as resourceful towards the stakeholder, which in turn contributes to build legitimacy.

The observations of making-do-behavior support the findings from Section 4.1 about available resources in the ecosystem. The students recognize several different resources, however, the most frequently used resources in their early-stage development are most of all student-related. The other resources are either used for recombination (to build legitimacy), or found to be useful in problem-solving, opportunity-seeking or for future value.

Chapter 5

Discussion

Without resources, and the right utilization of them, venture creation would be impossible (Baum and Locke 2004). Anchored in the literature, and supported by the collected data, we argue that students find themselves in a situation where they have limited access to resources (Kew et al. 2013; Politis et al. 2010). Being young and without full-time employment means that students have less financial resources, a smaller professional network and less experience than individuals attempting entrepreneurship at a later stage in life.

As presented in the results, a number of resources, and the student entrepreneurs' perception of their value and areas of use, were identified in the collected data. The student entrepreneurs all discussed strategies about what resources to use and how. Going back to the figure addressing the scope of this thesis, Figure 2.2 in Chapter 2, we would like to discuss how entrepreneurial bricolage-behaviors are adopted by student entrepreneurs to utilize and develop resources, within the university ecosystem.

Figure 2.2 outlines how entrepreneurial bricolage captures the interplay between the student entrepreneurs and the university ecosystem by categorizing their actions into bricolage-behavior: (1) resources at hand; relating to what available resources within the ecosystem the student entrepreneurs use and how, (2) recombination of resources for novel uses; referring to how the student entrepreneurs develop the resources further and find new areas of use, and (3) making do; relating to the student entrepreneur's ability to search for opportunities and solutions rather than acknowledging obstacles (such as resource limitations). In further discussions, we will highlight how these *bricolage-behaviors* are necessary tools for student entrepreneurs in order to locate, use and develop resources available within the university ecosystem.

5.1 Resources at Hand

An important element of entrepreneurial bricolage is the entrepreneur's tendency to rely on the resources at hand (Baker and Nelson 2001). In the student entrepreneurs considered in this study, this aspect relates to what resources they used within the university ecosystem, and how they developed them. Figure 5.1 illustrates direct resource-use within the university ecosystem, which is the part of the resource utilization that will be discussed in this section.
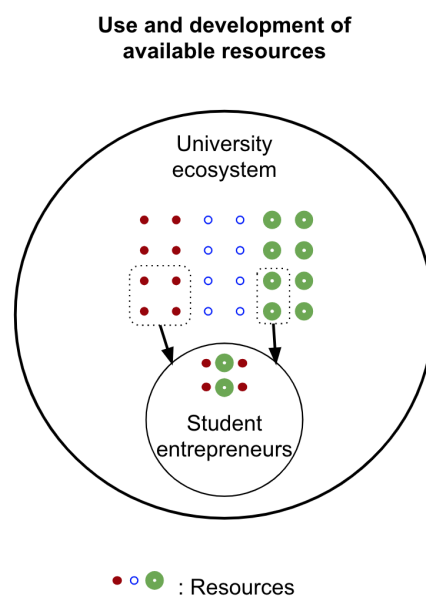
Use and development of
available resources

Figure 5.1: Model on how student entrepreneurs select and use resources within the university ecosystem.

Supported by existing literature (Brush et al. 2001; Kew et al. 2013; Politis et al. 2010), the study shows that resources play an important role in an entrepreneur's ability to develop new ventures. Nonetheless, we observed a consensus on student entrepreneurs not having access to the same resources that academic or serial entrepreneurs often do, which is underpinned by arguments by both Kew et al. (2013) and Politis et al. (2010). Several of the cases pointed to difficulties in obtaining resources located outside the university ecosystem. This difficulty has been worded in existing literature as well, as finding and using the right resources is identified to be one of the

greatest challenges entrepreneurs are faced with (Brush et al. 2001). Moreover, the cases all address the issue of external partners' distrust in their ability to actually start successful ventures, due to them being "just student entrepreneurs". This shows that there is an established understanding of student venture creation within the scarce resource environment of a university as being challenging.

Meanwhile, through creative combinations and development of the available resources in the university ecosystem, the student entrepreneurs still manage to overcome the limited resource-environment and progress in their early-stage venture creation. This ability to weather these challenges demonstrates how the bricolage-behavior of "relying on the resources at hand" is an effective means for creating something out of little, and progress in the venture creation process (Baker and Nelson 2001). This is consistent with the study of Politis et al. (2010), which suggests that student entrepreneurs have a distinct way of reasoning when it comes to the acquisition and use of resources. Politis et al. (2010) conclude that establishing a venture within a university context will influence the resource logic of the entrepreneur towards effectuation and bootstrapping. Consequently, this will foster flexibility and an emergent and means-driven strategy, as well as the process of acquiring resources at a low cost. This coincides with the reality of how the student entrepreneurs in this study describe the establishment of their ventures, which is marked by spontaneous decisions driven by low-cost solutions.

For instance, how do student entrepreneurs go about finding the resources to make a prototype? The student entrepreneurs considered all argue that they do not have the funding necessary to purchase costly materials. Instead, they plan to scramble together what they find at campus; borrowing circuit-boards and electronics from university-based workshops, and 3D-print plastic parts on campus. This creative resource-sourcing process coincides with the characteristics of *relying on resources at hand* (Baker and Nelson 2001). It is also consistent with the findings of Politis et al. (2010) arguing that student entrepreneurs are more likely to act in response to their ecosystem and surroundings when utilizing and developing resources than non-student entrepreneurs. This study extends those findings in suggesting that student

entrepreneurs, themselves, even are significant contributors to the formation and development of the very ecosystem that surrounds them. This is because student entrepreneurs introduce resources from the regional ecosystem into the university ecosystem, making them available to other student entrepreneurs. In that way, the student entrepreneurs are not just affected by, and operating within, the university context. They are actively affecting the entrepreneurial university ecosystem bottom-up.

5.1.1 Students as a Resource

Our study places the student entrepreneurs as vital creators and developers of the entrepreneurial university ecosystem. The framework by Wright et al. (2017), which describes what an ecosystem should consist of to enable student entrepreneurs to successfully launch their ventures, focuses on how the student entrepreneurs are affected by the university ecosystem. These findings are to serve as a tool to university faculty and administration when building and nurturing these ecosystems (Wright et al. 2017). Wright et al. (2017) make some interesting suggestions on how the student entrepreneur is affected, such as the impact of time, mentors and education. However, how the student entrepreneurs themselves affect the ecosystem is not taken into account.

We argue that student entrepreneurs, and especially VCP-students, are recognized by other student entrepreneurs as cornerstones within the university's entrepreneurial ecosystem. Lackéus and Middleton (2015) suggest that VCPs contribute to shaping a more entrepreneurial university culture by the development of entrepreneurial behavior in its students. The study recognize students within VCPs as especially competent and valuable as advisors and contributors within the entrepreneurial university ecosystem. This indicates that entrepreneurship students' way of thinking and acting, to some degree, might be shaped by the entrepreneurship education they take part in, adding to the findings of Lackéus and Middleton (2015). Politis et al. (2010) support this argumentation, as their findings suggest that student entrepreneurs who have been enrolled in entrepreneurship programs develop a collective way of thinking and behaving, in relation to their preferences for how to secure and use resources in the

process of starting up and managing a new venture. This collective way of thinking just might be the very core of these students' value within the university ecosystem. Deepening, we suggest that the culture and mindset that VCP-students develop is not merely constrained to VCP-students. Student entrepreneurs are affected by the VCP-students within their ecosystem and adopt their reasoning in the venture creation process.

Ironically, however this collective mindset might also be the reason why student entrepreneurs to some degree ignore the same resources within the university ecosystem. For instance, knowledge transfers may be a significant contributor to the university's entrepreneurial mission, facilitating commercialization and technological advances (Etzkowitz et al. 2000; Wright et al. 2017). However, to student entrepreneurs, this resource appears to be untapped and insignificant. Our findings even show that student entrepreneurs tapped into the regional ecosystem in order to find experts on intellectual property, bypassing the knowledge on patenting available at NTNU TTO entirely. Yet, according to Wright et al. (2017) knowledge transfers are a vital part of the university ecosystem, bringing us to believe the interest in elements making up university ecosystems is two-fold.

On one hand, the university is interested in facilitating commercialization of university technology and academic entrepreneurship to add to the university's value creation (Etzkowitz et al. 2000; Hayter et al. 2017; Wong et al. 2005), while on the other hand student entrepreneurs strive to benefit from the university ecosystem in order to grow their ventures independent of the university. This means that student entrepreneurs are eager to develop their ventures and help each other by exchanging knowledge and favors, yet none of them talked about creating value for the university in return. In that sense, the university and the student entrepreneurs appear to have different objectives in regards to the development of the entrepreneurial university ecosystem. This poses the question of who the entrepreneurial university ecosystem should be developed for. The resources that foster academic entrepreneurship might not be the same that encourages student entrepreneurship. Hayter et al. (2017) have recognized student entrepreneurs as the main entrepreneurship agent within the university con-

text, still the entrepreneurial university ecosystem seems incompatible to their needs. Next to the literature on the field (Boh et al. 2016; Hayter et al. 2017; Wright et al. 2017), this study points to different resources appearing important to the respective groups.

Moreover, Beyhan and Findik (2018) argue that every university ecosystem is different, and according to Bergmann et al. (2016) and Hayter et al. (2017) the characteristics of the region where the university is located also affects the student entrepreneurs. Findings in this study support these arguments as student entrepreneurs get access to resources in the regional ecosystem through the university ecosystem. Consequently, we suggest that research aiming to recommend how university ecosystems should be built or developed might be of limited value. Our study points to a dissonance between the importance of the elements within the university ecosystem in regards to what student entrepreneurs actually use and what the literature recommends ecosystems to consist of. As literature within the field of entrepreneurial university ecosystems broadly address the composition of it, and top-down advice on the development of it (Boh et al. 2016; Miller and Acs 2017; Wright et al. 2017), this study sheds light on bottom-up aspects related to the use of the entrepreneurial university ecosystem. We argue that the student entrepreneurs themselves are active developers of the entrepreneurial university ecosystem, both by embedding resources from the regional ecosystem into the university arena and by helping each other navigate, and benefit from, the entrepreneurial university ecosystem. This way of responding and navigating based on the resources at hand concur with entrepreneurial bricolage-behavior (Baker and Nelson 2001; Fisher 2012), suggesting that student entrepreneurs are adaptable and dynamic in the interplay with the university ecosystem around them. This could, in turn, suggest that *how* the student entrepreneurs maneuver within the university ecosystem is more important than the elements of which it consists.

5.2 Recombination for Novel Uses

Recombination of resources for novel uses is the second highlighted element of entrepreneurial bricolage (Baker and Nelson 2001). In this study, this relates to how the student entrepreneurs manage to combine the available resources to the extent that they can be used for different purposes than that of their direct value. In the studied student entrepreneurs, this reflects how they used the resources creatively, and Figure 5.2 illustrates what will be discussed in this section, which is the recombination of available resources within the university ecosystem.
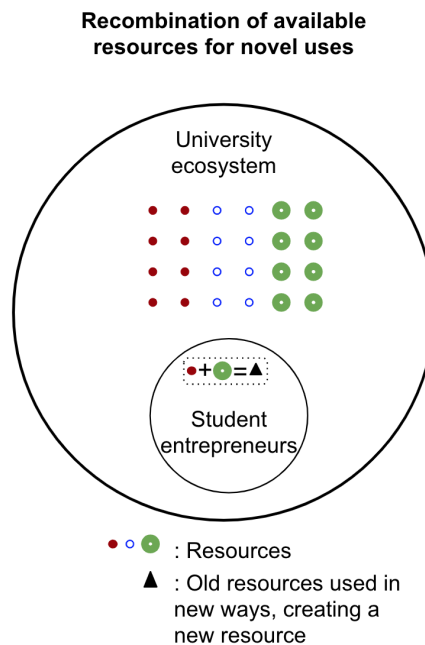

Figure 5.2: Model on how recombination of available resources is used to create, or gain, new resources.

Developing and recombining the existing resources in order to further benefit from them proved to be a common focus among the studied cases. The "new resource skill" is vital to venture creation (Baum and Locke 2004), and according to our findings, student entrepreneurs are likely to adopt it. This is supported by scholars that set student entrepreneurs apart from other entrepreneurs in terms of resource logic, behavior and response to the ecosystem (Brush et al. 2001; Hayter et al. 2017; Politis et al. 2010).

We argue that entrepreneurial bricolage-behavior enables student entrepreneurs to utilize "the new resource skill", which is an absolutely crucial part of student entrepreneurship. Developing resources with the aim of widening the resource-repertoire is a typical trait of entrepreneurial bricolage, and is in line with observed actions in the student entrepreneurs considered. All of the students mapped out and used resources for uses beyond its direct purpose.

Student entrepreneurs use different resources, especially the student-label, consciously aiming to build legitimacy towards external stakeholders. There are a number of resources in the regional ecosystem that are (temporarily) unavailable to the student entrepreneurs. These resources could, for instance, be funding, partners or customers. Zimmerman and Zeitz (2002) suggest that entrepreneurs face a legitimacy threshold for accessing these resources, which coincides with our findings. Furthering that, this study reveals that student entrepreneurs attempt to use resources as stepping stones to cross the legitimacy threshold. The students utilize the fact that they know the university environment with experts and access to the newest technologies, knowledge and facilities, by using it as a sales arguments in conversations with potential partners outside the university. In this way the student entrepreneurs find new uses for the resources around them, and actively use resources with the goal of building legitimacy.

Why would student entrepreneurs find and combine available resources with the intention of building legitimacy, often even before they actually use the resources for their obvious purpose? According to Singh et al. (1986) and Zott and Huy (2007) stakeholders face uncertainty and may be cautious to make resources available to new ventures. Hence, the entrepreneurs need to build legitimacy in order to eliminate the obstacle of uncertainty. The actions of the student entrepreneurs in doing so by recombining resources are corresponding with the logic of entrepreneurial bricolage, which stresses the importance of exploring new uses of resources, in order to grow their new venture (Baker and Nelson 2001). Moreover, they apply available resources as a means of building legitimacy with the aim of obtaining new resources, like partners, sales contracts and funding. When attaining a new resource is considered "the next important step" student entrepreneurs will search for available resources that can

hold future value, using them as a means of establishing enough immediate legitimacy to obtain the new resource. By not merely looking at the resources and their direct value but opening up to alternative uses, the student entrepreneurs manage to make something out of little.

In contrast, the student entrepreneurs knowingly hid the student-label when they expected it to contribute negatively to external stakeholders' view of the startup. This suggests that the student entrepreneurs balance the student-label both as a resource and an obstacle. This balancing act has not yet been articulated within the literature of student entrepreneurship. However, Beyhan and Findik (2018) found that the university's excellence in science had a significant impact on student entrepreneurship. Our findings add to their discussion by suggesting that the university's reputation of excellence does not merely influence the entrepreneur's abilities, but also affects how the student entrepreneurs expect to be perceived by external partners and customers. Student entrepreneurs use the student-label actively to build legitimacy by attaching themselves to the NTNU-reputation of excellence. An interesting question in this connection is whether the characteristics of the university might impact if the student-label is viewed as a resource or an obstacle.

5.3 Making Do

Within entrepreneurial bricolage "making do" is about locating available resources, yet never accepting their limitations (Baker and Nelson 2001). The mindset this refers to is that of an entrepreneur who is opportunity-seeking, focused on problem-solving and who is not constrained by having limited resources. In this study it relates to how student entrepreneurs map out and plan their startup-activities around available resources, and their problem-solving or opportunity-seeking actions and behavior. How can they make the most out of least within the university ecosystem? Figure 5.3 illustrates what part of the resource utilization will be discussed in this section, which is the actual direct mapping of available resources and the related opportunity-seeking and problem-solving behavior of the student entrepreneurs when doing so.

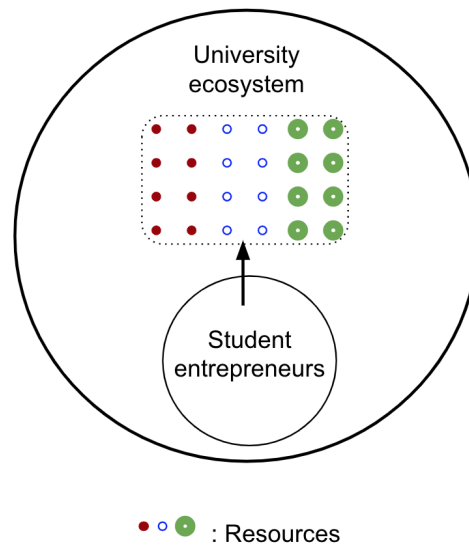**Identifying and making do with resources
within the university ecosystem**

Figure 5.3: Model on how student entrepreneurs "make do" with the available resources, by mapping them out and looking for opportunities and focus on problem-solving based on resources within the university ecosystem.

The study shows that student entrepreneurs first of all utilize the resources that are in close proximity to them, by actively reaching out to professors and other student entrepreneurs to find answers to their questions. This underpins findings by both Ahsan et al. (2018) and Boh et al. (2016) establishing that contributions from entrepreneurs, mentors and other experts are central to student startups. The student entrepreneurs are aware of the rich university knowledge, and actively seek expertise inside the university ecosystem. However, the student entrepreneurs acknowledge the surrounding regional ecosystem, yet, first of all, the student entrepreneurs consult other students to get information or a reference. This is in itself an example of how the student entrepreneurs act according to an entrepreneurial bricolage-mindset of "making do", meaning they make the most out of their immediately available resources.

In that respect, the study supports Shook et al. (2003) in the assessment of the importance of the interplay between the individual student entrepreneur and the resource environment, as the student entrepreneurs are found to both be affected by, and affect-

ing the ecosystem. However, this study furthers the findings of Shook et al. (2003) by wording *how* the student entrepreneurs act when maneuvering the ecosystem. They start of by exploring the parts of the ecosystem that they consider closest, and thereby easiest to access. They reach out to other student entrepreneurs and use the student ecosystem as a road map to navigate the university ecosystem.

Additionally, students within VCPs create ventures in a facilitated environment where they learn to fail and learn from mistakes (Lackéus and Middleton 2015). This study shows that VCP-students bring these experiences and attitudes along into the university ecosystem, which is an important aspect of entrepreneurial experience. The encouragement to try again and "make do" that is embedded in the core of the student entrepreneurship-culture affects the student's eager and desire to start a new venture in terms of always focusing on opportunities and moving forward. Lackéus and Middleton (2015) argue that VCPs are capable of shaping a more entrepreneurial university culture by developing entrepreneurial behavior among involved students. This is in line with findings in the studied cases, as student entrepreneurs enrolled at a VCP all pointed to faculty and doctoral students (who are made available through the program) as providers of vital insight to their venture creation process. As discussed, the VCP-students are in turn important resources to other student entrepreneurs within the university ecosystem. Not only does this contribute to a more entrepreneurial university culture as argued by Lackéus and Middleton (2015), it is also a way of developing the students' collective way of thinking and behaving as proposed by Politis et al. (2010).

Further, Beyhan and Findik (2018) argue that informal environmental factors such as attitudes are highly influential on student entrepreneurs. It appears that the attitude of "making do" aid the students in collectively being content with the resources at hand, rather than acknowledging obstacles and limitations. Student entrepreneurs show an overwhelming amount of this exact trait by looking for, and utilizing, resources in close proximity and finding alternatives or substitutes that is "as good as" what they really need. In that, they act confident and unaffected by resource constraints, attesting to the entrepreneurial bricolage-mindset as being of value in driving the venture

creation forward.

5.4 Resourcefulness as an Underlying Driver for Bricolage-Behavior

After discussing the three bricolage-behaviors as identified by Baker and Nelson (2001), there is yet something that we believe has been left out. That is, who the bricoleur is in the middle of all these behaviors and strategies. Duymedjian and Rüling (2010) have pointed to the need for more research on the traits of the bricoleur, as the most acknowledged references for entrepreneurial bricolage focus on actions rather than *who* the bricoleur is. In conducting this study we noted that a common trait across all the studied student entrepreneurs was their ability to extend their resource-repertoire beyond what was handed to them. In order to succeed in doing so, they had to find the right people within the university ecosystem, who could point them in the direction of new resources. Although we have categorized the act of reaching out and using other student entrepreneurs as a way of using and developing *the resources at hand*, we argue that the bricoleur's ability to do so is anchored in their level of *resourcefulness*. Our grasp of resourcefulness is in broad strokes in line with the original view of Lévi-Strauss (1966), as we observe it to be an understanding of one's environment and the ability to navigate it.

However, we expand on the idea of resourcefulness by suggesting it is anchored in the bricoleur's boldness when reaching for a broader repertoire to benefit their star-tup activities. The student entrepreneurs are able to find resources and grow their ventures by reaching out to people, interacting with customers and planning future resource utilization. The student entrepreneurs talked about how their solutions were to be shaped by what their customers or partners expressed interest in, and "sold" a solution before they knew if they could even develop it. They do whatever it takes, which goes beyond what could be categorized as "making do". Not only are they opportunity-seeking and solution-oriented, but we would argue that they do it in a *smart* way. Meaning that there appears to be a foundation of resourcefulness from

which the student entrepreneurs act upon in order to succeed in their strategies for resource utilization, carried out by bricolage-behavior.

Chapter 6

Conclusion

The purpose of this study was to better understand the phenomena of early-stage resource development among student entrepreneurs within the university ecosystem. A multiple-case research design has been applied, where four early-stage startups at NTNU Trondheim have been observed and interviewed in February and March 2019. The study aimed to answer two research questions:

RQ 1 How do student entrepreneurs go about early-stage resource development?

RQ 2 What is the role of the student entrepreneur within the entrepreneurial university ecosystem?

Data from observations and interviews was coded, analysed and discussed, using existing literature as a frame of reference and entrepreneurial bricolage as a theoretical framework. The results highlighted some findings, which will be presented related to the respective research questions in the following.

Research question 1: How do student entrepreneurs go about early-stage resource development? The student entrepreneurs map out available resources within the university ecosystem, mainly by interacting with other student entrepreneurs. They ask their peers for advice on funding, events, document templates and other resources. Other student entrepreneurs were recognized as the most valuable resource within the university ecosystem. Moreover, the student entrepreneurs "make do" with the available resources by being highly opportunity-seeking. They evaluate which available resources they expect to become important in the future, and plan their activities based on opportunities and resources at hand within the university ecosystem. In addition, the student entrepreneurs recombined resources in order to use them for different purposes than their direct area of use. All studied cases used resources available in the university ecosystem as a means of building legitimacy. In this way, it is possible to cross the legitimacy threshold between the students and resources available in ex-

ternal ecosystems.

Research question 2: What is the role of the student entrepreneur within the entrepreneurial university ecosystem? The student entrepreneurs proved to be essential resources within the university ecosystem. Student entrepreneurs rely on each other for advice, guidance and recruiting. In that, the student entrepreneurs appear to be vital developers of the very university ecosystem they operate within. They are contributors to the university ecosystem in two ways. Firstly, student entrepreneurs are sources of knowledge to each other, providing treasured advice that several times leads to direct and tangible value to student startups. Secondly, student entrepreneurs add to the university ecosystem by pointing each other in the direction of resources.

Moreover, the most used and appreciated resources to student entrepreneurs are resources in close connection to them, or resources that other student entrepreneurs brought into the university ecosystem. This goes to show that student entrepreneurs develop and expand the entrepreneurial university ecosystem. The top-down administrative creation and development that is much discussed within existing literature might be more influenced, or accompanied, by bottom-up mechanisms and initiatives from students than what has previously been taken into account. It is indisputable that the knowledge the student entrepreneurs bring into the ecosystem is indispensable, as it is deemed the main driver for successful student-created ventures, by the student entrepreneurs themselves.

6.1 Implications and Future Research

On the basis of the uncertainty of whose responsibility it is to maintain or develop the university ecosystems, we pose the question of the value of research covering recommendations on specific elements that should exist within the ecosystem. Is it realistic that one person, or entity, could take on the task of changing the elements making up the whole ecosystem? Taking into account the fact that ecosystems are large and heterogeneous, and thus difficult to change or influence, whilst student entrepreneurs are possible to advise and teach (Gorman et al. 1997; Neck and Greene 2011; Pittaway and

Cope 2007; Rae et al. 2012), it seems natural that the student entrepreneur deserves a sharper focus. Thus, suggestions on how the student entrepreneurs themselves can cope and learn to benefit from what is available in their university ecosystem form a valuable contribution to the literature. Moreover, how universities might facilitate student initiative, and develop future research to strengthen the field of student entrepreneurs, is a valuable implication from this study.

We would like to introduce some implications for student entrepreneurs, universities and future research, drawn from the findings of this study.

6.1.1 Implications for Student Entrepreneurs

Establishing student-to-student contact as one of the most important resources in the ecosystem, we suggest that the students themselves can facilitate even better communication across the student ecosystems. They can benefit from engaging in the innovation initiatives at the university, and interactions with other student entrepreneurs. However, finding that many of the student entrepreneurs do not know about each others' existence suggests that more interaction is needed. Simple things such as having a map of the ecosystem hanging on the wall, can influence their awareness. Further, innovation events are recognized as important arenas for connecting with other student entrepreneurs. This can in turn help facilitate even more peer-to-peer collaboration and the extension of knowledge between student entrepreneurs.

Lastly, the engagement of student entrepreneurs at campus could inspire and encourage student unions across disciplines to engage more in innovation activities. In that way, the student entrepreneurs lead by example, and foster the development of the university ecosystem by increasing the demand for innovation activities by showing entrepreneurial presence.

6.1.2 Implications for Universities

In light of the suggestion that universities are heterogeneous in their resources and competencies made by Beyhan and Findik (2018), it is interesting to observe that most

studies address the discussion on student entrepreneurship and university ecosystem at university- or program-level. For instance, does the framework for university ecosystems developed by Wright et al. (2017) apply to all the different university ecosystems? Our findings suggest that the framework embodies several elements that appear to be significant parts of the university ecosystem at NTNU, in the eyes of the student entrepreneurs. This suggests that it is necessary to account for differences between universities when developing their university ecosystem. No universities are the same, so the ecosystems and mechanisms will be different. Studies, such as this one, should serve as a compass and inspiration rather than a complete map.

We suggest that universities would benefit from mapping out the students' contribution to the ecosystem, and supporting the students in their development of the entrepreneurial university ecosystem by acting on student-initiative. Many important resources and hubs identified in this study were student-driven or student-started. This suggests that student involvement in developing the ecosystem is beneficial. Moreover, promoting entrepreneurship in an even broader context in the student network at campus, could widen the student entrepreneur-count. This would include not only the students already introduced to entrepreneurship through university courses, but also civil engineers, chemical engineers, material science, cybernetics and data scientists.

6.1.3   Implications for Further Research

Student entrepreneurs deserve more attention in future research on entrepreneurial university ecosystems. Their role in developing such ecosystems, which is highlighted in this study, is fairly unexplored until now. Even though this study paints a clear picture of the ecosystem at NTNU, the context may differ between universities. Research on the topic conducted at different universities would serve as a valuable contribution moving towards more generic statements about student entrepreneur involvement in university ecosystem development.

Moreover, the study shows that student entrepreneurs present customers, partners

and future employers with different resource-packages in order to strengthen legitimacy. Ahead of the data collection we assumed legitimacy to be a resource that student entrepreneurs gained as a consequence of using other resources to build their startup. We thought the road to legitimacy was fairly subconscious, and considered legitimacy to be a resource that some startups managed to utilize while others did not. However, early in our observations it became clear that the student entrepreneurs used the resources around them both to grow their startup and even more so as a means of building legitimacy. Findings in this study could be used as a basis for future research on the topic of deploying resources for the purpose of building legitimacy. Research investigating the relation between both the startup aiming to build legitimacy and the outside stakeholder, would be interesting.

Lastly, we call for research exploring *resourcefulness* as a dimension of entrepreneurial bricolage. Previous publications have indicated that more attention should be paid to the psychology of the bricoleur (Duymedjian and Rüling 2010; Halme et al. 2012). In this study, we have observed that there is a particular boldness in the way the student entrepreneurs go about resource development. By that, we suggest that the concept of resourcefulness deserves a more central role in future studies on entrepreneurial bricolage, and that more comprehensive studies on the topic would be of value.

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