The Impact of Norwegian Government Funding Policies Through the Lens of an Entrepreneur.

by

Murshid M. Ali

Thesis submitted in fulfilment of
the requirements for the degree of
PHILOSOPHIAE DOCTOR
(PhD)

University
of Stavanger

Faculty of Social Sciences
UIS Business School

University of Stavanger
NO-4036 Stavanger
NORWAY
www.uis.no

ISBN: 978-82-8439-023-9
ISSN: 1890-1387
PhD: Thesis UiS No. 603

Acknowledgements

This thesis is submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy (PhD) at the University of Stavanger (UiS), Norway. All compulsory courses were attended at the University of Stavanger, and through the Norwegian Research School of Innovation (NORSI). NORSI courses were taken at BI Business School in Oslo, and Oslo Metropolitan University. A course in leadership and sustainability was also taken at the United Nations University in Tokyo, and a study tour was conducted with NORSI to San Francisco and Silicon Valley as part of the PhD study.

I would like to thank my wife Fjóla and my son Elyas for their support throughout this period, my parents Mubarak and Samroos and my siblings Arshad, Sahfana and Mushrifa and their families. I would also like to thank my supervisors, Professors Jan Frick and James Karlsen for being supportive and engaging throughout the whole process, and Bjørn Asheim, Ola Barkved and Hilde Ness Sandvold for their advice and guidance. I would also like to thank the business community in Stavanger (and Oslo), and the entrepreneurs, employees and board members of various start-up, development and scaleup companies for their vigilance, perseverance and debates.

These individuals include (but are not limited to): Azmi Amith, Maria Amelie, Egil Reksten, Marius Harris, Marius Meli, Øyvind Hovland, Petter Selvikvåg Berge, Øyvind Vesterdal, Stig Myrseth, Henrik Jesman Sunde, Are Selstad, Michel van Tol, Lars Helge Helvig, Nicholas Gains, Lars Holst, Christophe Schaille, Peter van Kleef, Olav Wathne, Øyvind Wathne, Osama Kamal, Bjørn Rygg, Osman Amith, John Skajem, Joachim Sannes, Brage Amundsen, Eskandar Maleki, and many more. Lastly, I would like to thank the staff at Innovation Norway (especially the Stavanger office) and the Norwegian Research Council. The discussions with them, insights and feedback provided a great deal of information about how Norwegian government funding policies work in 'real-life'.

Murshid M. Ali
Oslo, Norway, 2020

Abstract

Norway, like many other industrialized countries, has a long tradition of implementing funding policies to shape and develop national innovation systems. These policies are often targeted at industries in which there is a sectoral competitive advantage, so leading to path dependency. Policymaking in Norway can be explained as a duality; policies implemented to correct market failures, targeted at small firms, and policies aimed at supporting national champions and upgrading existing technological capacities of selected industries. Existing studies on innovation systems and government funding policies often focus on top-down variables, and therefore fail to provide deeper insights on the effect of policymaking on company creation, regardless of path dependency. The aim of this study was to provide the perspective of an entrepreneur on the impact of government funding policies throughout a company lifecycle. This provided a hands-on contribution to the field, through active participation in and following five case companies and creating three companies.

These case companies fell within the categories of path dependency, path renewal and path creation. Three of the companies belonged to the oil and gas industry. We therefore assumed they were part of a sectoral innovation system, and path dependent. One was a financial technology company, representing path creation. The last company was

a renewable energy company, which represented path renewal, government funding policies being mapped through interactions with both public and private actors. Findings suggest that the Norwegian government funding policies are strong in the first phases of a company lifecycle, but weak during growth and scaling. Policies are furthermore more likely to help entrepreneurs with existing networks, and therefore with the capability to leverage private funding. This study aimed to demystify the creation of a technology company, to help academics and policy makers understand the drivers behind creating and improving innovation in their region.

Keywords: Innovation, Stavanger, Norway, Path Dependency, Path Creation, Path Renewal, Government Funding, New Venturing, Entrepreneurship, Innovation Systems, Sectoral Innovation Systems, New Technology.

Table of Contents

List of Tables

List of Figures

Abbreviations

AR	Action Research
AUM	Asset under Management
B2B	Business to Business
B2B2C	Business to Business to Customer
B2C	Business to Customer
BMC	Business Model Canvas
CEO	Chief Executive Officer
GDP	Gross Domestic Product
GWA	Goodwill Agreements
HCT	Huddlestock Crowdtrading Technology
IN	Innovation Norway
IDE	Innovation Driven Enterprise
IRD	Industrial Research and Development Grants
IPR	Intellectual Property Rights
M&A	Mergers and Acquisitions
MOU	Memorandum of Understanding
MVP	Minimum Viable Product
NRC	Norwegian Research Council
NIS	National Innovation Systems
NORAD	Norwegian Agency for Development Cooperation
NOPEF	Nordic Project Fund
RIS	Regional Innovation System
R&D	Research and Development
SBIC	Small Business Investment Company
SME	Small Medium Enterprise
PPA	Power Purchasing Agreement

1 Introduction

Economists have, for centuries, debated the importance of government funding policies, and their impact on developing new technologies and accelerating innovation within a country (Karlsson & Warda, 2014). According to Acemoglu et al (2013) p. 123:

'…. Other new technologies have not spread and are unlikely to spread to places around the world today, where a minimum degree of centralization of the state hasn't been achieved.'

There are very many theories around this. A credible example is the *Small Business Investment Company (SBIC)* Act. The US government in 1958 put SBIC into motion, and promised that every dollar private investors invested in innovation, would be matched by three dollars from the government, giving a new company the opportunity to raise four dollars (De Bernardi & Azucar, 2020). Silicon Valley and the dominance of the US over global innovation is at the time of writing widely recognized, especially within the field of internet technologies (Saxenian, 2015).

Government funding policies are important in developing a nation's innovation system, and in building frameworks that help entrepreneurs to take risks and establish companies (Lazonick, 2014; Plummer, 2007).

Mazzucato (2015) states that early grants given to Google and Intel Semiconductors were instrumental in validating their technology and covering early-stage risk. This was also at a point in time when there was a lack of private investors. These funding policies also create a trickle-down effect that encourages private investors and private capital to participate in Research and Development (R&D) and innovation, so creating proximity collaboration and partnerships. Examples of this in Europe are the automobile industry in Germany and the pharmaceutical and banking industries in Switzerland (Lazonick & Mazzucato, 2012; Mazzucato, 2013). Funding policies are often centred around specific industries, those targeted being industries which the government believes have a competitive advantage. Examples include natural resources or educational facilities (Audretsch & Thurik, 2004).

Funding policies therefore incentivize companies in specific industries to draw together, improve R&D, and attract people from various parts of the world (D'Andrea, 2013; Florida, 2002; Mazzucato, 2015). This blend of people, education, incentives, companies and expertise creates innovation systems (van Hemert & Nijkamp, 2010). An *innovation system* is a national framework that supports industry and sectors, including educational institutions, targeted policies, networks of industry-related companies and trained personnel who can work within dedicated industries (Fagerberg, 1988; Powell & Grodal, 2005). Innovation systems are layers that define the economy of countries and help them develop expertise and a competitive advantage (Fagerberg, 2002; Lundvall & Borrás, 2005).

Innovation systems are often born out of the evolution of economic developments in a country. They therefore tend to follow *paths* and become *path dependent* (Tödtling, van Reine, & Dörhöfer, 2011). The explanation of this is, simply put, that government investment of large sums of capital and resources into specific industries or sectors, leads to innovation, to expertise following those sectors, and to the concentration and additional innovation or R&D in them (Wicken, 2009a). The Norwegian government developed these targeted funding policies in the 1970s, to attract capital into the development of the oil and gas sector from private oil companies (Wicken, 2009a).

The Norwegian government had, for decades, implemented funding policies for the building and strengthening of the nation's innovation system (Castellaci, 2008). According to Fagerberg et al. (2014), the Norwegian national policies were built around *three layers* of innovation systems in the country. These have been central in forming the modern Norwegian economy of today and have led the nation into several directed *path dependencies* (Fagerberg & Srholec, 2008). The funding policies that have been implemented have, furthermore, evolved into a dualistic support system. One of these is for *correcting market failures* and is biased towards smaller companies, and the other is the infrastructure to improve existing innovation systems based on natural resources, either regional or sectorial, and the development of *national champions* to compete in a global market place (B. T. Asheim & Gertler, 2009; Fagerberg, Feldman, & Srholec, 2014; Lundvall & Borrás, 2005).

These policies have been put into practice in Norway through two government organizations: *Innovation Norway* and the *Norwegian Research Council* (Fagerberg, Mowery, & Verspagen, 2009; Kuhlmann & Arnold, 2001). This dualistic approach can be interpreted as being the funding policies that firstly support smaller companies at a micro-level, and secondly, support sectoral or regional innovation systems at a macro-level, which is often achieved through large corporates creating a 'trickle-down' effect towards similar companies in close proximity (Lundvall & Borrás, 2005). These policies are closely linked to path dependencies and the development of sectoral innovation systems, and have an important effect on the creation of innovation in a region or country (Fagerberg & Srholec, 2008).

1.1 Problem Statement

A lot of research has been conducted into *innovation*, both in Norway and internationally, economists and policymakers both wanting to understand the mechanisms that can improve and increase innovation in countries (Hervas-Oliver et al., 2011). The prime drivers of innovation are *innovation driven enterprises* (IDE) and not the traditional *small and medium enterprises* (SME), such as barbershops or grocery stores (Aulet & Murray, 2013). Innovation is key to productivity and growth. Not many studies have, however, explored the implications of targeted policymaking over many years, and how *path variables* affect new innovation outside of sectoral innovation systems (Castellaci, 2008).

There is also a profound lack of understanding of how these funding policies impact early stage innovation-driven enterprises in Norway from an entrepreneur's viewpoint, and how policies can be improved to better support entrepreneurs (Lundvall & Borrás, 2005; Madsen, Alsos, Borch, Ljunggren, & Brastad, 2007). According to Uyarra et al (2016), part of the criticism of research into entrepreneurs is based on there being less focus on externalities or macro-perspectives such funding policies, and greater focus on individual characteristics such as education, sociological background, or psychological traits, from a top-down perspective. It is also far too broad, both innovation-driven enterprises and small business enterprises being included. This causes research to completely ignore important governance features and policies that are instrumental in the creation of innovation in societies (Flanagan & Uyarra, 2016; Lazonick & Mazzucato, 2012).

Studies of the impact of policies on innovation have been similarly criticized for being too limited and having a narrow top-down perspective that lacks the informal, entrepreneurial-oriented aspects of innovation (Flanagan & Uyarra, 2016). In Norway, Fagerberg et al. (2014) explained how Norwegian policies were implemented after the second world war to create sustainable innovation and industrial sectors in the country. Others, such as Chesbrough (2006), explain how company networks are structured to create more innovation. This study provides first-hand insight into the early innovation process in Norway, and how entrepreneurs experience government funding policies that are aimed at increasing the number of new innovation-driven enterprises.

A large proportion of research has been conducted using active researcher participation as an entrepreneur, and through *action research*. The research also investigates the start-up of companies within path dependencies, and companies outside of them. Understanding the impact of government policies and path dependencies will provide economists, policymakers, and entrepreneurs with a better understanding of how they can increase the number of successful technology-driven companies in Norway.

1.2 Research Objective

The objective of this research is to investigate the entrepreneur's view and process experience of government funding policies. This is investigated through the perspective of the entrepreneur on the impact of government funding policies throughout a company lifecycle. Five case companies were mapped through three action-cycles. All are innovation-driven enterprises, three being founded during the study by the author. This gives unique insights from within an innovation system into the lived experiences of an entrepreneur who uses government funding policies, so providing an ‘inside-out’ perspective. The research objective can be further broken down into three research questions (RQ1, RQ2, and RQ3) that relate to the different stages of the companies.

RQ1: *How do government funding policies affect entrepreneurs in the early stages of a company, from inception to an operational company?*

The first stage of a company are the initial steps in which the entrepreneurs meet, form an idea, establish a company, and often write a business plan (Kawasaki, 2004; Ries, 2011). The team, idea and the business is often validated through capital raised from private investors, or from public funding (Prelipcean & Boscoianu, 2008). This can serve as a fundamental step before moving on to the next stage in a company lifecycle, which is the development phase.

RQ2: *How are entrepreneurs impacted by government funding policies in the development stage of a company?*

The development phase is often regarded as the most capital-intensive period of a technology company (De Bernardi & Azucar, 2020), and can require years of investments, hiring the right people, and testing and verifying the products or solutions that are to be sold (Ries, 2011). Technology companies sometimes need to evolve through a number of iterations and improvement stages, also called pivots (McGinn, 2012), companies often needing to completely change their strategy or product to survive. The company, in this stage, raises a substantial amount of capital from private or public sources, the capital validating that investors believe in the team, the idea, and the business model (Chemmanur, Loutskina, & Tian, 2014). The company then transitions into the next stage once a product is commercialized, and the company starts generating revenues.

RQ3: *What is entrepreneurs' experience of government funding policies for scaling and growing the company globally?*

Very few technology companies reach the final stage of international growth, a stage that often requires much more capital than earlier in the lifecycle (Nair, 2003). The company now has a strong management team, solid investors, and a scalable product that is achieving international growth (Ries, 2011). Technology companies might still be losing capital at this stage (De Bernardi & Azucar, 2020), but can be further positioned for growth through the support of both private and public capital (Gompers, Lerner, Silviera, & Wright, 2007).

1.3 Structure of the Thesis

This thesis is written as a monograph and is divided into three main sections. The first section includes the introduction, the theoretical framework, and methodology, and the second section is the action-research section and analysis. The final section contains complimentary research, a review of results, and the conclusion. This introductory chapter provides the reader with an overview of the topics researched and discussed in the thesis. Chapter 2 will review the most important concepts and ideas within entrepreneurship and innovation studies, including the work of Schumpeter and Kirzner, two important economists who describe the modern entrepreneur, and how modern technology has transformed our understanding of innovation.

The theoretical foundation of the thesis is also reviewed, the historical development of innovation systems in Norway, the three-layer system, and the creation of the different paths of the Norwegian economy being described. It is important to understand the sectoral make-up of the Norwegian economy, if a better understanding of why and how the policies impact the case companies differently is to be gained. A lot of research on Norwegian government policies, schemes and tax subsidies is provided. Understanding chapter 2 will therefore give the reader insight into why some of the companies found raising funds, or evolving into a profitable business, much easier and why it took others more time. It is important to understand different *path variables*, how policies are dualistically shaped, and how they can affect innovation in a country.

A path variable in this thesis is defined in one of three ways: *path dependent*, *path renewal* or *path creation*. The methods and action-research framework that is used in this thesis to build new knowledge is reviewed in chapter 3. The action-research was conducted over a number of years, and then afterwards structured using Osterwalder's Business Model Canvas, to assess the various cycles and the government funding policies at each stage of the company. The action research is presented in chapter 4, through a form of diary and memoirs, from the start of the companies until 2020.

The companies that are presented are Reemsys, Huddlestock and Norsk Solar. Huddlestock is a much longer text than the others, mainly because the company has been in operation longer. The other case companies, Oil Tools of Norway and Vision Io are presented in chapter 5 as part of the Overview and Analysis. All the case companies are analysed using the business model canvas in chapter 5, which provides insights into the findings on the impact of government policies from the entrepreneurs' viewpoints. The chapter also provides a summary of the action-research of three of the companies in the earlier chapter, so giving an overview of the support received during the three action cycles, and providing a rich set of data from the companies within all path variables.

Chapter 6, called Complimentary Research, is based on the papers written during the thesis with Professor Jan Frick on the topic of SkatteFUNN and government funding policies in emerging markets. They provide a robust backdrop to the Conclusion chapter. A review of the results, including in-depth analysis both through the business model canvas, and the funding given to each company, is presented in chapter 7. It covers both direct government support given in the form of grants and loans, and other assistance provided through collaboration and introductions. The results are analysed based on existing studies and theories presented in chapter 2. The theoretical contributions of the thesis and conclusion are presented in chapter 8. Policy recommendations are also included, so are suggestions to entrepreneurs who want to start their own business in the region.

2 Theoretical Framework

Joseph Schumpeter is regarded as a pioneer in defining the modern entrepreneur. His magnum opus is *The Theory of Economic Development* published in 1946 (Kerr, Nanda, & Rhodes-Kropf, 2014). The entrepreneur, for Schumpeter, is an essential actor in the modern economy. The entrepreneur creates innovations that cause a creative destruction of existing solutions, so increasing productivity in society. The reason the entrepreneur seeks creative destruction is because it brings profits and commercial gain to the entrepreneur and their companies (Schumpeter, 1934).

There are plenty of historical examples of the creative destruction of industries. The invention of the printing press and the innovations that followed during the industrial revolution are probably some of the most cited in research (Mokyr, 2011). Books were, prior to the printing press, rare and expensive. They had to be handwritten or were printed using a press made for each and every page of the book. People specialized in hand-writing books, there being a job market for this skill. This laborious and inefficient way of making books made them scarce and caused literacy to be limited (McGimpsey, Tannock, & Lauder, 2016). The invention of the printing press made books more widely available and cheap, and helped increase literacy throughout large parts of society (Acemoglu & Robinson, 2014).

2.1 Examples of the Entrepreneur

The entrepreneur is the creator of innovations, but not necessarily of the invention itself (Mokyr, 2011; J. A. Schumpeter, 1934). According to Aulet et al (2013), an *innovation is a commercialization of an invention.* An example of this is the Model T Ford, an affordable car developed by the entrepreneur Henry Ford. Henry Ford did not invent the car, but turned the Model T Ford into a mass-produced car that most people could afford to buy (R. Hisrich, Langan-Fox, & Grant, 2007). Another example from our time is Tesla and Elon Musk. The Tesla electric car was not the first electric car to be produced, electric cars in fact being first produced in the last half of the 1800's. The Tesla was, however, the first mass-produced and affordable electric car with a superior technology to the alternatives in the market at that time (Rothaermel & King, 2015). The inventions themselves were not, however, enough. Entrepreneurs needed to drive the commercialization of these inventions and put them into action. Hence creative destruction, alias innovation (Schumpeter, 1942).

Henry Ford did not invent the gasoline-driven, cheap automobile, but did make it available to the masses through introducing the production line and standardization. Elon Musk did the same. Made the electric car efficient and available to the masses. Entrepreneurs such as Henry Ford and Elon Musk are central to the productivity of any society and economy, and are often responsible for innovations that change our lives for the better (Kawaski, 2000). The definition of an entrepreneur is therefore someone that takes an invention, often a new and novel technology, and makes a profit out of it through a new business model, or through a new and efficient means of production. The core concepts are therefore in summary, that the commercialization of an invention equals innovation, and the responsible actor is the entrepreneur (Aulet & Murray, 2013).

2.2 Other Definitions

Israel Kirzner had a different approach to the definition of an entrepreneur. The entrepreneur, for Kirzner (1973), is an individual who seeks to make a profit by optimizing margins through buying and selling products or services. The main difference between Kirzner’s and Schumpeter’s theory of creative destruction is that Kirzner’s entrepreneur would not necessarily change or disrupt an industry. He or she mainly seeks to increase profits through new business models, rent-seeking or buying cheap and selling at a higher price (Kirzner, 2009). A chain of grocery stores, for example, would be able to increase their revenues by putting pressure on supply chains to lower their prices, or buy in bulk to increase profits and margins on the products that they sell in their stores.

A banker who constructs a new financial instrument, such as a green bond or a dividend stock, or a consultant who buys a solar power farm cheap and sells it at a higher price, all are entrepreneurs according to Kirzner's ontology. In this study, and probably in the broader society, Schumpeter is more relevant due to the emergence of scalable technologies such as blockchain, exponential neural networks, autonomous transportation systems and decentralized renewable energy applications, which indeed cause creative destruction of industries and sectors on a grand scale (Florida, Adler, & Mellander, 2017).

There are many more definitions of an entrepreneur. The Schumpeterian School and the Kirzner School are, however, the two most well-known in this field (Holcombe, 2003). Schumpeter's definition of an entrepreneur is the one that is built on, but with a modern twist, to place it into the context of today.

2.3 The Technology Entrepreneur

The age of the computer, beginning sometime in the 1970s and extending to the emergence of the internet in the 1990s, has created new business models, and new previously unthinkable ways of entrepreneurship. These new technologies and solutions have morphed into a new understanding of entrepreneurship, one in which companies can establish oligarchy dominance in some industries (McGimpsey et al., 2016). An example of this is Microsoft, which completely dominated the computer software industry (Sprowls, 1994).

Apple and Samsung, two industrial giants that together have almost the total share of worldwide mobile phone sales, also have achieved a certain degree of oligarchy dominance (Barrett, Satariano, & Burrows, 2012).

This new form of capitalism is a far cry from the first industrial revolution, and from innovations such as the printing press and the first automobiles (McGimpsey et al., 2016). Entrepreneurs therefore today can capture a large proportion of the value creation of sectors and industries due to scalable technology. They can therefore amass a large amount of wealth and build oligarchy types of markets (Parker, 2020). Other examples include Facebook, Google and apps such as TikTok, Zoom, Uber, AirBnB, Skype and similar digital tools with market dominance (Arogyaswamy, 2020). This type of entrepreneurship is different from Schumpeter's age, and requires a new definition and a new paradigm if we are to understand who the entrepreneur is.

The entrepreneur is, even so, the agent that commercializes the invention and turns it into an innovation through commercialization. There are, however, some notable differences that need to be addressed.

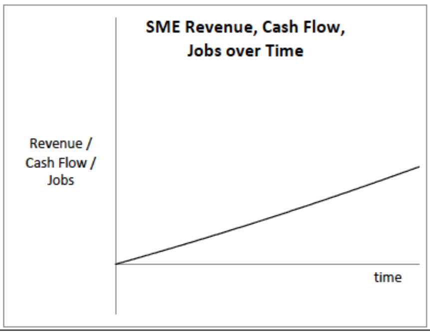
2.4 IDE vs. SME Entrepreneurship

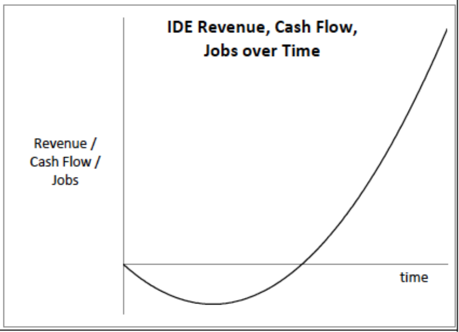
This thesis uses a definition of the entrepreneur that was developed by MIT-professor Bill Aulet (2016). Aulet presents a version of Schumpeter and Kirzner's definitions of the entrepreneur that has passed through an evolution. Entrepreneurs are divided into two groups: *SME entrepreneurs*, and *IDE entrepreneurs*. SME stands for Small Medium Enterprises and are individuals that start businesses such as a grocery stores, hairdressers, and consultancy firms. They in many ways adhere to Kirzner's idea of an entrepreneur. IDE stands for Innovation-Driven Enterprises. These are, in the spirit of Schumpeter, characterized as being disruptive, driven by technology that is scalable, have a global market place, and require many years of R&D investment (Field, 2014).

Figure 1

SME and IDE Entrepreneurship, (Aulet, B., 2013) p. 7

SME Entrepreneurship	IDE Entrepreneurship
Focus on addressing local and regional markets only.	Focus on global markets.
Innovation is not necessary to SME establishment and growth, nor is competitive advantage.	The company is based on some sort of innovation (tech, process, business model) and potential competitive advantage.
"Non-tradable jobs"—jobs generally performed locally, e.g. restaurants, dry cleaners, service industry.	"Tradable jobs"—jobs that do not have to be performed locally.
Most often family businesses or businesses with very little external capital.	More diverse ownership base including wide array of external capital providers.
The company typically grows at a linear rate. When you put money into the company, the system (revenue, cash flow, jobs, etc.) will respond quickly in a positive manner.	The company starts by losing money, but if successful will have exponential growth. Requires investment. When you put money into the company, the revenue/cash flow/jobs numbers do not respond quickly.





IDEs also have many investors, and require long timescales and substantial investment up-front before they can generate income (Aulet & Murray, 2013). Another important characteristic of IDEs is that they own solutions and technology that are patented. Examples of IDEs are Alibaba, Uber, AirBnB, Facebook and Google. These companies are scalable and can deploy their technology globally in a short period of time. It takes the average IDE company around 7 years to reach profitability (Duening, Hisrich, & Lechter, 2015), to have the capability of establishing itself in multiple countries at the same time, and to hire people quickly throughout regions to expand and create profitability (McGinn, 2012).

Many of these companies were established in the late 2010s and onwards, building on the new sharing-economy (Quattrone, Proserpio, Quercia, Capra, & Musolesi, 2016; Wallsten, 2015). This gave rise to IDEs that grow very quickly in a short time space of time, often fuelled by heavy investments from venture capitalists (Chemmanur et al., 2014; Kenney, 2015). These IDEs go through a number of stages of private and public funding, public often being in the form of grants or subsidies. The most important funding stages are the seed rounds, investment being made by family, friends, and often angel investors, entrepreneurs raising anything from two hundred thousand to a million USD to build and launch their products (Ries, 2011). The next round is Series A, which is often led by Venture Capitalist investment, characterized by the company making large investments in technology and hiring. The Series B funding round takes place when the IDE is in the growth phase (T. Meyer, Stobbe, Kaiser, & Walter, 2008; Prelipcean & Boscoianu, 2008).

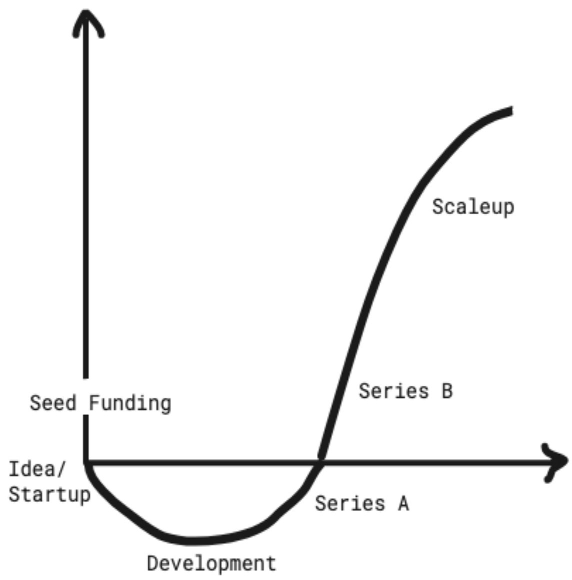
2.5 The Lifecycles of a Technology Company

IDEs can be said to go through at least three cycles: start-up/idea, the development stage and then the scaleup phase (Kawasaki, 2004; Ries, 2011). These cycles are closely interlinked with the funding stages of the company, Seed, Series A and Series B. The first phase is finding the idea, putting together a team and raising seed funds from private investors or public capital. The second phase is what many call the *Valley of Death*, in which the IDE needs to invest heavily to reach maturity, develop and build a product (McGinn, 2012).

The Valley of Death is illustrated in the figure below:

Figure 2

The Valley of Death and Funding, Adapted from Aulet B. (2013)



Successfully passing through the development phase, or the 'Valley of Death', requires a lot of capital, companies often failing between the seed and venture phases (Field, 2014). Many economists around the world have considered whether competitive markets fail to provide enough funding for R&D during the founding years of an IDE, from idea to scaleup (Hall & Lerner, 2010; Ordanini, Miceli, Pizzetti, & Parasuraman, 2011), many concluding that the private sector does not sufficiently invest in the development of new products and services, especially technology-based entrepreneurs and concepts. Government funding policies are therefore instrumental in this phase (Aldrich & Morton, 1975; Hervas-Oliver et al., 2011; Kamien & Schwartz, 1978).

Product, product market fit, and raising more funds for further expansion are key factors in companies successfully traversing the development phase. The funding in this phase is often called Series A and should be enough to help the IDE move from the second stage into the last stage of the lifecycle (Duening et al., 2015). The last stage is scaleup, in which the IDE's launched product or service gains increasing numbers of users and revenue, and international growth (Kawasaki, 2014, Aulet, 2012). The IDE, in this stage, raises Series B funding, and more if necessary (Kenney, 2015) These cyclical phases are important when studying the entrepreneur from a micro-level and assessing the impact on government funding policies from an *inside-out* perspective.

Capital and funding are essential for any entrepreneur who is setting out to create innovations. Many entrepreneurs fail because they underestimate the high levels of start-up costs required, and do not manage to raise enough private capital in the two first lifecycles (Hisrich, 1990; Ruzzier, Hisrich, & Antoncic, 2006). This is reflected in data from the Norwegian Business registry and statistical central agency, which shows that only 28.4% of the limited liability companies established in 2013 were still active in 2018 (SSB, 2020). The number is even lower for technology companies, estimates indicating that more than 90% fail globally within the first five years (N. Patel, 2015).

Research from the US, however, suggests that firms that are backed by venture capital have a 10% chance of surviving (Chemmanur et al., 2014). Those that survive contribute a lot to the economy. According to a Stanford study, 574 or 43% of all public US companies are Venture Capital (VC) backed, and account for 57% of market capitalization (Gornall & Strebulaev, 2015). In Norway, findings suggest that the country has a lack of critical early-stage support for entrepreneurs, including in the start-up and development phases. There is therefore a low innovation rate in the country compared with its Scandinavian peers (Castellaci, 2008; Fagerberg & Sapprasert, 2011; Langeland, 2007).

2.6 The Origins of the Entrepreneur

Not many choose to become entrepreneurs, and even fewer start an IDE. Many studies of the individual entrepreneur and entrepreneurship have been conducted to understand who becomes an entrepreneur and why, often from a top-down perspective (Flanagan & Uyarra, 2016). The Kauffman Foundation[1] for example has a lot of statistics on entrepreneurs. These studies look at variables such as personality, age, educational level, ethnic origin, and how these variables are interrelated to create new companies (S. Y. Lee, Florida; Acs, 2004). These experts often argue that having a certain degree of education or level of experience from the industry increases the probability of creating a successful company.

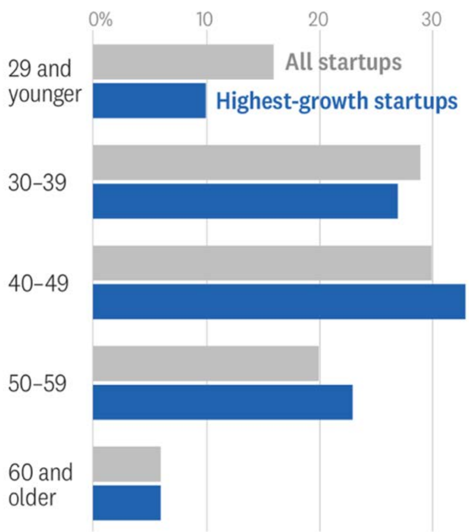
The focus in this is on the entrepreneur and explaining why they start their own companies. For example, when asked about the average age of entrepreneurs, it is widely believed that successful entrepreneurs are young and under 30 years old (Barrenhag et al., 2012). The media often plays on age as a wow-factor, profile entrepreneurs such as Bill Gates, Steve Jobs and Mark Zuckerberg all starting their companies when they were in their early twenties. This myth was debunked by the Pierre Azoulay et al. (2018) comprehensive study of business founders in the US, that leveraged confidential administrative data sets from the U.S.

[1] https://www.kauffman.org/

Consensus Bureau. They found that the average age of an entrepreneur in the US is 42.

Figure 3

Age and High Growth Entrepreneurship, (Pierre Azoulay et al. 2018)



This includes all types of entrepreneurs. Azoulay et al. found from examining technology company entrepreneurs, that average age varied from sector to sector. For example, in software it was 40, while in experience requiring industries such as biotechnology it was 47. The technology entrepreneur (when starting their first high-growth technology company) was on average 45 years old. They furthermore found that older entrepreneurs have a higher likelihood of succeeding. The reasons are industry experience, networking with peers and a firm understanding of the product and how to capitalize on sector trends (Azoulay, Jones, Kim, & Miranda, 2018).

This research is in line with studies of serial entrepreneurs, which indicates that former founders with experience have a much greater likelihood of succeeding. This is for many reasons, including a larger network and a better understanding of the processes of starting a company (Meyers, 2020). Similar research shows that just as many education dropouts tend to become entrepreneurs as those with a PhD (Stangler, 2014), age and education being one factor or variable that researchers study when trying to understand the entrepreneur. Other studies include ethnicity and background. Studies on ethnicity in the US, for example, suggest that Jews and Koreans are more successful in starting their own companies due to better access to capital through family or ethnic networks (H. Yoon, Yun, Lee, & Phillips, 2015). The findings show that certain immigrant groups tend to influence or help each other in starting companies. Many of these studies, however, focus on SME entrepreneurship or do not distinguish between a grocery store and a technology start-up (Yoon, 1995).

Other studies in a similar field suggest that entrepreneur background has little influence, but that educational level and work experience are the most crucial factors, irrespective of ethnicity (Etemad, 2009). A study of immigrants in California for example found that the rate of entrepreneurship among its community was closely linked to their education level, and that those with a good educational foundation were involved in 20-25% of the high technology companies in Silicon Valley (Saxenian, 2015). The majority of these studies are based on empirical research, the analysis of datasets from various countries, or on qualitative research methods such as interviews and case studies. This top-down approach to studying the entrepreneur, which is based on a set of variables, might exclude many other complex issues such as personality traits, close family connections, the charisma of the entrepreneur, relationships between policy makers and entrepreneurs, or government-granting bodies and entrepreneurs, and co-incidence (Flanagan & Uyarra, 2016).

As the quoted research above suggests, it’s quite difficult to determine the success of entrepreneurship based on the origins of the entrepreneurs. There are, however, strong indications that innovation blossoms if the country’s infrastructure is sound (Lazonick & Mazzucato, 2012). Early stage innovation requires a dynamic proximity of knowledge, educated people that can help each other (Rodríguez-Pose & Comptour, 2012), networks that can foster innovation (Hansen, Chesbrough, Nohria, & Sull, 2000), and a government system that incentivizes innovation (Wicken, 2009b). Another very important component is access to capital (Amorós & Bosma, 2014; Giebe et al., 2008; Singer, Amorós, & Moska, 2015).

2.7 Networks, Regions and Government Policies

Research on the entrepreneur often focuses on each individual and their characteristics, their family or societal background and other objective variables from a top-down perspective (Flanagan & Uyarra, 2016). Entrepreneurs, however, seldom operate in isolation. Geography, access to capital, network and resources all play an important role in helping advance or restrain entrepreneurs (Acemoglu & Robinson, 2014). For example, Mazzucato (2016) argues that the US government was important in the development of Silicon Valley and tech giants such as Google. There are also studies that argue that *open innovation* was more important in forming these regions (Chesbrough, 2006).

Open innovation occurs when there is collaboration between actors in the region, who give each other access to patents and solutions developed by others to build and commercialize new products (Chesbrough, 2007). Henry Chesbrough (2006) uses examples from Xerox, to show that opening up their R&D to others allowed a more efficient form of innovation to develop, in contrast to closed innovation, where companies carry out R&D alone without any collaboration. Empirical research conducted in this field, such as by Audrestch and Feldman (2003), show that the production of innovation relates strongly to locations where knowledge is available. This knowledge, according to Jaffe et al. (1993), has a tendency to spill over locally and takes time to geographically transfer across distance.

These theories are more focused on the importance of proximity, networks, and government policies that improve the ability of some regions to develop innovation capacity (Lundvall & Borrás, 2005). Karl Polyani (1944), for example, argued that the government creates innovation by implementing purposeful policies that govern the country. This is a social construct in which the market and the state are not two separate entities, but one single force. This implies that the state will not work without the market. Similarly, John Maynard Keynes (1883 – 1946), one of the architects behind Bretton Woods, argued that governments can in a depression or recession, intervene positively by increasing demand through additional spending. Increasing demand would in turn stabilize or increase the GDP of an economy (Mazzucato, 2013).

The impact of government has, according to Keynes (1936), a multiplier effect. Each dollar or pound the government uses triggers demand that leads to several rounds of spending. Keynes and his ideas dominated much of US-politics, and led to the Bretton Woods era, in which the dollar was pegged to gold, and other currencies that were linked to the dollar. This was the defining moment for the US dollar as a 'world currency' (McGimpsey et al., 2016). It is also quite likely that Keynes' ideas influenced the establishment of the SBIC program in 1958, and similar programs (Lavoie, 2009). SBIC, as discussed earlier in this chapter, provided three additional dollars for each dollar invested in new technologies by private investors, triggering a well-documented trickle-down effect (Ceulemans & Kolls, 2013; Schacht, 2013).

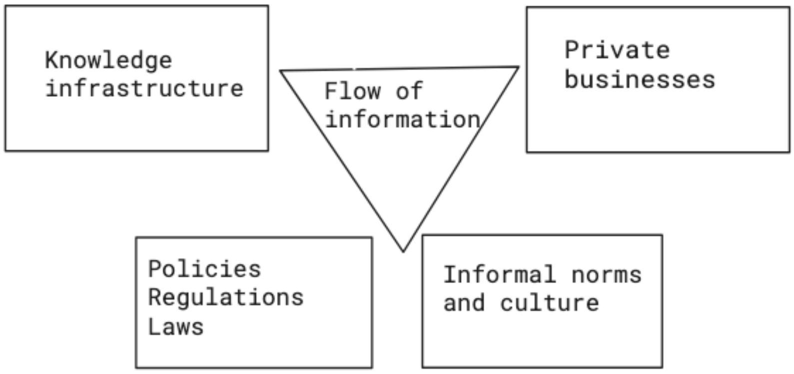
The same ideas have been instrumental in stimulus packages after serious financial crises such as the Great Recession in 2008, and now recently the Great Lock-Down (as defined by IMF) in 2020 due to the Covid-19 crisis (Giebe et al., 2008; Hervas-Oliver et al., 2011; Mazzucato, 2017; Parker, 2020). Stimulus packages involve tax cuts, subsidies and other government funding schemes that are guided by policies, to increase innovation and productivity in uncertain times (Bekkers et al., 2015).

2.8 Innovation Systems

Innovation systems is a framework of support for innovation in specific geographical areas, in close proximity or within a country's borders, often within specific industrial sectors. These support systems have evolved over a period of years, often through targeted government funding policies that govern and strengthen them (Fagerberg et al., 2009; Fagerberg & Srholec, 2008). Innovation systems are therefore a flow of information, of interactivity built between existing knowledge infrastructures, private businesses, government policies, regulations and law, and informal norms and culture (Isaksen & Karlsen, 2010).

Figure 4

Simplified illustration of an innovation system (adapted from A. Isaksen, 2010, p. 17)



Innovation systems are often a result of a country's policies, regulations, and existing businesses. They therefore often develop national characteristics, which are also called *National Innovation Systems* (Lundvall & Borrás, 2005). The National Innovation System is similar to an innovation system but is constrained to the interactivity between actors in a country. It follows a specific pattern and develops its own national characteristics (Fagerberg et al., 2009). These national characteristics are often *sectoral*, countries over many years implementing policies and regulations biased towards natural resources or other industries in which the government sees there is a competitive advantage (Lazonick & Mazzucato, 2012).

Sectoral innovation systems, a sub-branch of national innovation systems, could for example be oil and gas, or other industries such as automotive (Germany) and watches (Switzerland). Sectoral innovation systems are defined by a nation investing over many years, both public and private actors, policies and capital, into developing specific sectors of its economy (Pavitt, 1984). Another sub-branch of the national innovation system is the *regional innovation system*. The sectoral and national innovation systems are intertwined, sectoral characteristics and the needs of the firms in these sectors influencing government policymaking and the further development of the national innovation system (Fagerberg et al., 2009).

The regional innovation system (RIS), developed in the 1990s, is a theoretical concept that is fairly new (Cooke, 1992, 1998; Asheim, 1995). This can be explained as a smaller scale version of a national innovation system that belongs to a specific region, or a geographic concentration of firms and entrepreneurs (Lagendijk & Cornford, 2000). The government, to create these innovation systems, whether they are sectoral, regional or national, must incentivize research institutions, universities, foreign investors and private organizations to collaborate, invest in R&D and train the domestic workforce with specialist domainknowledge (Wicken, 2009a). This is achieved through public industrial policies, for example tax incentives, subsidies or other direct funding mechanisms.

Research on innovation and productive environments have attracted the attention of scholars all over the world for a long time, these scholars primarily focusing on Silicon Valley and similar areas in the US (Aslesen, Isaksen, & Karlsen, 2012). The main focus is on the networks in these systems, interaction being a result of policy intervention to increase innovation capacity and collaboration. This consists of a regional infrastructure that supports the firm throughout its life-cycle (B. Asheim, 2012), and is measured by the level of collaboration between firms, government, policymakers, universities and research institutions to increase innovation, which in turn increases the GDP and productivity of a particular region (Aghion et al., 2011).

According to Schumpeter (1934), innovation is a highly collaborative effort and is conducted through the active participation of an entrepreneur who commercializes a business idea, banks or investors bearing the financial risk. Important characteristics of an innovation system are that it contains a strong vocational education system, has a well-developed infrastructure for technology transfer, a well-organized chamber of commerce and a highly-developed production capacity (B. T. Asheim & Isaksen, 2002). Sectoral, national and regional innovation systems converge in a complex interplay between policymakers, private actors, knowledge institutions and culture. Policies can, furthermore, direct and create industries, and incentivize sectoral development in certain geographical regions (Lundvall, 2011).

Examples of this include the placing of the headquarters of national oil champion Equinor in the Norwegian city of Stavanger in the 1970s, or even the recent placement of Nysnø (The Government Sovereign Climate Fund) also in Stavanger, to strengthen its economy in the midst of the oil crisis post 2014. Both were very clear national policies aimed at increasing productivity in specific regions of Norway (Enersgård, 2018). These innovation systems create, however, path dependencies and certain structures, firms outside of the paths *experiencing poor support for their innovations*. Narula (2002), for example, has argued that the Norwegian national innovation system provides little support for knowledge-intensive ventures that fall outside of the nation's innovation system.

There have, despite the popularity of the concept of innovation systems, been very few studies that have investigated the impact of national innovation systems over a long period of time (Acs, Audretsch, Lehmann, & Licht, 2017). Scholars also disagree on how to describe a nation's innovation system (Fagerberg, 2003). The studies that exist are also, as with research on individual entrepreneurs, focused on the top-down study of generic variables. There has also been limited research on how government funding policies impact entrepreneurs from their perspective, and whether there is any difference in their affiliation to the national or sectoral innovation system (Uyarra & Flanagan, 2010).

2.8.1 Innovation Systems and Norwegian Funding Policies

The Norwegian government funding policies implemented in the post-war era involved a *dualistic support system* that would 1) correct market failures, and 2) support existing industries and upgrade technologies with sectorial advantages within path dependencies (Fagerberg & Srholec, 2008). This dualistic system also gave birth to various institutions and organizations that support entrepreneurs and companies in various stages of their lifecycle, such as universities, research organizations and export agencies. Most importantly, many of these funding policies were specifically targeted at specific industries, to re-enforce the existing national innovation systems (Wicken, 2009b).

Norwegian government institutions that support innovation and entrepreneurship have evolved over recent decades. Their mission and goals remain, however, the same. Understanding the Norwegian government funding policies on innovation, and their impact on entrepreneurs requires a knowledge of how the Norwegian economy has evolved from the end of the 1800s to the time of writing, and the foundation for the funding policies implemented during this era (Wicken, 2009b). Norway was below the average GDP of Western European countries at the beginning of the 1900s, but was one of the wealthiest countries in the world by the early 2000s (Fagerberg & Sapprasert, 2011).

Many suggest that this achievement is largely due to the abundance of oil and gas in the North Sea. This is, however, not entirely true. Productivity was most likely accelerated by the exploration of oil and gas. Governance, policies and a solid existing innovation system have also, however, been key in this wealth-creation (Narula, 2002). The growth of the Norwegian economy has often been characterized as a 'paradox', due to productivity and income being amongst the highest in the world (without the oil and gas sector) (Fagerberg & Sapprasert, 2011; Kroknes, Jakobsen, & Grønning, 2015), but with an innovation rate that is low compared to its Scandinavian counterparts. A deep dive into the Norwegian economy is required to understand why this has occurred.

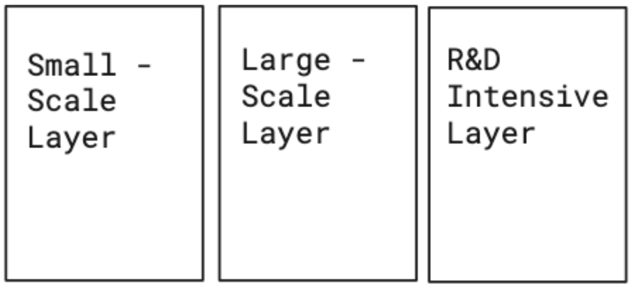
2.9 The Three Layers of the National Innovation System

The Norwegian economy is broad and characterized by natural resource rich sectors such as fisheries and aluminium, then after this one of the largest shipping fleets in the world, and most recently oil and gas exploration in the North Sea (Fitjar & Rodríguez-Pose, 2015). The expertise and knowledge from these industries are intertwined, there being a clear technology transfer from one sector to another in the early phases. This leads us to the theory of the creation of paths within a national economy. Path dependency evolves where nations have invested capital and policies over decades into developing innovation systems, path dependency creating more and more firms and innovations within a specific sector and a strong innovation system (Isaksen & Trippl, 2016).

Path dependencies can be a critical weakness in a country's economy, but can lead to *path renewal* through targeted knowledge spill-overs and technology-transfers to other different sectors that have related characteristics (T. B. Asheim, 2003). An example of this is the number of ship builders in the country that were capable of transferring their knowledge to the oil and gas industry. The new platform building sites were old shipyards that utilised the yards numerous engineers and extensive technical know-how (Wicken, 2009a). According to Fagerberg et al. (2009), the Norwegian economy has developed from a pre-industrialized nation to a modern nation, through several series of renewal periods. These periods are called the three layers of National Innovation System (NIS), and are:

Figure 5

Three Norwegian Innovation Layers, Adapted from The Norwegian Innovation Layers (Fagerberg et al. 2018)



The first layer is the *small-scale* layer, a layer that was developed in the early formation of the Norwegian economy. Small companies, often numerous, emerged within a sector, for example fishermen owning their boats, minor grocery stores in cities, and individual farmers. This economy was largely dominated by a fragmented but strong and large, ownership class (Wicken, 2009b), which allowed for a plenitude of local businesses to thrive and establish as epicentres in the economy. Part of this is due to the geographical expanse of Norway as a country, causing businesses to seldom cluster into large corporations that control or dominate one particular industry (Castellacci, Clausen, Nås, & Verspagen, 2009).

This was true for large parts of the Norwegian economy in the last century, except sectors such as shipping and mining that required large investments, and in which Norway has a clear resource competitive advantage over other countries (Fagerberg, 1994). Other resource-intensive sectors, such as the fisheries industry, were for a long time characterized by having many small actors, often independent, and a lower degree of R&D and innovation. This sector in the early 2000s underwent a series of re-structuring and consolidations, creating large corporations owned by a few wealthy individuals. Examples include the Norwegian businessman John Fredriksen and the consolidation of Pan Fish and Fjord Fish, which became Marine Harvest, one of the largest fishing companies in the world (Sogner, 2009a).

The second is the *large-scale centralized* layer. This layer materialized in Norwegian history through the development of hydropower and aluminium from the beginning of the 1900s, and later from 1960 onwards through the maritime and oil and gas industry (Wicken, 2009a). The Norwegian government played a significant role in developing the large-scale centralized layer, through active policy implementation and tax subsidies to foreign companies that participated in developing these industries. The goal of the policies was to increase Norwegian competitiveness and create knowledge transfers from foreign investors to Norwegian suppliers and businesses. These industries are characterized by their resource-intensive nature, following traditional evolution within a path, creating a *path dependency* and a framework for *modus operandi* in R&D and innovation (Fagerberg & Sapprasert, 2011).

Shipping, aluminium, power industries and similar large-scale layers in Norway all have strong synergies, and have all developed path dependencies (Wicken, 2009a). In the petroleum sector, for example, concessions to drill and extract oil in the North Sea were primarily granted to US companies. Over time, the Norwegian government pro-actively implemented solutions that ensured the transfer of knowledge and know-how to the national champion, Equinor, and local oil and gas suppliers (Engen, 2009). There were several spill-over effects from shipping, aluminium and other industries into the oil and gas industry, that gave Norway a head-start in developing its own competence within this sector.

The last layer is the *R&D intensive network*, which includes sectors such as biotechnology and ICT, that are important to the Norwegian economy. These sectors have received large amounts of support from the Norwegian government, to try to build innovation capacities in these industries (Grønning, 2009; Sogner, 2007). The R&D intensive network layer that evolved from the 1970s and onwards is unique in Norwegian history, as it represents an attempt to create new industries, indulge in path creations, and divert away from the traditional thinking of building industrial competence based on apparent resource-driven advantages. *Path creation*, the last of the three *path variables* in economic development, is the concept of creating a complete infrastructure and innovation system around a specific sector or industry (Wicken, 2009a).

The government targeted specific industries and sectors, aiming for path creation, and later path dependency (Grønning, 2009). Examples are the heavy investments in ICT in the early 1990s, and companies such as Nordic Semiconductors, Simrad and Kongsberg Digital. Researchers argue that this path creation attempt has not been as successful as other policies that focused on resource-intensive sectors and industries. Scholars argue that Norway has not traditionally had any advantages within sectors, which create through the R&D intensive layer. The country also did not have a well enough developed sectoral innovation system to support the creation of such a path (Engen, 2009; Narula, 2002; Sogner, 2009b; Wicken, 2009a).

2.9.1 Policy Objectives of the Government

Government sponsored R&D did not play a central role in Norway until after 1963. There was a substantial increase in support for R&D, especially during the 1980s, which was probably linked to the cold war and newly found oil and gas revenues (Wicken, 2009b). The government established several research institutions between 1963 and 1967 to support R&D and increase public R&D funding. These funding policies were often targeted at specific industries, and strengthened path dependencies, policymakers arguing that Norway had a competitive advantage in, for example, aluminium, fisheries and the oil and gas sectors (Wicken, 2009a).

The funding policy objectives of the Norwegian government are: 1) correcting market failures, 2) developing national champions and 3) upgrading technological capabilities of existing industries. These can be broadly categorized into a dualistic system, 2 and 3 being in the same bracket (Clausen, 2009a). These policies were also deeply embedded in the idea of path renewal and path dependencies. Industries evolved, all being connected to each other, and provided grounds for the easier transfer of knowledge. Examples are as mentioned earlier: the transition from shipping to oil and gas. There are similarly strong relationships between the sectoral innovation systems of the shipping industry and the early fishing industry in Norway from 1960s onwards (Aslesen, 2009).

2.9.2 Correcting Market Failures

Correcting market failures is based on the assumption that individual entrepreneurs, or smaller companies, will face challenges when trying to develop novel and new technology, due to lack of funds or uncertainty (Castellacci et al., 2009). The government, to mitigate this, implements subsidies or other funding mechanisms that can promote surviving the most critical phase, for example the *Valley of Death*, by assisting entrepreneurs financially and through targeted regulations.

The government changed their funding policies in the 1980s from supporting national champions, to becoming more lenient towards correcting market failures. These policies were targeted towards the small-scale decentralized path of the economy, the government supporting smaller private companies and individual entrepreneurs in their development of new and innovative technologies (Clausen, 2009c).

Smaller companies often lack the necessary resources to be able to develop and commercialize new technologies. The government therefore steps in and provides risk-minimization through grants or tax relief (Mazzucato, 2015). Funding might also trigger additional capital from private investors, examples including the SBIC programme implemented by the US government in the 1950s. It is important to note that these funding policies, both the Norwegian and the US, are targeted towards technology companies, and not SME enterprises (Block & Keller, 2011). IDE enterprises, especially those that possess intellectual property, have the potential to increase productivity and employment, and therefore are the main benefactors of the funding policies (Schacht, 2013).

Policy rational follows the idea of correcting market failures in the seed phase and then, once companies evolve, supporting them through the policies implemented at a macro-level, such as technology collaboration support, and R&D taxation schemes (Lazonick, 2010). Companies which evolve through the classical lifecycle, from seed to development and then growth, all need financial support through each phase. The SBIC programme has been quite successful at funding policies (Mazzucato, 2015), Google and Microsoft both having received grants in their early stages through these US government programs (Hawkins, 2015).

2.9.3 Developing National Champions

The development of *national champions* has for a long time been an important cornerstone of the Norwegian government funding policies, for fostering growth and innovation in targeted sectors (Fagerberg & Srholec, 2008). The rationale is that national champions, due to their size and leadership, can compete internationally against other global companies (Powell & Grodal, 2005). Supporting them, and providing them with subsidies and grants will therefore have a trickle-down effect towards other smaller suppliers (Mazzucato, 2017).

Examples of this have been the establishment and support of Equinor, which has been important in developing many innovative suppliers within the oil and gas industry in the Stavanger region. Equinor often provides research grants to smaller suppliers, or acts as an end-client for their novel solutions (Wicken, 2009a). Research suggests that Equinor has been a catalyst for a number of Norwegian supplier firms and for the development of their innovative solutions. For example, Equinor has been an important first client of companies such as Easywell, Hitec, and Oil Tools of Norway (Engen, 2009; Frick & Ali, 2014).

A number of sectors, including the already developed ICT sector, shipping and other industries, discovered the oil and gas industry to be a lucrative market at the beginning of the 1970s. They could approach and deliver solutions to the North Sea endeavour without spending large amounts of capital on export (Castellacci et al., 2009). Recent research shows that most R&D grants still go to large companies, these receiving approximately 48.5% of total R&D subsidies (Clausen, 2009b). The most applied for Norwegian Research Council grant is, however SkatteFUNN, a subsidy programme for R&D which is industry agnostic. Studies suggest that these subsidies benefit smaller R&D companies more than large corporations (Cappelen, Raknerud, & Rybalka, 2012b).

2.9.4 Upgrading Existing Technological Capabilities

The last important funding policy objective is upgrading the technological capabilities of existing industries. This policy is actively targeted through the large-scale funding programs of the Norwegian Research Council (Clausen, 2009a). Most of these programs, in 2019, focused on oil and gas, fisheries, and other industries compliant with the structure of the Norwegian national innovation system, and the three layers of path dependencies of the modern Norwegian economy

(Fagerberg & Sapprasert, 2011). The implications of this, as is supported by research, suggest that the Norwegian Research Council is prone to support industries within path dependencies, through strategically targeting the development of national champions and upgrading the technological capabilities of existing sectors (Cappelen et al., 2010; Wicken, 2009a).

The upgrading of existing technological capabilities and funding policies targeted at national champions are interlinked due to the nature of the sectoral make-up of the national champions (Lundvall & Borrás, 2005). Most national champions, if not all, fall within path dependency, and follow Norwegian industries that already are heavily funded and developed. These include, but are not limited to, the oil and gas industry, shipping, fisheries, aluminium and other sectors in which Norway has a path dependency (Fagerberg et al., 2009; Wicken, 2009b).

2.10 Strategic Funding Policies and Related Institutions

The first public fund to support a small-scale decentralized form of industry, was the fund for collective industrial research, called Bransjeforskningsfondet, established in 1967. This fund introduced a subsidy system for public R&D contracts. Public R&D funding increased between 1983 and 1993 from 5500 to 9000 million NOK, by more than 80% (Fagerberg et al., 2009). Another mission- oriented policy that increased innovation in the oil sector was the so-called GWAs. The government introduced the Goodwill Agreements (GWA) in 1978 into the petroleum industry, GWA becoming an influential tool in creating an innovation system in the oil and gas sector, investing 5,800 million NOK between 1979 and 1991 in oil companies (mostly foreign) through approximately 1,500 projects.

These policies created a domino-effect in the rest of the Norwegian economy (Wicken, 2009b). Correcting market failures is, however, an approach that addresses smaller entrepreneurs and companies that are in risk of not developing novel solutions due to the lack of capital. Subsidies or support from the government will help these companies and entrepreneurs in the development of new innovations (Mazzucato, 2013). Supporting national champions, and upgrading the technological capabilities of existing industries, are strategies that address the large-scale innovation system of a country itself (Wicken, 2009a). It is therefore reasonable to divide government policies into two main categories: ones that support smaller companies and individual entrepreneurs (correcting market failures), and ones that develop and support innovation systems (such as targeted industries, resource-intensive and certain technological sectors).

These mission-oriented policies have created two main government organizations for supporting and fostering innovation. These are the *Norwegian Research Council* and *Innovation Norway*.

2.10.1 Support Systems for Correcting Market Failures

Innovation Norway (IN) is the premier incentive of the Norwegian state to promote new venturing and innovation at an early-stage level. The organization provides establishment grants and development funds to companies or individuals with business ideas that have demonstrated the capability to create new business ventures. Most of these business ideas are based on new concepts and innovation that could strengthen the local, and then the national economy (Frick & Ali, 2013).

The organization was established in 2003, first as a statutory company, then 100% fully owned by the Trade and Industry Ministry. It was reorganized in 2010, Norwegian counties becoming part owners. IN is now 51 % owned by the State Ministry of Trade and Industry and 49% by the counties ('Innovasjon Norge,' 2020). The most important schemes for small businesses are the Establishment grants (phase 1 and phase 2), and the Research and Development grants (IRD).

Establishment grants are given to individuals or newly founded companies with good business ideas. These grants range from 100,000 NOK to 750,000 NOK and are divided into two. The first phase is the establishment stipend, maximum funding being 100,000 NOK. The second phase is the marketing stipend, maximum funding being 750,000 NOK. Total available funding is 850,000 NOK for an establishing grant (based on the 2020 structure). IN funding is based on a 50–70% subsidy of actual costs incurred through the establishment phase (Finansieringsordninger for oppstartsselskaper, 2020).

IN typically only supports entrepreneurs that have technology related ideas that are scalable, and that have great international potential (Alsos, Clausen, Hytti, & Solvoll, 2016). They therefore fit into the IDE enterprise bracket/theory discussed in earlier chapters. Receiving support from IN requires the submission of an online application, similar to a business plan, and the presentation in a meeting of a case for the business idea. Some research suggests that companies that have received funding from IN, have a higher survival rate than companies that have not received funding (Madsen et al., 2007).

There are also research and development contracts that include *industrial research and development contracts* (IRD) and *public research and development contracts* (PRD). Research and development contracts aim to stimulate innovation across Norwegian industry. They are based on a commitment to the development of a product or service between a supplier and a customer, which can be a government agency (PRD) or Norwegian or foreign company (IRD). The purpose of this is to encourage cooperation on the development of new products, services, processes or methods with a significant market potential (Frick & Ali, 2013). There is no maximum grant for IRD grants, which typically range from 1 million NOK to 25 million NOK, depending on the project and the company.

IN also provides risk loans and grants for companies that want to develop and commercialize technology within the renewable technology sector, such as solar power, wind, wave and geothermal technology (Frick & Ali, 2013). There are many other indirect and direct government incentivized funding mechanisms, such as the Plogen funding from Prekubator TTO, Eurostars funding from EUREKA via the European Union, and Nopef funding from the Nordic countries. These funding mechanisms are indirectly or directly funded by the Norwegian government.

The Plogen grant is, for example, funded by the government through the incubator Validé. Plogen provides funding for feasibility studies, industry screening and patent searches, and funds up to 100,000 NOK for eligible ideas (Valide, 2020). Other incubators have similar programs that are funded by the Norwegian government. Ideas that receive support from Plogen can, based on this, apply for funding from the incubator connected to the University of Stavanger, and receive more funding from the FORNY2020 programme to commercialize research from universities (Forskningsrådet, 2020b).

2.10.2 Support Systems for Developing Existing Technological Sectors

The government of Norway established the Norwegian Research Council (NRC) in 1993 through a merger of five regional Research Councils. The mission of the organization was to promote and fund Norwegian research at home and abroad. NRC does this in several ways: by managing research, distributing grants and providing government advice in research policy topics (Forskningsrådet, 2020c). NRC furthermore acts as a meeting place for researchers and administers from the European Union funding programs such as FP7 and Eurostars, and Horizon 2020 (Frick & Ali, 2013).

NRC also has a number of funding programs that fund Norwegian research in private companies (Forskningsrådet, 2020a). These programs are all aimed at creating incentives for research in innovation, and in new ideas that may lead to the commercialization of products or services that could then benefit the Norwegian economy (Frick & Ali, 2013). The most important schemes or funding programs from NRC described in this thesis are SkatteFUNN and the Large-Scale funding programs, such as MAROFF, DEMO2000.

2.10.3 The Evolution of the GWA Tax Subsidies

SkatteFUNN (SF) is administered by NRC and is a tax reimbursement scheme for R&D investment in all businesses in Norway. The main purpose of SF is to motivate companies to acquire new knowledge, information or experience that may lead to new or improved products, services or production methods. Companies that have been granted a SF are given tax deductions of up to 20% (18% for large companies) of R&D project costs. The maximum tax deduction is 8 million NOK per year (2018), per company or per project (Forskningsrådet, 2020c).

SF was implemented by the Norwegian government in 2003, and replaced the former model, FUNN (Møen et al., 2006). It was initiated as part of a fiscal policy to increase innovation and new venturing within Norwegian companies. A number of models were evaluated. The government, however, decided on a tax incentive model, companies that carry out R&D benefiting from lower taxes, or from subsidies if they have no taxable income and are running at a deficit (Cappelen, Raknerud, & Rybalka, 2012a).

Research on the SF mechanism shows that more than 3,982 companies were in 2003 granted a tax incentive, 649 companies being rejected. Most of the 2,986 companies that apply are not in a tax position, 996 companies being in a tax position (Møen et al., 2006). SF has been evaluated a number of times, and there are written reports on its function, impact and overall assessment (Cappelen et al., 2010).

The European Commission published a study on R&D Tax Incentives in 2014 and ranked Norway No. 2 of all countries in Europe, just behind the French tax incentive mechanism for young innovative companies (EC, 2014). Norway was ranked high because the SF programme applies to all industries, not just one (Frick & Ali, 2013). The grant is also generous, as it allows each company to get up to 8 million NOK in tax reductions, up to 20% of the overall R&D budget, or cash reimbursement if the company is running a deficit while funding R&D.

Table 1

Definition of novelty for R&D incentives, (EC, 2014)

New to the world	New to the country	New to the firm	Ambiguous
•Belgium	•France	•Austria	•Bulgaria
•Canada	•Japan	•Denmark	•Greece
•France		•Finland	•Hungary
•Lithuania		•Ireland	•Israel
•Poland		•Italy	
•Portugal		•Japan	
•Romania		•Latvia	
•Slovenia		•Malta	
•Spain		•Netherlands	
•Sweden		•Norway	
•United Kingdom		•Poland	
•Croatia		•Slovak Republic	
•Czech Republic		•United States	

Another important reason for the high ranking given to the Norwegian SF scheme was the category of innovative and grant eligibility. It was sufficient that the R&D was new to the firm, for a tax incentive to be granted (Frick & Ali, 2013).

This is positive, as it incentivizes firms to become more efficient and competitive compared to other country rivals. The scarce research on SF further suggests that most companies that apply for the grant are SME companies, and that SF is a tax scheme that is designed for smaller companies as opposed to large companies (Møen et al., 2006).

Table 2

Overview over SkatteFUNN, (Norwegian Tax Directorate, 2003)

Number of employees	**Number of companies**	**Total tax reduction**	**Total payment**
Total	3189	1256	977
Total SME	1468	682	477
0-4 employees	1258	397	356
5-9 employees	463	177	145
10-19	531	230	182
20-49	479	206	145

Number of employees	Number of companies	Total tax reduction	Total payment
50-99	238	116	78
100-249	134	76	47
250-499	43	23	16
Over 500	43	31	10

The table above shows that most SME companies applied for SF in 2003. Only 43 companies with over 500 employees applied for SF, while 1,468 SME companies (a significant number) applied and were granted SF funding. The research therefore suggests that SMEs, rather than larger companies, benefited from SF (Møen et al., 2006).

2.11 Challenges with a Top-down Approach

The top-down approach dominates research into entrepreneurs and innovation, which results in insufficient attention on the actors, the bottom-up relationships and the learning processes of the entrepreneur (Iammarino, 2005). Studying the individuals, only looking at personality traits, education, and other variables, often fails to address and include innovation systems, and how government policies directly influence the entrepreneur (Flanagan & Uyarra, 2016).

The micro-mapping of variables attributable to certain characteristics of the individual entrepreneur overlooks, however, the dynamics of networks and interaction between actors in the innovation systems, that result from government policies (D. B. Audretsch & Belitski, 2017). The literature on innovation systems similarly does not address the entrepreneur, and their experience of how government policies interact during the creation of innovations. Regional and geographically-constrained theory is also being challenged by the increased rate of globalization and globally connected networks through the internet (Pitelis, Sugden, & Wilson, 2006).

There is, therefore, a clear absence of an approach to entrepreneurship and innovation that captures both the subject of government funding policies and the viewpoint of the entrepreneur. Many innovation studies often consider firms to be mere demanders of support, adhering to funding policies as they are implemented, and thus underplay the influence of the entrepreneur in these processes (Uyarra, 2009). A solution to this gap in the academic literature is to understand and see how government policies support the entrepreneur from their viewpoint - an *inside-out* approach. An inside-out perspective should be able to give new insight, to illuminate the complexities and the coincidences that often distinguish successful entrepreneurs from those who are not successful (Flanagan & Uyarra, 2016).

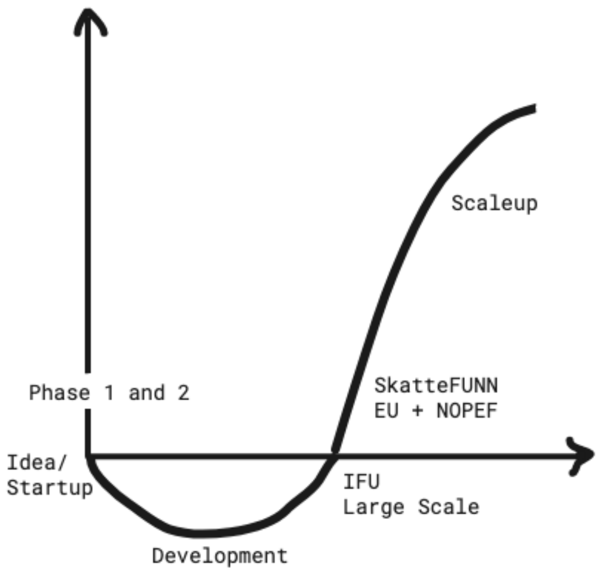
2.12 Company Lifecycles and Government Funding

Studying the impact of government subsidies and funding requires an in-depth, practical understanding of who receives the funding. Without this understanding, the data based on policy and path dependency theory is difficult to analyse. Prior research suggests that funding goes to large companies within specific sectors, and that there are clear differences, for example, between the Norwegian government approach to funding and the European Union (EU) (Fagerberg & Srholec, 2008).

Government funding policies have been investigated in the three cycles of 1) *start-up*, 2) *development* and 3) *scaleup*. Dividing the study into these phases provides an overview of which government grants are available, and which are most used by companies in each cycle. These are illustrated in the figure below, and relates to the private funding stages of an IDE, namely *seed*, *Series A* and *Series B*.

Figure 6

Gov Support during the company lifecycles, adapted from Aulet, B. (2016), p. 7



Support for the first cycle: Sources here are the two main funding mechanisms from IN – first the market acceptance funding, then the commercialization funding, also called phase 1 and phase 2 funding.

Support for the second cycle: There are many funding mechanisms in this stage, including innovation contracts with the industry, and large-scale R&D funding from NRC, such as MAROFF and DEMO2000. IRD is another funding mechanism that is granted through IN, funds being granted to develop new technology that is based on industrial collaboration. SkatteFUNN falls between cycle 2 and cycle 3.

Support for the third cycle: Growth loans are granted by IN for this cycle, facilitated by the European Union. There are no grants from NRC in the last cycle. Other grants such as, however, NORAD exist.

2.13 Summary of the Literature covering Basic Concepts

'The Theory of Economic Development', written in 1934, and 'The Process of Creative Destruction (1942)' by Joseph Schumpeter have been important in defining the entrepreneur in this thesis. Israel Kirzner and 'Competition and Entrepreneurship (1973)' provided important insights into the nuances of definitions. It was, however, Bill Aulet et al (2013), and 'Disciplined Entrepreneurship (2013)', that helped define the modern-day entrepreneur. Aulet divides the entrepreneur into two categories, SME and IDE.

Robert Hisrich and his research, which includes 'Entrepreneurship (2016)', and 'Technology Entrepreneur (2020)', are interesting and important to the topic. Fagerberg et al (2013) and 'Innovation, Path Dependency, and Policy: The Norwegian Case' is another source that covers the basic concepts. This book is informative and gives a solid introduction to Norwegian economic development throughout the years, including government funding of key sectors in the country. A plenitude of papers has also been important.

3 Methodology

This chapter reviews the methodology used in this study, exploring different concepts and explaining why action-research was chosen. The main research paradigms are the empirical, the interpretive and the critical-theoretic (Bricki & Green, 2007; Bryman, 1984; Creswel, 2008; Creswell, 2007). Empirical research is the most well-known and is grounded in the philosophy of a dualistic approach to thinking about our world, in which the subjective self, and the object is to be studied. Empiricists promote the idea of studying reality by studying objects, assessing them and controlling the outcome carefully through control-groups. Subjectivity - the researchers own opinion or interpretation - is not desirable (Creswell, 2007).

This approach is dominant in the world of science, engineering and technology. The empiricist approach has, however, shortcomings in a social context, where psychology plays a major role (Mcniff & Whitehead, 2002). A large part of this research is based on the second paradigm, interpretive research. The interpretive tradition primarily grew out of sociological enquiry and acknowledges the importance of subjective contributions from the researcher. This type of research, instead of a purist empirical approach in which objects are studied in isolation, is useful for studying people in their natural habitat, or settings (Mcniff & Whitehead, 2002).

3.1 Different Research Paradigms

A cornerstone of the interpretive research tradition is the case study methodology. The definition of the case study varies in academia. The general understanding, however, is that it is a design that allows for an in-depth examination of many variables or features of one individual or several individuals belonging to one group (Bricki & Green, 2007). According to Yin (1984), the use of a case study as a research methodology includes empirical inquiry, investigating specific phenomena within its real life-context, the first step in this approach being to create a focus that can be referred to by the researcher during the study of a complex issue (Yin, 2006).

Many researchers, due to the lack of a common understanding of what a case study is, however present their case-based research without calling it a case study (Stake, 2005). The differences compared to, for example, participant observation, can also be vague. These two research paradigms, the empirical and the interpretive, are different but also similar in the sense that they recognize a clear difference between the researcher and the objects or people that are to be researched. The researcher is therefore an 'outsider' or an external observer, and speaks on behalf of other people (Mcniff & Whitehead, 2002).

3.1.1 The Critical Theoretic Approach

The last research paradigm is the critical-theoretic approach that hails from the Frankfurt school in the 1930s, Jürgen Habermas being one of its champions (Mcniff & Whitehead, 2002). Habermas rejected the notion that knowledge generation developed by academics should be purely a neutral activity in the study of the 'other'. Research should be driven by a person with a particular internal desire or interest in learning about the subject (Habermas, 1991).

The critical theorists therefore deemed the two latter dominating paradigms as insufficient because they did not consider the historical, cultural and societal status of the researcher. How can you build a framework for research when you, yourself, and your surroundings could be biased? These thoughts relate to the concept of habitus (Bourdieu, 1977), and how our surroundings, and tacit knowledge affect our thinking and understanding of reality.

3.1.2 Evolving into Action-Research

Critical theory has evolved into an important dimension of academia, spurring new research approaches such as action research (AR). This type of approach allows the researcher to be part of the group that they study (Mcniff & Whitehead, 2002). The goal of any research is to generate new knowledge, this being in action research practically useful knowledge (Delgado, Porter, & Stern, 2010). AR is selected in this thesis as a method, because it provides the tools for investigating and understanding the entrepreneur journey inside-out, and the impact of government policies on innovation within an innovation system and within path dependencies.

Entrepreneurship is an ever-evolving endeavour. AR is dynamic, and developing, the improvement of practical insights into theory and praxis therefore being important (Kemmis, 2010). AR is also about putting ideas into action. Not just talking about them, or studying them as an external researcher (Mcniff & Whitehead, 2002). This allows the researcher to study the subject in-depth and gain a more holistic understanding than a purely top-down approach, analysing objective variables (Reason & Bradbury, 2006a).

3.2 Action-Research Compared to Conclusive Research

One important aspect, when considering AR for this study, was that the methodology would allow for the inclusion of a systematic approach to interpretive research. The main differences between AR and empirical-based research that uses quantitative measurements (also called conclusive research) are summarized here:

Table 3

Differences between AR and CR, (R. E. Stake, 2005) p. 24

Components	Action Research (AR)	Conclusive Research (CR)
Purpose of research	To gather information concerning a given situation	To verify the information and assist in choosing the best course of action
Data needs	Vague	Clear
Sources of data	Not well defined	Well defined
Form of data collection	Rough and open-ended	Normally structured
Data collection	No set procedures	Flexible
Sample	Selected subjectively in maximizing generalization of insights	Normal, large and selected objectively in permitting generalization of findings

The aim of this study is to create knowledge that, to some degree, can be reproduced. It is important that future researchers can use some of the content in this thesis to understand how government policies and support schemes, affect innovation inside and outside of path dependencies and innovation systems. Creating a company in Norway is definitely something that can be reproduced, which includes the implementation of many of the strategies described in chapter 4 under action-research.

Much of the secondary data collection is embedded in legal documents and financial reports to the government, which in turn can easily be validated through official organizations such as Brønnøysund and the Norwegian tax authority. A methodological framework that includes elements from the interpretive research paradigm, critical-theoretical and AR, will be therefore applied and used to develop a sound research design that is put into practice using well-known frameworks, such as the business model canvas developed by Alexander Osterwalder (Alexander Osterwalder, 2004).

3.3 Documentation through Mode-1 and Mode-2

Entrepreneurs often work in networks that are based on tacit knowledge and historical relationships, and make decisions based on gut-feelings or collaborative decision-making with others (Howells, 1996). AR is a form of on-the-job research, carried out by people in any context, regardless of their position in the company or organization. It is often, due to this, called practitioner research, or practice-based research (McNiff & Whitehead, 2006). One way to understand the entrepreneur is therefore for the researcher to conduct the research through AR over a number of years. The approach is hands-on and carried out by the researcher firstly engaging in observing entrepreneurs, and then secondly, starting their own companies and documenting the experiences through field notes, diaries and memoirs.

The ontological position of an action researcher is pragmatic and committed to the idea that learning will evolve into positive implications, and that this will lead to both social and environmental benefit. Epistemologically, knowledge is never static, or complete. It continuously develops, through learning and experiences (Argyris & Schön, 2010). It is important for the researcher to be self-reflective, often through an iteration of cyclical processes, a continuing spiral of planning-acting-observing-and-reflecting, then re-planning and another cycle (Argyris, 2006). Action-research is conducted primarily through Mode-1 and Mode-2 knowledge production (Gibbons et al., 1994).

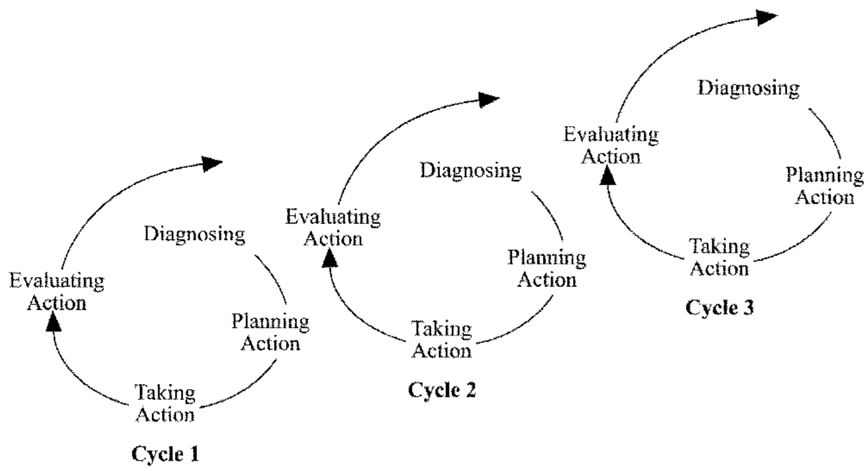
Mode-1 is seen as being the traditional academic mode and prevails in universities. It is created within the university in specific disciplinary divisions and transferred to society through an invention, a theory, a scientific article or a report. Mode-1 can be applications for public actors, writing and publishing of patents, and an analysis of competition or market space for the companies studied. Mode-2 is created in collaboration with the industry, outside of academia (Karlsen & Larrea, 2018). Mode-2 action-research can be created through active documentation of the process, including diaries, short notes, board meetings, media articles related to the firm, and other types of valid proof of experience (McNiff & Whitehead, 2009).

3.3.1 Action-Research as a Structured Approach

The action-reflection cycles were developed by Lewin (1946), and include a spiral of steps involving planning, fact-finding and execution. The initial reflection-cycles are not methodical but are more intuitive and impulsive developments in which planning could come after fact-finding, and execution immediately after planning. It is important for an action researcher to not be constrained by his or her systematic approach (Clough & Nutbrown, 2002). Kurt Lewin has inspired other researchers such as Stephen Kemmis (2002), who takes the model further, and has developed a more structured approach.

Figure 7

Planning Action Research, (Kurt Levin, 1964)



In this approach, AR always starts with one idea, the researcher then performing reconnaissance involving fact-finding and analysis. A general plan is outlined, a series of steps are taken to execute the plan, the outcome is evaluated, and the results are reflected upon (Kemmis, 2009). The sequence may vary. AR is therefore seen as being a spontaneous, self-recreating system of enquiry. The researcher develops a systematic process for observing, describing, planning, acting, reflecting, evaluating and modifying - without the need to follow a construct (Mcniff & Whitehead, 2002). It is important, when conducting AR, to have a specific plan or goal, or a research question to be answered. The researcher needs to understand the purpose of the action research, and why it is being conducted (Reason & Bradbury, 2006b). AR is dynamic and developing, improving practical insights through theory and praxis being important (Adelman, 1993).

3.3.2 The Importance of Reflective Practice

Theory and practice are developed interdependently in an on-going process, which might change its course if unexpected evidence or new ideas arise through this iterative process. ‘Reflective practice’ (Schön, 1983) is an enquiry into one’s own practice through collecting data such as keeping a research diary, writing memoirs or notes. This can be reflected upon in cycles, making sense of them and drawing conclusions to obtain clues about how to perform better. It can be carried out by an individual, for example by a teacher who questions his/her students about their views of the learning opportunities in the classroom.

This, however, only becomes fully-fledged action research where the process and results are planned, discussed and shared either with a group of other stakeholders such as colleagues, or with external advisors acting as ‘critical friends’ who can be trusted as both appreciative supporters and well-meaning critics or possibly as co-researchers (Argyris & Schön, 2010). AR relies on different sources of knowledge, empirical observations, scientific literature and practitioners’ experiences in education, social work or health care, and popular wisdom (Pernecky, Jack, 2016). AR in most cases uses qualitative methods and interactive designs, but may also use quantitative methods for collecting, processing and statistically analysing data if this promises to advance practice (McNiff & Whitehead, 2006).

3.3.3 Ethical Considerations

AR allows the researcher to be an active participant in the research that is being conducted, as in this research in which a number of companies were started. The use of Mode-1 and Mode-2 interactions require a high degree of adherence to academic values, such as honesty, and consent between participants in the research (McNiff & Whitehead, 2009). Methods that have been used include writing memoirs, writing government funding applications, and active participation in meetings with both public and private actors.

Some companies or actors have been anonymized, and most key employees are denoted by their first name. Starting a company in Norway requires annual accounts to be submitted each year, and transparency from the first day of business operations. A lot of the material in this thesis is therefore publicly available, either through newspaper articles, submitted annual accounts or information that is published by the Norwegian Stock Exchange, Oslo Børs.

3.4 Research Design

It is important for AR as a method to have a clear goal at the start (Mcniff & Whitehead, 2002). The research objective of this PhD research is, therefore, to investigate the entrepreneur's view and process experience of government funding policies. This is carried out through action-research in the establishment and development of five companies, based on technology innovations. The objective can be further broken down into three research questions (RQ1, RQ2, and RQ3), which relate to the different stages of an IDE lifecycle.

It is crucial, when combining the interpretive and the critical-theorist paradigm, to use a systematic approach to research, if new and valid knowledge is to be created (Mcniff & Whitehead, 2002). Social science provides us, when developing a new research design, with two such basic approaches: deduction and induction (Alvesson & Sandberg, 2011). The deductive approach has been more popular, researchers using the magnitude of an existing theory as a platform to build a hypothesis and use empirical research to confirm or disprove the researcher's arguments – also called the top-down approach (Popper, 1963). Deduction is defined as: Theory → Hypothesis → Observation → Confirmation.

Inductive research is a bottom-up approach, grounded theory being a popular example (Walker & Myrick, 2006), including a broad range of case study research designs (Yin, 2009). This is basically defined as: Observation → Pattern → Hypothesis → Theory.

3.4.1 Methods of Reflection

Professor Mats Alvesson (2012) uses problematization to conduct research and develop knowledge. This concept is more or less identical to action research and the idea of reflection (Alvesson & Kärreman, 2007; Alvesson & Sandberg, 2011, 2014; Alvesson & Spicer, 2012; McKinley, 2008). Some research topics are complex and include many variables that will be challenging to research and create knowledge from. The use of a form of theory development called abduction (Pierce, 1978) can, however, resolve this challenge. According to Alvesson and Kärreman (2011) abduction consists of three steps:

1) The application of an established interpretive rule (theory)

2) The observation of a surprising empirical phenomenon—in the light of the interpretive rule

3) The imaginative articulation of a new interpretive rule (theory) that will resolve the surprise

This is fundamentally defined as: Theory → Observation → Pattern → Hypothesis → New Theory.

This is further explained by Van de Ven (2007) p.5:

'Problem formulation and theory building follows an abductive form for reasoning, which is neither inductive nor deductive. Abduction begins by recognizing an anomaly or breakdown in our understanding of the world and proceeds to create a hypothetical inference that dissolves the anomaly by providing a coherent resolution to the problem.'

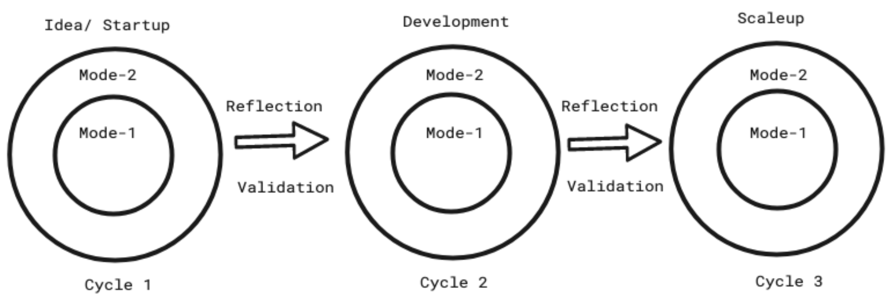
3.4.2 Using Reflection in the AR-cycles

AR is conducted through active work with the action-research companies, and dialogues and meetings with various actors, both public and private. Mode-1 and Mode-2 are often used together in a hybrid version, due to the nature of the entrepreneur's role as a researcher. Mode-1 is always the starting point, such as writing an application to IN, reading and understanding all the practicalities of government funding policies, or even writing a PhD dissertation on business development.

This in turn might lead to AR Mode-2, such as presentations that lead to commercial collaborations with existing companies. A three cycle AR-model has, based on this dynamic, been developed for this study:

Figure 8

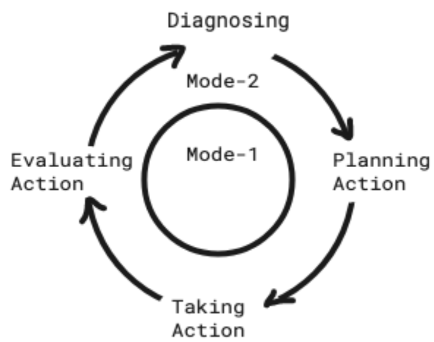
Three-Cycle Iterative Model, (Ali, 2020)



The three-cycle iterative model builds on Kurt Lewin and Schön's (1964) loop. It begins with cycle 1, that is the idea/start-up phase, and progresses in iterative loops, Mode-1 and Mode-2 converging. The process often starts with Mode-1, such as writing a paper on a particular business subject, or writing a patent, which in turn leads to a Mode-2 interaction in the agora, and further into commercial collaborations. Each cycle ends with a reflection, and a validation. The three cycles are also built on the three funding and life cycles of the IDE-enterprise, start-up phase, development and then growth/scale-up phase (Gompers et al., 2007). A conclusion is presented at the end of this thesis that summarizes and concludes on the three cycles of the company.

Figure 9

Action Cycle Loops, Adapted from Lewin, K. (1964)



Each cycle passes through an iterative process, based on Kurt Lewin's (1964) action-reflection cycles, including a spiral of steps that involve planning, fact-finding and execution. Each case company passes onwards to the next cycle when it has reached a certain degree of maturity, such as additional funding, or a commercial product/service.

3.5 Analytical Framework

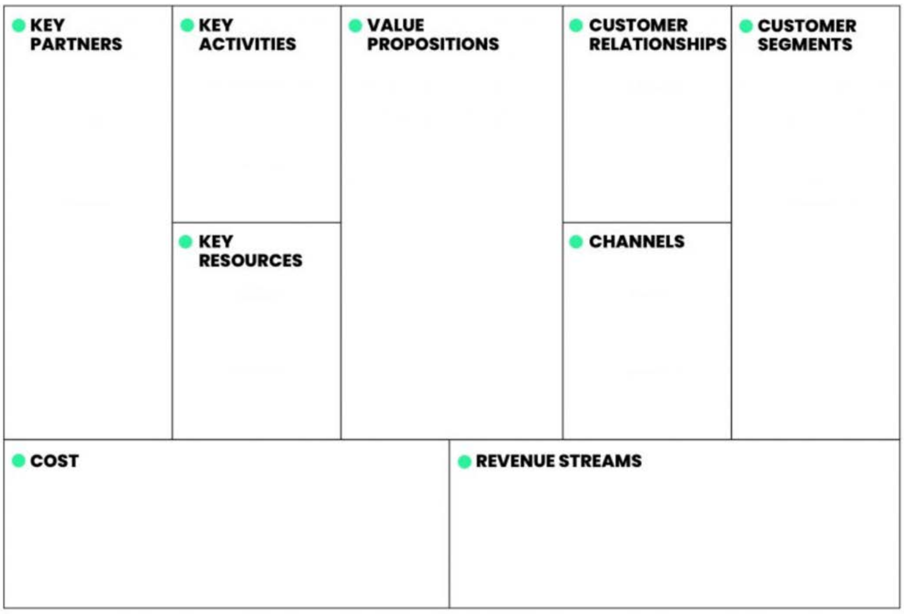
AR is presented in Chapter 4 as memoirs, a form of field notes. These are, in Chapter 5, divided into two or three action cycles. Each action cycle starts with the incorporation of an IDE. Specific variables decide whether the case companies pass onwards to the next action cycle, and whether the research can be reproduced, tested and validated (or falsified). To pass through the first cycle, the case company needs the idea to be validated by fund-raising from either private or public capital. The product, which is a result of an idea conceived in cycle 1, will be pivotal to whether the company reached cycle 3 or not. A case company that creates a product, commercializes it, and raises additional financing to grow the company, will be moved to the last scaleup stage, cycle 3.

The Business Model Canvas developed by Alex Osterwalder (2010) is used to structure the action-research, and the abduction process. All this activity generates a wealth of knowledge. It is, however, important during the action research cycles to generate evidence to support the claims of knowledge. Osterwalder’s Business Model Canvas consists of nine building blocks, and is actively used in this thesis. Every block is important during each company’s three cycles, and is used to assess the potential of a business idea, or to diagnose strengths and weaknesses at various stages in the growth of a company (Alexander Osterwalder, 2004). Osterwalder’s Business Model Canvas (BMC) was used at the time (2013-2018) by Innovation Norway and their employees for assessing the maturity of companies and whether they would be eligible for funding or not.

BMC provides a good overview of the most important elements of making a business viable, and can be looked upon as a type of mini-business plan. BMC is used to assess critical aspects of a business, such as its key resources, partners, its value proposition, customer segments, marketing channels and revenue sources (Alexander Osterwalder & Pigneur, 2010). It is also used in this study for mapping the impact of government funding policies, either directly through grants, or indirectly through networks or assistance provided by government actors.

Table 4

Business Model Canvas, (Alexander; Osterwalder & Pigneur, 2010)



3.5.1 Measuring Cyclical Progress

BMC is today used by a number of companies to provide them with an overview of their business model, and of where to focus their strategy when developing a business. BMC can be used to examine new possibilities and innovations in marketplaces (Osterwalder, 2010), the nine building blocks being adopted as a foundation for understanding how to take new technologies and solutions to the marketplace. BMC is a result of micro-level assessments in this study, the interaction between the actors in the sectorial innovation system laying the foundation for strategy and possibilities for the company. Examples of this are derived from the nine building blocks: key partners, key activities, customer segments, customer value proposition, channels, customer relationship, revenue streams, key resources and cost structure.

Each building block might evolve, change or even disappear during the development of a company (Osterwalder, 2010). Key partnerships are, however, the most important partners in the company during the course of the cycle. This might change from cycle 1, to 2 and to 3. Examples of key partnerships could be support from Innovation Norway or the Norwegian Research Council. Other partners are suppliers and engineering firms in the development cycle of a company, or the distribution and sales partners in the scaleup cycle.

Partnerships are often incentivized through government, examples being the GWA agreements implemented by the Norwegian government in the 1970s (Fagerberg), or even IRD contracts with

Innovation Norway. Partnerships might be easier to arrange for some companies because of the structure of the sectorial innovation system (for example within oil and gas in Stavanger). The core activities of a company are its key activities and define the areas in which the company needs to perform to succeed.

3.5.2 The First Cycle

1) Key partners
2) Key resources
3) Value proposition

We, in the first action cycle, assess three building blocks, which are key partners, key resources and the value proposition of the firm. Firms in early stages of development may not have reached a level of maturity that allows the other parts to be assessed. These three building blocks, however, cover the essentials. Key partners, resources and value propositions are important in the start-up stage of a firm. It is, starting with the value proposition, the product or service that distinguishes a company from its competitors. This idea or concept is critical at the very beginning to obtaining support, financing through government grants, or private funding, and to the building of the company (Alexander Osterwalder, 2004).

Key partners are core in the start-up phase, due to the limited capabilities of a small company. Entrepreneurs, even where two or three, often do not have all the capabilities and experience in-house required to develop a product or a service. Having access to suppliers and other partners is therefore important. Lastly, but also of importance, are the key resources. This could be the entrepreneurs, the capital available, experience and intellectual property. The resources are often considered to be the most important asset in a start-up (Kawaski, 2000; Ries, 2016; Thiel, 2014).

3.5.3 The Second Cycle

1) Key activities
2) Cost structure
3) Revenue streams

A firm which has reached the second cycle, has reached maturity, gained confirmation from government actors, received funding from Innovation Norway or the Norwegian Research Council, or even raised private capital. Companies therefore need to think more about their key activities when developing their technology, their cost base and revenue stream. Three more building blocks are therefore added in action cycle 2. Key activities are important to the underpinning the value of the proposition. These map the activities that are to be undertaken to achieve the value proposition goals of a product or service.

A company's costs in association with the product or service form the cost structure in the Business Model Canvas (Alexander; Osterwalder & Pigneur, 2010). Some companies are cost-driven, and compete on price. Others are value-driven and compete more on quality or exclusivity. The last building bricks in the development phase are the revenue streams. Revenue is the income the company makes, and the way it makes it, for example, through a licensing model, a pure one-off sale, subscription fees or other type of fees (George & Bock, 2011).

It is important to assess key activities, cost structure and revenue streams during the R&D phase, as these provide an understanding of how to build the company into a growth position, and of where to establish its products or services to succeed in the market. The R&D phase is often referred to as the 'Valley of Death', and is where Venture Capital investors typically position themselves. Key activities such as cost structure and revenue streams are the most important to VC funding raising (T. Meyer et al., 2008).

3.5.4 The Third Cycle

1) Customer relationship
2) Customer segments

3) Channels

The last action-cycle is the scale up stage of the business. The company has, in this cycle, commercialized its products, and has started receiving revenues from their solutions. The three last building blocks are added in this cycle. Growing a business requires a focus on customer relationships and having a clear objective for customer segments. Customer relationships is the way in which you interact with your customers, including an automated service such as a chatbot, or even external distribution and sales.

Customer segmentation allows the company to obtain an overview of the type of customers that are relevant to its products and services. Segmentation can include statistics and an overview of purchasing power. Channels are, however, ultimately about customer communication. Traditional sales channels for a store, for example, are the physical store, but for other channels it could be a website, or door-to-door salespeople.

3.6 Gathering Data Through Action-Research

The storage and accumulation of data is as for other qualitative approaches, data being gathered through field notes, diaries and logs, reports, questionnaires, surveys, interviews and discussion forums (McNiff & Whitehead, 2009). This data is structured and presented in chapter 4 as a report, segmented for each case company. Three of the companies are included, but not Vision Io and Oil Tools of Norway. These companies are instead presented in chapter 5, through the business model canvas analysis.

The support mechanisms of the government are, in addition, all carried out online. Entrepreneurs must submit applications and pass through a digital screening process before being granted funding or subsidies. The corporate identification numbers of all action-research companies and case study companies can be searched for and be used to find out which government grants they have been granted and when. This information is easily available online, on the website of Innovation Norway and the Norwegian Research Council.

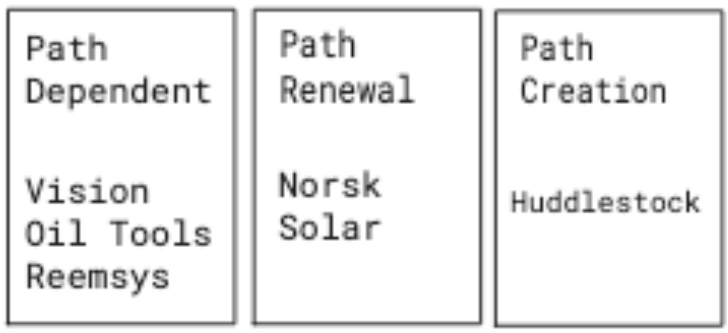
3.7 Case Companies

The action research in this thesis is based on five companies. These companies are Norsk Solar AS, Huddlestock Fintech AS, Reemsys, Oil Tools of Norway and Vision Io AS. They cover all path variables. Studies on innovation systems suggest that companies within path dependencies will benefit more from government policies, than companies that fall within sectors and that represent path renewals or path creation. Vision Io and Oil Tools of Norway were both part of the oil and gas industry, and Reemsys is part of the Maritime industry.

These are unarguably part of the sectoral innovation system in Norway (Wicken, 2009a).

Figure 10

Path Variables, adapted after Fagerberg (2014)



Norsk Solar is part of the renewable energy industry, which has strong links to existing sectors such as oil and gas and represents path renewal. Huddlestock, the last company, and a financial technology-related company, does not have any relation to existing sectoral innovation systems in Norway. This case company therefore represents an outsider and is placed as a new venture within a path creation. These three path variables, dependent, creation and renewal, are fundamental to the research. 5 IRD applications, 1 MAROFF, and 5 DEMO research applications were written for the case companies, to gain an understanding of the mechanism of government funding policies The acceptance rate was 80%. 45 tax incentive schemes were also written for the other companies with a 90% acceptance rate.

Most studies on sectoral innovation systems, and the impact on government funding policies based on path factors, are ambiguous and give little information about the effect on the entrepreneur and the companies started. This study, which spans seven years, provides insights and knowledge from a 'bottom-up' perspective, which is unique in this field. The action-research companies served as a solid foundation for problematizing existing theoretical material on topics in all cycles, and to from this develop theory. Another important aspect of assessing government support is to see how it can also contribute to raising funding from private investors, as this is also key in validating a cycle.

3.8 Primary Data

Data collected from Vision Io, Oil Tools of Norway, Reemsys, Huddlestock, and Norsk Solar include board papers, NDAs, contracts, accounts, legal papers, employment letters, media coverage (short commercials, interviews, awards won and more), applications to the Norwegian Research Council and IN. This also includes a number of board meetings, closing partnership and collaboration agreements (such as Letter of Intent, Memoranda of Understanding) with other companies, and closely monitoring and following the financial situation of each company.

The Norwegian registrar Brønnøysund regularly publishes accounts and other company statements. Fully disclosed financial accounts for all AR companies are available online through www.purehelp.no and www.proff.no, for all years from 2013 to 2020. Huddlestock and Norsk Solar are listed on Oslo Børs Euronext Growth, under the ticker HUDL and NSOL. All financial reports and other information related to the companies after listing are also publicly available online.

3.9 Secondary Data

The thesis also utilizes information from secondary sources, collected by others, to derive a broader understanding of the topic and variables studied. Literature from secondary sources is sourced from libraries, electronic databases and journals, past study findings, government and organizational websites. Secondary data was used when writing the papers and chapter 6, additional research.

Data from Rogaland Eksportutvikling from the last 25 years was collected and reported. Data from BR Industrier was collected first-hand from the management of each company. An example of such secondary data is using www.proff.no, a Norwegian website of all financial information on registered companies in Norway. Data on company accounts not related to the case companies, filings, board-members, and even info about the salaries of the managing director can be investigated through this website.

4 Action Research

This chapter introduces the case studies of the three companies founded during this research. There were five case companies. The names of the individuals involved have been shortened to their first name, to protect personal privacy. The entrepreneurs in the study are denoted through acronyms, including some partnership companies. The references made in this section are connected to newspaper articles, magazines, film clips or similar resources that are online. Few media resources, however, refer to academic theories.

4.1 Reemsys

Reemsys (RS) was the first case company to become a part of this study. All the entrepreneurs were new to fund-raising from IN, NRC and private investors. They are described by the acronym RF, which stands for 'Reemsys Founder'. Each entrepreneur is numbered, and RS is used as a denotation for both entrepreneurs together, and the company.

RF1 – Murshid M. Ali

RF2 – Geir Ueland

4.1.1 Background and roles

RF1 had broad operational responsibilities in RS and was the CEO of Reemsys from its incubation in 2013 until 2015, when RF3 took over.

RF1 resumed his position as interim CFO, and Chairman of the company until 2018 when Sub Sea Services bought 51% of RS (Friestad, 2017). Jostein took over as Chairman after the purchase, and Julie became the new CEO. Both RF3 and RF1 continued as board-members, shareholders and active contributors to the company. RF1 was, in this period, solely responsible for all the government funding programs and applications.

The concept RescuePod was, before RS was started, nominated for a DNB Innovation Award in 2013, the most notable Innovation Award in Norway at the time (Nordic9, 2014). The concept was shortlisted among 700 business ideas and was selected as a regional finalist. None of the founders had experience or knowledge of the maritime industry prior to establishing RS. They, however, knew that developing the RescuePod product and technology would require a lot of capital and take some time. The testing of such products is usually carried out at sea, and the certification process is known to be difficult. The market was also dominated by a few players, who controlled the distributors.

4.1.2 First cycle (2013–2015)

The initial seeds that led to the foundation of the company were planted in late 2012 when RF1 met RF2, an engineer in Completion Technology Resources (CTR). CTR developed and delivered completion tools for the oil industry and was a client of RF1 in the company Norsaco. Norsaco carried out business development and export advisory for Norwegian energy companies that wanted to establish in the Middle East. RF2 and RF1 travelled extensively together, to Tel Aviv, Abu Dhabi and Dammam, and discussed many potential ideas. RF2 was not happy with his current position in CTR and wanted to start something new.

RF2 and RF1 discussed many potential concepts and ideas, *RescuePod* being one of them. There were no good solutions on the market for safety equipment for infants. Most of the solutions available were designed for adults, and did not address the key reason for infant death at sea: Hypothermia. Building an isolating solution, a pod that covers the baby entirely, could drastically reduce child mortality, and could be a product that could be of interest to the market. The entrepreneurs also complemented each other, RF2 having a technical background, and RF1 having a commercial background. RF2 also felt that it would be fairly simple to develop and commercialize that product, and that there were many potential clients, including ferry owners, families with small children and large cruise ships. RF1 and RF2 worked more on the idea, developed sketches, and pitched the idea to actors in close proximity.

These primarily were the University of Stavanger, and surrounding engineering companies and their employees, the well-developed sectoral innovation system giving the entrepreneurs good feedback on their technical product innovations. One example of this was that the sketches were prepared by a designer that worked in-house at CTR, a company RF2 worked in (see appendix 1, 1). Most of the feedback received on the product was positive. The entrepreneurs therefore prepared a short business plan that included the costs of developing the RescuePod, and market analysis. They also, in this period, stumbled across DNB's Innovation Award, an annual competition that encourages entrepreneurs to submit their business ideas for a prize of 500,000 NOK. DNB is Norway's largest bank, and the Innovation Award was at that time one of the most prestigious in the country.

RF1 and RF2 submitted an application for the RescuePod idea. DNB later that year called. They informed the applicants that they had reviewed hundreds of ideas and shortlisted the RescuePod idea as one of six regional finalists for the DNB award. The feedback from the team at DNB was positive. They wrote, in their review, that the idea had great international potential, that the market segment was global, and that RS had an innovative idea. The entrepreneurs were invited to the awards and presented RescuePod. The awards were initiated solely by DNB. Conference attendees, however, included IN and NRC employees. RF1 and RF2 did not win the competition but received a lot of positive feedback on the product. RF1 and RF2 therefore decided to establish the company RS in early 2013. The company's name was an acronym for Rescue Emergency Systems (Reemsys).

RS was established as a Limited Liability Company, with 30,000 NOK in start-up capital, the minimum for starting such a company. This money was seeded 50-50 from RF1 and RF2 (15,000 NOK each). The most important validators for RS in Cycle 1 (c1) were phase 1 and 2 from IN. These funding policies would give RS the opportunity to develop a product that could be launched. Applying for the first government grant from IN went well. The first grant is called Phase 1, and at that time (2013) was maximum 150,000 NOK, given as a match-up grant, founders being required to provide 50% to receive all the capital. RS first, to apply for this grant, contacted IN, getting their contact details through the government incubator Ipark (now Validé). RS then had a telephone meeting with IN, and after this a meeting with them in their offices in Ullandhaug.

RS discussed RescuePod as an idea, the shortlisting for the DNB Innovation Award, and the team background. IN was, at that time, a keen supporter of regional product innovations, that is physical products that represented a new solution and had global appeal. All such ideas should have the potential to increase the number of local workplaces, but also national workplaces. IN must have liked the idea, because they recommended RF and RS to write an online application and submit it. The application took a couple of hours to write and was similar to a brief business plan. It took almost a month after submission before RS received an answer. RS was granted 150,000 NOK, IN paying out 50% of this when RS started the project. RS had to first inform them by email, and post a signed letter accepting their terms and conditions. RS was paid the granted amount via the company bank account about a week after accepting and sending the letter. RS experienced this as a very professional and straightforward process. It was also clear that IN followed certain procedures when granting capital.

The support from IN also, however, created a problem. Firstly, none of the entrepreneurs had large amounts of capital to invest in the development of the idea. Secondly, the grant from IN was given on a 50-50 basis. Half of every NOK supported had to be matched by private capital. The pay-out structure also made this difficult. The total budget for phase 1 was 300,000 NOK. RS first received 75,000 NOK; the remainder being paid once the company had used the whole budget of 300,000 NOK. This meant that RS had to obtain 125,000 NOK in private capital to access the full support from IN. RF1 and RF2, to solve this liquidity problem, arranged for a company credit for RS at DNB (a national bank) of 200,000 NOK based on the granted support and *personal guarantees* of both entrepreneurs.

If RS could not repay the loan, then RF1 and RF2 would have to personally bear the full amount. Government funding from IN was, regardless, very important to the building of a prototype. RS's goal was to get it built, and then raise more capital from private investors to survive from c1 to c2. RS assumed that 300,000 NOK would be enough to build a prototype, and that a maximum of 1 million NOK would be needed to build a product that could be sold to customers. RF1's and RF2 's networks were confined to the University of Stavanger, a couple of engineering companies and the office space at a local incubator. Finding suitable suppliers was therefore a challenge. RS was introduced, through the University of Stavanger, to a company called RPC based in Ålgård, south of Stavanger.

RF1 contacted the Managing Director of this company by email and spoke briefly to him on the phone before setting a date to meet in their offices in Ålgård. RS sent some information prior to the meeting, including on the RS grant from IN, the DNB Innovation Awards and the preliminary technical drawings made in-house by CTR. The meeting went well, and the managing director suggested signing an NDA and conducting a feasibility study. This study would assess the main criteria for getting the product built and commercialized. RS agreed and signed the necessary papers. The next meeting was scheduled for a couple of weeks later. RPC then presented the first conceptual drawings of RescuePod with in-depth technical drawings and solutions. RPC had developed a hard-shell version of the RescuePod, with an egg-like design, and a pipe as a breathing mechanism for the child (see appendix 1, 2).

RPC presented a development plan in which a prototype would be completed within a couple of months, and the first product would be ready for commercialization and sale in the market after 1-1.5 years. RPC could help RS with the entire process, including potentially sourcing material from abroad for the RescuePod and production of the product. It was agreed, after the meeting, to continue the collaboration between the companies, RS asking RPC to send them a service agreement. RS was later advised to apply to Validé, a government incubator, by a number of people including staff at IN. RS would, as part of the Validé qualification process, be invited to a number of meetings with the incubator. The first meeting was a couple of individual meetings in which RS would meet Validé staff and discuss the idea. If Validé found the idea to be good (after assessing its business opportunity and probability for success), RS then would be invited to a group meeting with several Ipartners. RS pitched the RescuePod project at this meeting and received feedback, the Ipartners being consultants attached to Validé who either were investors or were connected to the industry in some way.

They were professional businesspeople dedicated to helping new companies such as RS. The meetings went well, and the feedback was always positive. The interaction with Ipark was, for RS, another key validator that they had a good business idea. RS met a number of potential industry partners in one such group gathering, and the

Chairman of Rødne Rederier, one of the largest ferry companies in the Rogaland region, who wanted to introduce RS to Lars, Rødne Rederier's owner. Lars, after this warm introduction, agreed to meet with RS. RF1 had prepared a presentation which included drawings from RPC, feedback from the industry, a business model and a plan for development. The meeting day arrived, and RS presented the project to Lars. He liked the project and the team and was very enthusiastic. He believed the industry needed such a solution and acknowledged there was no adequate safety equipment for infants on his ferries. Lars wanted to support the project with their expertise and knowledge.

Lars recommended that RS arranged a meeting with Redningstjenesten (National Safety Services), which Rødne Rederier had become a part of after winning a regional tender to deliver these services. These services are run by private companies such as Rødne, but heavily funded by the Norwegian government. Lars set up the meeting with Redningstjenesten, on Finnøy, an island about one hour from Stavanger. RS drove to Finnøy and arrived to find around forty people waiting for the RS presentation (see appendix 1, 3). RS did not have any presentation materials at that time, so conveying the message to the crowd was not easy. RS, however, showed some pictures of the RescuePod to them and discussed the RescuePod concept. The audience members were, initially, sceptical. However, after the RS presentation, almost everyone was convinced that developing the RescuePod was a good idea.

Most of the company capital had up to now been used on developing the RescuePod and been paid entirely to RPC. RS received the service agreement that had been requested from them by email. After reading it, RS was unsure about going forward. RPC must have been convinced that there was a large potential market for the RescuePod, because they wanted an exclusive agreement with RS. They also they wanted the intellectual property for the product that they developed, and a 22.5% royalty on all income that the product would generate after commercialization. RPC also claimed that since RS already had signed the feasibility study, that RS were locked into using them for the rest of the development. RF1 felt that there always was a way to solve the situation and reach an agreement. The emails back and forth, however, came to nothing. RF2 had previous experience with such problems. He therefore recommended engaging a lawyer to investigate the case and support RS. RF1 found the law firm KyllingstadKleveland in Stavanger through his personal network.

KyllingstadKleveland went through all the email correspondence, the agreements between RS and RPC, and concluded that RS had a strong case. They recommended that RS sent an official letter from KyllingstadKleveland to RPC informing them that RS would terminate development, the agreement and find another subcontractor/supplier. The dispute was quickly resolved using the law firm. RPC did not want to escalate the case and released them from their claims. They also gave RS all the blueprints and technical drawings of the RescuePod, and the market research they had carried out. The lawyers, acting as an independent contractor or mediator, solved the conflict for RS. This conflict, however, delayed the development of the RescuePod, RS having to find a new actor as subcontractor and who could help them build the product. They had to use their own network and meet with potential partners to find this. RS assessed many different partners and met with some of them. Some were sourced through the network of the University, and others through their personal networks. This required looking beyond Stavanger to other regions such as Oslo and Trondheim.

The process took a couple of months. RS however finally found, through RF1's network, a small design company in Oslo called Pivot Produktdesign. They were small, but an agile team. They had also developed solutions for the maritime industry before. That was a major bonus. RS had learned from their experience with RPC and engaged Pivot for a test project of a few months, during which a plan and sketches of an updated RescuePod were to be developed and presented. All the material developed by RPC was delivered to Pivot. They went through this and were not impressed. The design was in their opinion poor, and it was clear that RPC did not have the maritime industry experience required.

The designers at Pivot started working on the test project and after a month or so RS was invited to Oslo and was presented with a report. Pivot had dug deep into the industry, spoken to a number of potential clients, including ferry companies, had carried out market analysis and more. The feedback was positive and showed that there was a market need for something like the RescuePod. Pivot described, in the report, the development path from idea, prototype to a live product. They also showed a new design of the RescuePod (see appendix 1, 2). It would take around six months to build a functional actual size prototype, and about one to one and a half years to develop the first commercial product. The estimated cost for this by Pivot was around 500,000 NOK.

The service agreement presented by Pivot was very different from the RPC agreement. Pivot wanted no exclusivity, and no royalty fee on sales. Nor did they want the intellectual property rights. Pivot, however, wanted to stand as a co-inventor on any patents filed for the product, which was very acceptable. They would bill by the hour or charge an agreed fixed price. This gave RS a predictability. This new service contract was a surprise to RF1, but also a lesson learnt on how much contracts can differ and that all can be negotiated and developed deal-by-deal. RS later learned that Pivot’s contract proposal was more the norm in the industry than RPC's. RS had, by that time, almost used all the funds from phase 1. There was, however, around 100,000 NOK left in the bank account. RS agreed with Pivot that they would start the development process with them and continue if RS was granted phase 2 funding from IN for the rest of the development. RS were thus dependent on phase 2 funding from IN. The company would not, without this support, have the financial capability to continue its development.

Pivot wanted to build a hard-shell product of the RescuePod and use the blueprint that RPC had developed. Their new design looked very good. It was modern and functional (Produktdesign, 2015). They closed the phase 1 grant when RS signed Pivot as partners. A report had to be written and an accountant had to confirm the expenses, and file this with IN for the phase to be closed. RS had to show that the project had incurred costs of a total of 300,000 NOK, before the rest of the grant would be paid out and could apply for a phase 2 grant from IN. These interactions between the different actors, both private and public, were an important learning curve in understanding how the government support worked. It was a financial grant, but it also had strict reporting and rules attached to each grant. All costs associated with the project had to be documented and approved by third-party professionals. The grant was also a validator to others, such as potential clients, that the project was of high quality.

One of the most important criteria for the phase 2 grant in 2013/2014 was that interest had to be shown by an end-client in participating in the project. RS discussed this with Lars of Rødne Rederier, and he was positive and willing to support the project with a letter stating that Rødne would buy the RescuePod product once it was commercialized. RS then, equipped with this letter of support, the new designs of the RescuePod (see appendix 1, 4), and all the marketing material and research carried out throughout early 2013, applied for phase 2. The phase 2 application was, as for phase 1, written and submitted online. RS called IN prior to submitting the application and discussed options and the potential for them to be granted phase 2. IN knew the project well by now and recommended they submit an application. Phase 2 applications were much more comprehensive, required more groundwork on budgets, income-projections and a solid business plan. RS was, after submitting the application, invited to a meeting with IN. They met the granting officer at this meeting and discussed the project and answered any questions that they had. These interactions between RS and IN were important, to increase trust between the parties.

It took about two months from the meeting for RS to receive an answer on their application. The response from IN was positive, and RS was granted the maximum amount of 600,000 NOK. Just as with phase 1 support, 50% of the grant would be paid out when the project started and the rest after RS had finished the project. The total project size was 1.2 million NOK, as it was a 50% grant. RS received 300,000 NOK when the project started but had to use 900,000 NOK before being able to access the remainder of the grant. Not many people have 900,000 NOK available in free capital to invest in a risky venture. The plan was that RS could, with the 300,000 NOK from IN, start the process with Pivot and build the first prototype, and then with the prototype RS would approach private investors and raise the rest of the capital so that they could continue building and then commercialize RescuePod. As with the phase 1 grant, RS was granted a credit line from DNB based on their personal guarantees and the grant from IN.

4.1.3 Second cycle (2014–2020)

RS started working on other government support mechanisms for Reemsys at the beginning of 2014. This was important for c2. The mechanisms included MAROFF from NRC and IRD from IN. IRD grants were given to companies that developed something novel and innovative in collaboration with an end-client who contributed 20% of the R&D budget. This grant was ideal for the RescuePod and for the collaboration with Rødne. MAROFF seemed a little more challenging. It had, in recent years, only given grants to large firms with solid revenues.

RS applied for a MAROFF grant at the beginning of 2014. This grant required a detailed application of over 11 pages, including a lot of financial information, budgets and technical drawings. The application included information about the team, the RS technology/solution, market, and competition, all completed online. Submitted applications were reviewed by a panel of experts, who would rate them, the best applications receiving funding. MAROFF, as for IN grants, offered a 50% grant. RF1 and RF2 flew to Oslo again after applying for the MAROFF grant. Pivot had built a small prototype that was ready for testing in a pool.

The update from Pivot was very encouraging. The small prototype, a 3:1 model, was tested on water also before the team (Woolley, 2015). The hard-shell was designed in a way that it would turn around if it landed the wrong way up. It was also robust and very functional. Pivot had also solved many challenges such as the issues with heating inside the RescuePod, breathing for the baby through filters, and an auto-stabilizing effect. It all seemed very promising, and RS returned to Stavanger impressed and positive. In the summer of 2014 RS also received an answer on the MAROFF application. The application had received good ratings, and was deemed innovative by the panel, which was positive. But they were not convinced on the financial aspect or that RS was solid enough to be able to receive the grant.

It was definitely a blow for RS. It would also not be the last. Pivot had around this time also completed building a 1:1 prototype, a full-scale version of the RescuePod, and invited RS to Oslo to see the RescuePod and take it back to Stavanger. RF1 remembered coming into the meeting and seeing the full-scale version for the first time. It was much larger than RS envisioned on the drawings, and from the smaller prototype (see appendix 1, 5). RS realized that the distance between the companies, one company being in Oslo and the other in Stavanger, made it necessary for RS to supervise development. Until then, RS had trusted Pivot completely and let them build a product without interference. This large product had room for a child of between 0 and 1 years of age. The product was also heavy, weighing about 15 kg, without a child. Ferries would not buy such a product, and families with small children would not take it with them when traveling at sea. It was too impractical, large and heavy for that purpose.

This was confirmed when the product was brought back to Stavanger and presented to Rødne. The product was indeed too large and heavy. They, and Redningstjenesten, already had limited space on their ferries and boats. It was further clear to RS, after interactions with other actors such as Redningstjenesten and Rødne Rederier, that the only solution would be an inflatable RescuePod. Pivot Produktdesign did not have the expertise needed to build an inflatable version, so RS had to find a new subcontractor/supplier for this purpose. RS ended their relationship with Pivot and received all the work that had been completed.

RS had learned a couple of lessons. Firstly, RS had let Pivot build a product without any input from RS, and secondly RS had not followed progress and only realized that the product was not right when Pivot had finally completed it. RS had by now used up most of its funds from both phase 1 and 2 and was on the brink of having to close down the whole project. It was in need of private capital to survive the development phase that it had just entered.

RS had many potential investors in close proximity but had still not approached them with a presentation or a pitch. RF1 was at that time, however, also working closely with the founder of BR Industrier, Bjørn, in mapping the effect of government funding policies, SkatteFUNN in particular, upon the organization (see complementary research in chapter 7). BR Industrier was an industrial conglomerate with thousands of employees and many subsidiaries, especially within the production of metal products and goods, and traditional industries. It had a combined turnover of 4 billion NOK (2019). RF1 therefore pitched RS and the RescuePod solution in one of the meetings, and Bjørn became interested. BR Industrier had no expertise within the maritime industry but had facilities that could be used to mass-produce RescuePod once it was ready, which could accelerate the action-cycles.

Soon BR Industrier acquired 33.3% of Reemsys, the sale of these shares buying competence, capital and the backing of a large industrial conglomerate. The involvement of BR Industrier gave the project new wings, and RS decided to re-apply for MAROFF, this time with the concept of the inflatable RescuePod and the support of BR Industrier. One of the major weaknesses of the first MAROFF application was lack of financial stability. RS furthermore found Inventas around the same time as BR Industrier took a stake in Reemsys. Inventas was a design company based in Stavanger with experience in developing maritime equipment. RS had therefore found a subcontractor with the required qualities in close proximity. Inventas would design the new RescuePod and their partner company, Seilmaker Mathisen also based in Stavanger, would build the first prototype.

RS held a comprehensive all-day workshop to kick off the collaboration, inviting end-clients such as Rødne Rederier, Inventas, Seilmaker Mathisen and other important stakeholders and reviewing the RescuePod development journey. All actors involved were convinced that the inflatable RescuePod would be the product that could give RS a large global potential. Inventas was contracted and commissioned with the task of preparing a study of the design of the first prototype. RS had another meeting with Inventas at the beginning of 2015, in which they showed the new designs, and a path towards commercialization. The new designs were very different from Pivot's and looked very good (see appendix 1, 6). Inventas' plan also meant the RescuePod would be commercialized in early or mid-2016. RS decided, based on the lessons learned from previous attempts to develop the product, to hire a CEO for the company. Reemsys was also later that month granted MAROFF funding of 3 million NOK.

RescuePod had still not been completed two years after the entrepreneurs had established RS. The company was, however, in better shape than ever. The company had solid financing from strong private and public actors, was well-connected in the sectoral innovation system, and had the right partners and suppliers. RS was confident that RescuePod would be tested in 2016, and the company would pass on to c3 and be ready for the scaleup phase. The next goal was to find an appropriate CEO for the company. RS started looking for a suitable candidate that could help develop RescuePod and focus entirely on this project. They did not advertise for a CEO but talked to a couple of potential candidates through their network. RF1 was in 2015 introduced to RF3 through a fellow entrepreneur, Henrik. RF3, who was an economist with a business background, had worked for a couple of years as a management consultant in BEKK, and in Choice Hotels. He had decided to move back to Stavanger from Oslo and was interested in the entrepreneurial scene in the city. He, to find likeminded people, rented an office at the same incubator where RS were based and started the process of experimenting with ideas and projects.

Henrik organized the meeting with RF1. He was the first candidate for the potential job as a CEO. The meeting was short, perhaps 15-20 minutes, and conducted at the incubator. RS discussed a number of aspects of the role at RS. Consensus from co-founders is important when assessing a candidate. RF1 therefore discussed the situation with RF2 and vouched for him as a potential new CEO. RF3 was hired on a full-time basis as CEO of the company. Inventas had, furthermore, started the RescuePod project, which was led by their lead designer Trond. They developed a new version using all the information and experience accumulated by RPC and Pivot Produktdesign. Trond also brought with him experience and knowledge from building similar products earlier in his career. There were, however, many challenges to be solved with an inflatable version of the RescuePod. First, RS had to find a new solution for the breathing mechanism in the RescuePod, and secondly had to solve stability and updrift based on an inflatable design. Inventas also, for the first time in RS history, started the regulatory process of getting the RescuePod verified by the relevant authorities.

RS found out that there were strict rules and regulations on safety equipment at sea, and that these had to be verified by third parties. RS, to protect the invention, wrote a patent application for the RescuePod solution, and engaged Håmsø Patentbyrå in Sandnes to help formulate the patent and file it. This company was engaged through RF2's network, based on RF2 having used them before in his other company

CTR. Håmsø's expertise in product related innovations was the reason why RS choose them. RS filed for a Norwegian only patent, RS filing later for an international PCT patent (WO2017126978A1, 2017). Most of 2016 was used on iterations and upgrades of the RescuePod, this however taking much longer than anticipated, RS starting to experience severe setbacks.

The main lead, Trond resigned from his position in Inventas and started in another company during the development process. Trond had led most of the RescuePod work and was a key person in the designing of the new inflatable pod. He had developed all its features and new functionalities. The original goal was that Trond would take the product from prototype to completed product. This would not, however, be the case now. Many different designers were assigned to the project after Trond left, each making their own alterations and having their own project input. RS, after tiring of this, demanded one dedicated designer, or RS would take the business elsewhere. RS was allocated Hanne from Inventas as a project lead. She did a good job, but as with all other designers, she tweaked the product based on her opinion of how it should look.

RS applied for an IRD grant with Rødne Rederier after closing the phase 2 grant with IN. The end-client in such a grant, in this case Rødne Rederier, would contribute 20% of the overall budget, and IN would support the remaining 45%. The final share of 55% was to be financed by the company that applied for the IRD. If the total IRD budget was 10 million NOK, then 2 million NOK had to be covered by Rødne Rederier. 3.6 million NOK would then be covered by IN (of the 8 million NOK left), the rest being financed by the applicant. The IRD application was much more detailed than the phase 2 grant, and required a lot of work, including a comprehensive business plan, and income projections. RS applied for a total IRD budget of 5 million NOK, and a maximum support from IN of 1.8 million NOK. RS were invited between one and one and a half months after submitting the application, to a meeting with two representatives of IN. They now knew the project quite well, and the discussion was primarily about progress, and how far RS were from commercialization. The meetings must have gone well, because some weeks later RS was granted the amount of 1.8 mill NOK that RS applied for. RS as a company had up until then been financed through bank loans, private capital from the entrepreneurs, and from BR Industrier, and government support from IN and NRC.

RS had, by 2017, built several versions of an inflatable RescuePod, and RS had also tested the product in a pool (see appendix 1, 7). RS as a company was in good shape, the entrepreneurs now believing that finally after four years, the company was close to commercializing the product. There were, however, also still a number of problems, mostly related to funding. The IRD had the same payment structure as the phase 1 and 2 grants but was structured slightly differently. The applicant received 30% of the grant when the project started, 50% once 70% of budget was reached, and the remaining 20% after the project ended. As with the other support programs, RS needed to use all the funds before RS would receive the grant. BR Industrier were not willing to provide RS with more funds, as the progress of developing the product had taken much longer than anticipated. DNB, Norway's largest bank, often invited entrepreneurs and investors to network events to create collaboration and new clients and was where RF3 met Julie from Sub Sea Services in early 2017.

Sub Sea Services was a leading oil and gas service provider at the time. It and had restructured the company at that time and was looking to invest in ideas and companies outside of the oil and gas industry. The price of oil had plummeted, revenues were down, and several companies were struggling. Many hundreds of workers were being laid off. The Norwegian government, to mitigate this, had launched a series of initiatives at a national level where they granted capital to companies that wanted to transfer their oil and gas expertise into new sectors. These policies were targeted to specific regions in Norway, the oil and gas sectoral innovation system being one of the areas that had received a great deal of support. Sub Sea Services had received such a grant and was particularly interested in product innovations such as the RescuePod due to their experience with product technologies. They had established the investor company Ineosito AS to facilitate investments, which was dedicated to investing in seed companies such as RS.

RS started a due diligence process with Sub Sea Services and Ineosito that lasted almost six months. There were many meetings with the management of the company, and RS had to submit all documents, and accounts to them so that they could assess the state of the company. All liabilities, new ownership structure, and potential income was also to be mapped. Their in-house team also carried out research on the potential market opportunity of RescuePod and Reemsys. Ineosito concluded that they wanted to invest in Reemsys and retain a majority share of the company. Sub Sea Services and the group would bring engineers, capital, man-hours, and production facilities, so allowing RS to reach its goal of a ready-to-sell product. Sub Sea Services was a smaller company than BR Industrier, and much more agile. They also had sector experience. RS had, before a potential deal, to find a solution with BR Industrier.

RS sent a proposal to Bjørn by email. He responded with a counterproposal, and RS decided within a day or two on the price. The price was based on the balance sheet of the company. RF3 and RF1 bought BR Industrier shares, RS then being owned equally by RF1, RF2 and RF3. After several months of due diligence and discussions, Ineosito AS acquired 51% of Reemsys at a valuation of 15 million NOK in 2017.

RF1 stepped down as Chairman after Ineosito become a majority owner of the company, and was replaced by Jostein, the owner and Chairman of Sub Sea Services. RF3 also resigned as CEO and was replaced by Julie, a project leader in Sub Sea Services. Both RF3 and RF1 remained on the board of directors, RF2 however stepping out.

Ineosito took control of everything including bank accounts, web sites, domains, and patents. The entrepreneurs were, after 5 years of developing the RescuePod product, no longer part of the operational team. Julie and Ineosito's designers and engineers took on the task and continued to use Inventas and Seilmaker Mathisen for some essential development. This work was, however, slowly in-sourced to the group. This shift in collaboration and extensive usage of subcontractors in the sectoral innovation system was not only strategic, but also rational for Sub Sea Services, as they had received government support for this. The policies implemented at a national level therefore encouraged companies to develop certain expertise in-house, instead of collaborating with others in the sectoral innovation system.

But it had taken much more time than anticipated and had required much more capital than the entrepreneurs initially thought. If the entrepreneurs had understood this when RS was started, then they would probably not have started the company. Ineosito and its engineers and designers during 2017 and 2018 changed the designs once again, developing new prototypes that were tested live (see appendix 1, 8). They also found a solution to the certification issue for the product, RescuePod now being scheduled to be on sale in 2019, six years after the company was founded. This came to an effective stop when Julie stepped down as CEO in 2020, and the project was put on hold.

RS therefore never proceeded to cycle 3.

4.2 Huddlestock

Huddlestock (HT) was the second case study company included in this research. Two of the entrepreneurs, Murshid and Øyvind, were familiar with fund-raising from IN, NRC and private investors. Entrepreneurs are described using the HF acronym, which stands for 'Huddlestock Founder', each entrepreneur being numbered. HT denotes both entrepreneurs and the company.

HF1 – Murshid M. Ali
HF2 – Øyvind Hovland
HF3 – Michel van Tol

4.2.1 Background and roles

HF1 involvement in HT has been broad. HF1 served, during the study, first as Chairman (from 2014–2015), while Fredrik from Prekubator TTO

(Validé) was the CEO in the same period. HF1 then took over as CEO and co-founder, after raising the first round of private capital in 2015, HF2 taking on the role of Chairman. HF1 continued as CEO from 2015–2018, until Simen took over this role, and later Stig and John.

HF1 stepped down from operations in HT but continued to be an active board-member and a shareholder. HF1 was solely responsible for all the government funding programs and applications between 2013 and 2020.

4.2.2 First cycle (2014–2016)

HT was started as a company in the summer of 2014. The story or the idea that resulted in the incorporation of the company started, however, earlier. Mode-2 interactions to confirm interest in the idea were first initiated towards IN, through a simple phone call to discuss and see if the idea had potential and would receive funding from IN. IN politely responded that the organization would not support this idea due to its lack of innovation. There was nothing new, or there was no apparent way of creating an innovation driven venture. First, they argued, it was a combination of existing solutions, such as the smart phone, and the HFT trading algorithm, and secondly, they could not see how such a solution could be patented. They were also, in that period, not interested in supporting apps and related solutions. Writing and filing a patent would easily cost 25,000–30,000 NOK, which was more than HF1 could afford.

HF1, however, instead of giving up on the idea after this brief encounter, decided to discuss it with others, namely proven entrepreneurs in the area. HF1 met with HF2, and after listening to the idea, he expressed his interest. HF2 was a serial entrepreneur in the Stavanger-region and had started and sold a couple of companies. He had a well-established network in the city amongst other entrepreneurs, investors and also end-clients of potential projects such as HT. The idea was, in his opinion, very good, and he would also like to have much more of a gamification element to it, so that people could swipe and trade, receiving multiple ideas at a time. Searching for more validation of the idea, HF1 used his network through the PhD program at the University of Stavanger to establish contact with Prekubator TTO, an incubator based in Ullandhaug that offered support to innovations and ideas that emerged from the University.

NRC provides Universities in Norway with funding for spin-offs, and innovation activities through the FORNY programme. The funding is substantial, and often amounts to several millions a year towards targeted programs. Prekubator TTO had a program called Plogen, to which an application could be submitted for 50,000 NOK to support the development of a project (Validé, 2020). 100,000 NOK could also be received in support through the local FORNY programme, initiated by NRC. The application was just one page long and was written and submitted to Prekubator TTO by email. HF1 was contacted by Fredrik, one of the project leaders at Prekubator, after a week or so. HF1 met with Fredrik at their offices, to discuss the idea.

The dialogue opened up for a further expansion of HF1’s network, and relations connected to HT. Fredrik liked the idea and became an ambassador in the Prekubator TTO system, which was central to HT receiving the Plogen grant, and later the local FORNY grant. Plogen was granted to HT around early 2014, receiving the full 50,000 NOK. But it had to be used entirely on resources connected with the University, hiring students or others that could help the project. The grant made it possible for HT to hire a small team of students to help program and build a prototype of the envisioned product (see appendix 2, 1).

HF1 was introduced to Fabriece, a programming student, through the University of Stavanger, who agreed to join the project. He could put together a small team of students, Kjell Arne and Johan. The plan was, with more resources in place, to build a preliminary ‘app’ for the HT solution, and at the same time also develop a trading algorithm to send investment opportunities to clients. It was not easy finding someone at the time with the appropriate background to build such a system in Stavanger. In fact, it seemed hard to find anyone in Norway, and especially someone with that background that would want to join a student project like HT.

HF1 attempted to solve this problem by placing an ad on Elance (now Upwork), an international site where freelancers could connect with potential project providers. The ad on Elance was placed early in 2014, and after a short period of time HF1 received plenty of applications from programmers who said they could help build an HFT trading algorithm. Most of the applicants with this background were from Eastern Europe. Communication and dialogue to build a complex tech product far away was deemed a challenging task at the time. There was, however, one company that was interesting. It was Retropi, and its founder HF3. HF3 was based in Iceland, almost the same time-zone as Norway and just a two-hour flight away from Stavanger. There were also direct flights from Stavanger to Reykjavik in Iceland at the time. HF3 had a very impressive background. He had a PhD in financial econometrics and working experience from several of the largest hedge funds in the world, namely UBS O'Conner in Chicago and Meditor Capital in London.

He liked the idea and had a lot of good input on how to improve the project. His background was ideal for such a project, because he also had international experience from financial centres around the world. This was important to the entrepreneurs when building the company.

He could also potentially be a good technical partner. The team, back in Stavanger, started the process of building the HCT system. A preliminary 'app' had, after a couple of months, been built for Android, and HF3 gave good insights into how to integrate the app with a high frequency trading system. The team had something tangible with this prototype, that could be pitched, the feedback received being positive. It was therefore decided in the summer of 2014 to establish a company to continue building the HCT system and apply for grants from the Norwegian government.

These grants would help minimize the entrepreneurs' own financial exposure and help them finance the initial start of the company. Starting a company was also necessary to apply for the FORNY grant from NRC. This grant was a 90% grant and would give the project a flying start in the development and commercialization of the technology. Everyone involved made a list and voted on a name for the company. Most people wanted the name Huddlestock, which was a combination of a crowd (the Huddle) and stocks. HT was established in June 2014, with a paid-up capital of 30,000 NOK. 36% was owned by HF3 through his holding company Retropi Ltd, 36% was owned by HF1 through Berker Group AS, 10% by Prekubator TTO, and the remaining 9% each by HF2 and André through Vision Invest Stavanger AS and Hognan Invest AS. Everyone contributed pro-rata to their ownership stake. The entrepreneurs, after starting the company, immediately started the process of writing a patent for the HCT solution. They did not, however, know whether they could patent the crowd-trading technology or proposed solution. Prekubator TTO had, however, some experience with this and put them in touch with a law firm in Stockholm called Brann AB that specialized in this.

HF3 and HF1 started writing the patent and submitted it as a US-patent in July/August 2014, both as investors (WO2016034542A1, 2019). The patent, and the current ownership structure of the company, meant that the entrepreneurs applied for phase 1 funding from IN. Having established HT, having well-known entrepreneurs and the University on the ownership side, and having applied for a patent, phase 1 financing from IN went smoothly. The team had positioned themselves well for raising financing from IN, and also potentially through the FORNY programme at NRC. Phase 1 gave them the funding they needed to make pitches, presentations, and contract financial institutions and other potential end-clients to explore the potential of a product such as HT. They also needed a financial license from the Norwegian Financial Authority to operate. The plan was to apply for phase 2 funding afterwards, and then later submit an IRD application. HT would also apply for the national FORNY funding that would give them financing of 90%, up to 5 mill NOK. That was deemed enough to get HT to commercialization and reach c3.

It was easier for the entrepreneurs of HT, after receiving funding from Prekubator TTO that also now was an owner, and the filing for a patent through Brann AB, to convince IN that their solution was innovation driven. Prekubator TTO being a co-investor also meant that HT was a research spin-off in official terms, and therefore eligible for phase 1 and phase 2 funding. On 17 Sept. 2014, about 3 months after the company was established, HT received phase 1 funding of 125,000 NOK (14,750 USD), a high funding rate of 78%, 62,500 NOK being paid out at the project start. Match-up capital of 22% was required for the whole grant to be fully paid out. But this was not a problem, as the company also had funding from Prekubator TTO. HT organized a private funding round for the company to finance the rest of the operation, given that the IN grants were 50-50. The round only targeted current employees and existing investors in HT. The valuation of HT was set to 1 mill NOK, 500,000 NOK being raised. The other entrepreneurs agreed that HF2 would be given the opportunity to buy a stake equal to HF3 and HF1. In return he would be responsible for raising all private capital that the company needed.

Everyone else contributed with capital on a pro-rata basis, so their shareholding percentage remained unchanged. The students participated in the dilution. The new ownership structure became 26% Retropi Limited, 26% Berker Group, 26% Vision Invest Stavanger, 10% Prekubator TTO, 9% Hognan Invest and 1% for three other investors including the students that were early contributors to the project. Now HT had over 1 mill NOK to continue the project. In the next couple of months they built a prototype on Android of the HCT concept, sent in two patents, and got the green light from Wiersholm that they would be able to get their crowd-trading solution authorized by the financial authorities, and a blueprint of which licenses they needed. The main plan for setting up the company was to apply for and receive the national FORNY grant. HT were so convinced that they would get this grant, that it was almost factored into the budgets that they setup up. About one year later, HT received phase 2 funding of 800,000 NOK (95,000 USD), on a 64% grant basis, which meant that they needed to provide 36% of the funding through private capital.

A total of 400,000 NOK was paid upfront, the rest being paid once HT had used the total budget of 1.2 mill NOK. Phase 2 funding was very important to HT's ability to clarify key issues about obtaining a financial license to operate in Norway. HT could only secure funding from private investors after two rounds of funding from the Norwegian government. More than a year after incubation, in November 2015, HT raised 5 mill NOK from Stavanger, and Oslo-based investors in the financial industry, to start c2.

4.2.3 Second cycle (2016–2018)

HT raised a combined 1.125 mill NOK during the first action cycle from the Norwegian government in direct or indirect funding, and 500,000 NOK from the founders and Prekubator TTO. A lot of the AR was done in Mode-1, with an increasing level of hybrid and direct Mode-2 interactions. Validation from the first cycle was provided by the grants from IN, but also other forms of validation, including the investment and equity from the University of Stavanger through Prekubator and from founders. Prekubator TTO was given 10% equity in HT in return for the capital from Plogen and local FORNY. Other validations included the patent filed for the HCT, and the clarifications from the lawyers, Wiersholm. A strong indication of Mode-1 interactions was, for example, that the first prototype was built in-house by students at the University of Stavanger. The lack of a proper regional innovation system for financial technology in the idea/start-up phase was, however, evident. HT had to outsource major parts of its development, especially the more advanced technical parts, to foreign subcontractors.

The FORNY application, like MAROFF and other national funding grants from NRC, were comprehensive applications. HF1 had to write around 11 pages and prepare for a pitch/interview in front of an expert panel of judges. Once the application was submitted, the company would be shortlisted for an interview, and once they made it through that interview, the chances were high that a grant would be given, according to the statistics the entrepreneurs had looked at. HT made it through the first round and was invited to an interview with experts at Lysaker in Oslo. Fredrik and HF1 participated in the meeting. HT had, prior to this meeting, several pitching sessions in Stavanger with Prekubator, HF2 and André. The pitch to NRC would last 45 minutes, with 15 minutes for questions and answers. Experts sat on the panel and gave the team feedback. HF1 and Fredrik were both quite nervous but felt, after the pitch, that it went well. The entrepreneurs travelled back to Stavanger confident that HT would get 5 mill NOK from the FORNY program. The capital would be enough for them to build and launch the HCT platform. Compared to the 50-50 funding from IN, it was a 90% grant. One and a half months passed before HT received the news.

HT did not get the funding, even though the project received a high score. The judges at NRC sent a report, but this did not say much about why HT was rejected. Now the entrepreneurs had to re-coup and plan for another way to be able to reach the validation point and move forward to c2. The plan now was, having failed to raise funds from FORNY, to raise funds from private investors in Stavanger instead. HF2 was an accomplished entrepreneur. He therefore had a network of investors and others that could contribute with private capital to a project such as HT. The entrepreneurs made pitches and met with investors. There was no exact theory behind this approach in the research material. So this was more an approach that was founded on practical and experience based insight. The AR went from Mode-1, in which HT re-used a lot of the budgets, plans and presentations from the FORNY application to Mode-2 and the private investors. Private investors would carefully scrutinize the team and look for opportunities that would be able to triple their investments in a couple of years.

HF2 set up the meetings and contributed with warm introductions, and HF3 and HF1, sometimes also HF2, would attend. The investors were private individuals with investment companies and family offices. The questions they asked were similar to those NRC had asked, some sceptical, others positive. The process went on for about a month. In the summer of 2015 HT raised 4 mill NOK from investors through an oversubscribed fundraise that targeted private investors in Oslo and Stavanger (NRK, 2015). Prekubator TTO, in this round, sold most of their shares in the company, and made a profit of 1 mill NOK on their participation in HT. Suddenly HT had more than 30 private investors on board, who owned roughly 20% of the company in addition to the founders and the early investors. The government incubator reduced its shareholding from 10% to 1.7%. After the dilution and sale of shares by Prekubator, Fredrik stepped down as CEO and Prekubator left the HT's Board of Directors. The interactions with the University, hence Mode-1, were reduced as a result of this. HF1 took over as CEO in HT. HF2 became the Chairman, and HF3 continued as a member of the board.

HF3 then took over the lead for building the product, and HF1 focused on marketing HT, finding potential clients and partners, the regulatory aspect and government funding of the solution. HF2 was responsible for investor relations, raising funds, and strategic input. The entrepreneurs travelled extensively to London, and quickly figured out that London was the best place in Europe to develop the business further. London had at the time established an experimental regulatory sandbox, designed to foster Fintech technologies, and had positioned itself as a primary hub for new financial technology solutions and ideas. The city had, for a long time, been a world capital in finance, with New York. Its sectoral innovation system for supporting new financial technologies was vast, and much more comprehensive than the support HT could find in Norway. HT was further introduced, through HF3's contacts, to the regulated firm Sapia Partners, that offered to rent HT a license to operate through them.

If HT were to apply for a license from the Financial Authorities, either in Norway or UK, and be regulated in its own right, then HT had to go through a very comprehensive process that would be arduous, time-consuming and costly. Renting a license from Sapia Partners seemed much more attractive. HT would then be licensed through Sapia as a so-called tied agent to their business. The process of being a tied agent required HT, at the beginning of 2016, to go through due diligence, as the business had to meet the requirements of the British financial authorities. HT had, as part of this process, to establish a UK based company. Through HF3's company, Retropi Limited, HT built the early parts of the platform, and received monthly invoices. HF3 had hired Nick, a UK-based programmer with many years of experience, to work through his own company. He and HF3 worked on the backend of the system. For the front-end, HT hired another British company called Diverse Interactive Limited based in Guildford outside London. The whole team met twice in London in the end of 2015 to start the process of building the HT platform.

In c1, HT received all the funding that was available from IN for companies at that stage, but not from the FORNY programme. In c2, HT targeted the IRD funding program from IN (for companies in development mode), and the SF program from NRC. The IRD support scheme required HT to find a partner that was willing to back the company with resources and capital. The first partner that HT found was a company called RD Capital Partners, a Private Equity Firm based in London. The application was submitted online, after preliminary discussions with IN prior to submitting the application, to get an impression of the likelihood of receiving funding. It was critical that IN understood the application, and HT received feedback. HT applied for 1.8 mill NOK in funding through the IRD programme, similar to RS earlier in this chapter. HT was then invited to a couple of meetings with IN.

After HT delivered more information on the project, including budgets and income projections, HT was granted IFU funding. The plan was to launch HT in the summer or late 2016. A very ambitious goal, but HT was on track to make that happen.

The entrepreneurs established HT Limited in March 2016, a fully owned daughter company of HT, the Norwegian company. HF3, Nick, HF2 and HF1 were appointed to the board of directors of this new company. HT Limited was established and the team could conclude their due diligence with the British financial authorities (FCA). If HT was given the green light, and became a tied agent, then HT could also offer the HT platform to investors in the UK. Being approved by the FCA required all controlling officers (HF3 and HF1) to sit exams in finance to show that HT had an understanding of the financial markets. HT was setting up shop in London. The company was therefore also searching for an office where HT could register their UK branch. The entrepreneurs looked for offices in a number of places, mostly in the City. A journalist friend of HF1 introduced him to Jostein, a Norwegian entrepreneur who was based in London. There had been a large article in the biggest Norwegian financial paper, Dagens Næringsliv, just before about Jostein and his new company in London. A meeting was therefore setup at his offices, Level39, Europe’s largest fintech incubator based in One Canada Square, a large skyscraper in Canary Wharf.

Level39 was one of Europe's largest financial technology incubators. It was initiated by the UK government through targeted policies in the sectoral innovation system, to increase the number of Fintechs in London. HT met with Jostein and pitched the company. He thought that the concept was interesting, and suggested HT applied for office space at Level39. They did not accept everyone and had around 3000 applicants every year, but only hosted around 180 companies at the time. It was not easy to be accepted into the accelerator, which was seen as being prestigious. Jostein brought HT to the administration of Level39 on the same day, and the team pitched their company. After two more pitching sessions, by phone and then another live pitch, HT was accepted into Level39. A partnership agreement was, at the same time, signed with Thomson Reuters (TR) for financial data. TR is one of the largest stock data companies, and the event with Level39 resulted in some press coverage in Finansavisen and other newspapers. HT was covered again in 2016, this time by Euromoney, a well-known financial magazine in London. It featured an interview with HF3 and HF1 (P. Lee, 2016).

HT finally got the green light from the British FCA some months before the summer of 2016. It was therefore now approved to launch their service in the UK. This meant that HT could offer it to investors when the platform was ready. It was a huge victory. There were many people that doubted that HT would be able to be regulated. The entrepreneurs had learnt a lot within a short timeframe. Which banks to partner with, and which licenses HT required. Saxo Bank, a Danish bank, was signed as partner at the launch, this also attracting more media attention on the small start-up from Stavanger (Weldeghebriel, 2016). HT started to become a ‘known’ and well covered start-up company, and a ‘hype’ was being created around the company. HT started preparing for the second round of funding from private investors, which also was led by HF2. He setup meetings with these investors, the pitches mainly being carried out by him and HF1. HF3 and Nick focused on building the platform. HT closed their second large round of funding from private investors in late 2016, raising 7.5 million NOK, with warrants of an additional 7.5 million NOK if the team reached specific milestones. The valuation was 100 million NOK, and the company had still not launched a product. This funding round, due to being profiled in the media earlier, created a buzz. HT was mentioned in the national media in Norway, but also in international media (Finextra, 2016).

HT was granted 1.8 million NOK in funding from IN a few months after the IRD application was filed. The IN capital was important to the company and helped raise additional private capital. HT raised an additional 3.125 million NOK in the summer of 2017, from IN with Lakeview Systems GmbH as an IRD grant end client. The funding was used on developing and commercializing a B2B2C version of the HCT platform, a pivot from a B2C product. HT had been granted close to 5 million NOK in total from various public-funding programs during c1 and c2. The company was also granted SF in all years, which covered a large proportion of R&D costs for HCT platform development. HT, as an emerging fintech company, needed more employees. So the entrepreneurs, after raising the second round, decided to hire more programmers in-house, instead of using Diverse Interactive as a programming supplier. HT hired three full-time programmers in London, and a Chief Strategy Officer that could represent HT as a country manager in the UK. The CSO hired was Evrin. She had a PhD, many years of experience from the financial industry in London, and was one of the early employees at Nutmeg, a well-known fintech company from the UK. There were 8 employees at the time in HT.

HT in the same year applied for the SkatteFUNN (SF) tax subsidy scheme. SF was granted and gave HT 20% tax credits on the private capital used to develop the HT platform. The company in 2015 and 2016 used around 5–7 mill NOK per year. Tax credits would refund up to 1.4 mill NOK a year for the development. This gave HT a further validation towards c3 and the launch/commercialization of the technology. The plan was to launch the HT platform at the end of 2016, and through commercialization create a sustainable company. The platform was designed to make revenues on each trade the investors placed. It was therefore pivotal that HT achieved commercialization with the capital available from public and private sources. However, a plethora of challenges suddenly arose. First, technical development progressed much slower than planned. Delays, especially from programmers, caused problems. Then, right before HT could launch, Saxo Bank informed the company that they did not have the appropriate structure to carry out the crowd-trading that HT intended. This was due to a miscommunication between Sapia, HT and Saxo Bank.

HT did not talk directly to Saxo, but through Sapia. It was therefore a challenge for the team to ensure that all the technical details were communicated to Saxo. HT had to work around the clock to solve this problem, and land another bank, the Dutch KAS Bank, as partner. KAS could solve the problem, but they required HT to conduct a due diligence process that took almost three months. The team was, after this, ready to launch the HT platform. The continuous delays led to a soft launch of the platform. This would allow HT to open the platform to a closed set of beta-users, who could test and give the entrepreneurs feedback on improvements (see appendix 2, 2). The launch date was finally set to January 2017. The well-known magazine CB Insights in that year named HT as one of the global companies that was changing wealth management (CB Insights, 2017). HT had expanded to London. The company still, however, had close contact with IN’s UK office.

Crown Prince Haakon of Norway was to visit Level39 and the Norwegian companies based there in that month. Hilde, the Norwegian director of

IN in London, had been a strong supporter of HT since the company was established in the UK. The entrepreneurs brainstormed with her to find out whether the Crown Prince would be interested in placing the first ever trade on the HT platform during the launch. She discussed it with the royal team, and they were happy to do it. At the end of January, the Crown Prince, the Norwegian Ambassador to the UK Mona Juuhl, and journalists from Norway and London were in the HT offices at Level39 and launched the HT platform (Level39, 2017; Wood, 2017). After the launch and commercialization of the product and service, HT moved onwards to c3.

4.2.4 Third cycle (2018–2020)

The company remained at eight employees during c3 but hired a product manager that year. HT had launched a closed beta and received feedback on the platform. One reason why HT did not grow the company in terms of employees, was partly the scalable nature of the business. HT would only need the same technical staff to sustain it at a million users as it had when it had only a hundred users. Secondly, staffing was a budget constraint, and HT needed to start making revenues before more capital could be used on fixed costs. In contrast with for example US-based venture-backed firms, HT had raised funding from several smaller investors. The lack of institutional capital restricted the amount of capital HT could use when building the company. The feedback HT received from early users was that platform functionality and design both should be upgraded. Access to the closed beta was by invitation only. HT invited, in the beginning, only those who had registered their interest, plus families and friends.

The entrepreneurs expected that the userbase in HT would grow quickly after the launch following the hype in the media. This, however, did not happen. HT had miscalculated the cost and time it would take to build and market the product. After two months there were only 300 investors using the closed beta. HT hired Kai to improve this. He had previously been a director in the music-streaming company Tidal and worked specifically on product development. Kai wanted to take over product development, so that certain changes and improvements, especially design, could be made to give many more users. Design was important to attract investors, and Kai often used the case study of Tidal versus Spotify to argue for this. The first step was to make the product much simpler and remove unnecessary elements such as a chat-function and individual profiles on the platform ((see appendix 2, 3). The platform was too complicated for most people, even if HT had used an iterative approach in c2. It had to be made even simpler. Kai took over as Chief Product Officer, and HF3 transitioned to another role in the company, Chief Investment Officer (CIO).

HT could not, without investors, attract high quality strategy vendors (those that deliver investment ideas to the platform). Without high quality strategy vendors, HT could not attract investors. The entrepreneurs decided, to mitigate this, that HF3 who also had this expertise would create investment opportunities for HT and publish them on the platform. HF1 also was responsible for increasing the number of strategy vendors on the platform. He therefore picked up the phone and called around to different potential strategy vendors across the world and the EU. HF1 came in contact with Peter through one of these phone calls, a German who had many years of experience in the financial industry, especially as a director within trading and investing.

Peter owned the companies Lakeview Capital Markets (LCM) and Lakeview Systems (LS). LCM was regulated almost across Europe. Peter asked about HT's regulatory framework and HF1 explained about the link to Sapia Partners. The rental of a license from Sapia was not cheap. It cost HT more than 100,000 NOK a month, their lawyers billing even more for compliance every time a small change on the HT website was made. The collaboration was slow, and expensive for HT. Peter suggested that HT became partners with him and buy a 50% stake in Lakeview Capital Markets based in Germany. Through this purchase HT would be able to offer its platform to most of Europe and cut the running costs with Sapia. The entrepreneurs reacted positively to this, but could not afford it. Peter wanted 150,000 EUR for 50%, the equivalent of around 10 months rental to Sapia Partners. It was cheaper than Sapia, but HT were quickly running out of money. The company needed around 50,000–60,000 investors on the platform to reach break-even.

The costs of hiring Kai, a large office at Level39, many employees and an expensive monthly license rental meant HT was burning cash fast. Growth was slow, and the numbers were transparent. The investors were therefore disappointed. The entrepreneurs had for years focused on building a product and had spent no money on marketing. All marketing had come to HT organically and through traditional PR. Investors wanted an app, and many found the product far too complicated (see appendix 2, 4). HT, however, now had almost run out of capital and needed to raise more funds to survive. HF2 again led the process of raising funds from private investors. After a month, HT had raised 4.5 mill NOK on a much lower company valuation. This 'near-death' experience caused the entrepreneurs to restructure the company. Expectations for revenues had not been met. The team therefore had to cut costs and make the whole organization much more efficient, in line with investor expectations. Firstly, they downsized their office at Level39 to a smaller office and, secondly had to let Evrin go.

All the entrepreneurs reverted to minimal salary until HT started making revenues. They also issued notice to Sapia that HT would terminate its agreement with them. HF1 flew to Germany and bought

50% of Lakeview Capital Markets GmbH from Peter, and the team started to build a mobile version of HT. The plan was to launch on iPhone first, and then Android. The hype around HT was still alive, and in 2017 the company was awarded Best Fintech of the Year in Norway, and then later Best Fintech of the Year in the Nordics by the Nordic Startup Awards (NSA, 2017). HT was in that year also nominated Best Fintech of the Year in the UK by Digital Leaders. Monzo Bank won this award. However, just being nominated was a huge achievement for HT. As CEO, HF1 was also nominated for awards and was invited to high profile conferences. He, however, chose to decline these awards and nominations. He did not feel that the company was a success.

HT had launched, but the company was not growing fast enough, and could not raise enough money. The entrepreneurs had tried to raise capital from large institutional investors and had meetings after the launch with many Venture Capitalists (VC) in London to see if they were interested in funding the company. VCs typically invest large sums of money into scalable tech companies, so that they can invest in marketing budgets and more. Some Fintech companies were spending 10 mill NOK a month on just marketing their product. VCs however, in return for these large sums of capital, wanted preferred shares, through which they could exert power over the company. Preferred shares meant that VCs would fund the company up front and get paid if there was an exit or a sale. Preferred agreements and VC funding required a number of things: first, that all existing shareholders would sign a shareholder's agreement giving VCs certain rights; secondly, lock-in periods for the founders of the company. These lock-ins ranged from 3–5 years and required founders to dedicate 100% of their time to the start-up.

HT was structured in the opposite way. After raising funds, the company had over 50 investors on their cap table. HT also had three entrepreneurs who lived in different locations: Stavanger, Oslo and Reykjavik. They also had a programming team in London. Their investors bought and sold HT shares at will on an open-market OTC-list. Many would therefore not accept a preferred share-agreement. Most of the VC discussions therefore fell through and HT did not manage to attract funding from them due to the HT company structure. The entrepreneurs then laid out a strategy that involved HT either getting a solid and financially strong banking partner on the ownership side, or that the team would work to get in place so-called distribution partners. Traditional financial institutions were at the time (2014–2018) very slow and analogue. Their legacy systems were old and outdated, and their investment advisors still called clients to make them invest.

HT had built an entire digital investment advisor, a tool that could easily be modified and used by stock brokerages and investment advisors globally. The entrepreneurs believed it was a perfect fit. HT first approached banks. The process was, however, slow. HT had more than sixteen meetings with one of the largest banks in Norway and nothing materialized. HT, however, made good progress with a bank based on the west coast of Norway and their interest in investing in HT. But the investment never took place. At the end of 2017, HT however signed an agreement for a pilot with an investment bank for the deployment and integration of the HT solution. The pilot client was an investment bank in Sri Lanka called Aquity Partners that had come into play through HF1's network. The idea was simple. Normally, their investment advisors picked up the phone and called clients when they had investment ideas. They usually started with the wealthiest clients and moved down a list, calling around 30-40 clients a day.

Aquity Partners was one of the largest investment banks in the country and had around 50,000 active investors. HF1 flew to Sri Lanka and pitched the solution to their management. HT would allow Aquity Partners' entire customer journey, from onboarding, to investing and conveyance of investment ideas to be fully digitalized. The best part was that it would not cost Acuity any money and HT would deploy the technology. The companies would instead split the revenues made from the platform. First, Acuity, a traditional brokerage, would be fully digitalized. Their investment advisors would then be able to reach many more investors in real-time than the 30-40 investors currently reached by phone. HT underwent another due diligence process, this time with the FCA in Sri Lanka, and Hatton National Bank. The plan was to launch in Sri Lanka in early 2018, prove the B2B2C model, and then grow strategically. The due diligence process caused long delays, as old legacy systems were not prepared for new innovations such as HT. The launch with Acuity was delayed. The new strategy, however, allowed an additional round of funding to be raised in March 2018. This gave the company a funding of around 5.5 mill NOK, at an even lower valuation. Another 'down-round' was completed, causing problems with raising more capital from existing investors.

Funding was this time raised from international and more sophisticated investors, such as Lars. Lars is a known Danish fintech investor and was based in London. He became part of the board of directors of HT, as part of a drive to increase the company's expertise in global markets. Experience so far showed a clear difference between private capital and government support systems in c3. Government support was important in c1 and c2. It was, however, private capital that kept the company going in c3. HT had, since establishing HT and so far in c3, raised a total of 20 mill NOK in private capital from investors. The capital was used to build product, iterate, pass through a number of pivots, and work to make the company profitable.

HT launched in Sri Lanka a couple of months before the summer of 2018. HF1 attended the launch ceremony, stood on a stage and talked about the partnership with Acuity. The event was covered in the Sri Lankan press, and there were high expectations for the collaboration (Peyton, 2018; Talukdar, 2017). HT was some months later, finally launched on iPhone. Due to regulations in Sri Lanka locals had, however, to register with the authorities before they could trade foreign shares. The partnership with Acuity was therefore not as successful as planned. HT had underestimated the regulatory hurdles, which was another set-back for HF1 as a CEO. He felt he had failed several times. Being responsible for staff, being the outward face of the company, raising funds continuously. All this made HF1 realize that someone else should take over as CEO and lead the company further.

HF1 was demotivated, depressed and conveyed his intention to the Chairman, HF2. HF1, instead of looking at these events from an objective standpoint, took them personally as the CEO of the company. HT started the process of finding a new CEO, which they had to do under the radar. It was challenging. HT had to find a CEO that the current investors would accept without causing panic. That person also had to be someone who could manage the scaleup phase. They should also be prepared to work many hours a day, be an experienced entrepreneur, and be familiar with pitching and raising private capital. But most importantly, due to the company's investor base, they had to be someone they knew, and trusted. It was not easy to find someone to take charge in c3, the scaleup phase. However, after interviewing a number of people, the team found a perfect candidate in Simen.

Simen, a civil engineer from NTNU, had a background from McKinsey, and was the former CEO of Zaptec, an electricity charger manufacturer. He was also one of the founders and former CEO of Pexip, a video-conferencing company. He had built the company from 0 in revenues to around 70 mill NOK. He had the background and traits of the ideal candidate to lead HT and was motivated to take over the CEO role. Simen was also known to HT's largest investors. Most of them had invested in Pexip and had made money, the company now being valued at 2 billion NOK. All of this was positive for HT. This, however, came with major risks. Simen wanted 1.2 mill NOK in salary for the job, and 5% of the company. Hiring such an expensive employee would result in a large cost variable on the balance sheet, and a risk for the company and its investors. Wrong hires in this phase could kill HT.

HF1, however, felt that it was best for the company. Simen was ten years older than HF1 and had taken a similar scaleup, Pexip, from 0 in revenues to profitability. If there was anyone that could handle the task, which HF1 felt he had failed at, it was Simen. After many meetings and discussions on salary and a compensation package, Simen joined HT in the summer of 2018. The event was covered by Norwegian and London-based media, releasing HF1 from being the 'face' of HT (Hardaker, 2018;

Level39, 2018; Tandsæther-Andersen, 2018). It felt like a burden was taken off his shoulders. Some investors were surprised and negative to the change, especially the international investors who did not know Simen and his background. HF1, after 4 years as CEO would step down and someone else would take over the organizational lead. HF1 would return to being a board member, as he had done with RS a year before. The organizational learning process for Simen as a new CEO took over a month. After a month of work, introductory meetings and organizational setup, HF1 handed over operational control of the company. The first day of September 2018, HF1 stepped down as CEO of the company and left the management team. He left with a sense of remorse, and guilt, feeling that he had failed to take the company to becoming a profitable venture. But the bumpy ride was far from over.

A month after Simen took over, he decided to leave the company. HT had spent months in finding and getting him onboard, and after a month he resigned. His reasons for leaving were two-fold. First, the team was in his view too misaligned with the mission of the company. Co-founder HF3 and Kai, the Chief Product Officer of HT, did not even speak to each other. Secondly, he could neither see nor understand how the product could give HT a competitive advantage over all the other large players in the financial industry. The abrupt exit caused turmoil in HT. After months of trying to find the right CEO, he left. The company, from the heydays of 2016–2017 of high valuations, now was at breaking point. One of the company's largest investors, the Danish fintech entrepreneur Lars, recommended that a British Investment Bank, Finovate Capital Partners (FCP), was engaged to find a suitable partner or investor for HT. FCP would search globally for a partner, preferably a financial incumbent, a plan that was aligned with the overall strategy of the company prior to hiring Simen as CEO. This event also showed that the decision to hire a new CEO probably was a wrong and expensive one. The entrepreneurs in late 2018 worked around the clock to save the company. HT would first engage FCP to find a partner for the company internationally, Finovate organized a list of potential suitors, and HF1 lead the operation, meeting with several companies in London over the next couple of months. HT then would approach and find a partner in close proximity, with two things HT lacked: AUM (assets under management) and an administration, a leadership with a CEO that could take over HT.

HF1 had many meetings in London, and in Germany, but none worked out. The companies he met saw that HT did not have the two things they were interested in: AUM and a solid administration that could grow the company. HF2, however, at the same time worked with an organization that could help HT raise finance. This company, Stolt Finans, was also based in Stavanger. Close proximity, and common connections to each other's networks, made it easier to discuss with Stolt. This contrasted the potential partners in London and Germany.

Stolt was a traditional asset manager, with over 300 mill NOK in assets under management, a turnover of 7 mill NOK and a positive bottom-line of revenues. HF1 and HF2 had a couple of meetings with them, and they were quite enthusiastic about HT as a product, and the platform itself. After several meetings they declined to raise funds for HT. But instead, they suggested that Stolt and HT could merge into one company.

The new company would be called HT, and would be an organization with 12 employees, and growing revenues. The CEO of Stolt would take over as CEO of HT and bring in their management. The new board would consist of HF2 as Chairman, HF1, and two other Stolt founders as board members. This solution was optimal for HT and gave the company what it needed the most: Administration/leadership and assets under management (AUM). The merger-talks regained investor confidence in HT for those that heard about it, and the confidence of the employees. The regained investor confidence in the company was a positive contribution to being able to survive through the capital-intensive period in c3. HF1 flew to London to present the plans to the employees, and they were positive.

Everyone was convinced that this was the right step for the company. Kluge, a law-firm in Stavanger, was appointed to handle the due diligence. Merging with Stolt was expensive and would cost more money than HT had available. Investors were ready to invest in the company, but only after the merger. This meant that the entrepreneurs had to invest their own money into the company while the merger discussions were going on, to prevent the company going bankrupt. The entrepreneurs decided to follow their gut feeling and move forward with the due diligence, confident that it would be successful. Kluge setup a request list that required HT and Stolt Finans to submit a number of documents. The due diligence process was scheduled to last for two weeks. Both founding teams at Stolt and HT were, prior to the talks, positive that the deal would be closed.

The companies agreed on the terms of the pending merger. Existing HT shareholders would get 60% of the new company, while Stolt would get 40%. Documentation for due diligence was submitted by both parties, Stolt being primarily interested in the asset management license that HT had acquired from LCM. Stolt was therefore connected to Peter, to provide them with more information about the license, and the reporting framework for the German regulator. The Stolt founding team, in parallel with the due diligence, travelled to London, was introduced to the HT employees, and continued the discussions. Introductions to employees, and the promise of an upcoming merger with a potential company, increased expectations among all HT staff. The abrupt exit of Simen had caused turbulence in the company and many employees expressed concerns about their job security.

HF1 and HF2 continued throughout this to lend the company hundreds of thousands of NOK each month to sustain operations and pay salaries to employees. This was based on a hope that things would materialize, and that there was no other choice. Entrepreneurs tend to overestimate the probabilities of success and underestimate the large risks of failure, as was reflected in Stolt Finans towards the end of March, that after weeks of due diligence pulled out of the merger talks. They were not satisfied with the answers received on the licensing agreement in Germany. The entrepreneurs were, one more time, in a state of shock. The aftershocks of Simen abandoning the company had not yet passed before Stolt's deathblow struck the company.

The company, without proper leadership or direction, again faced the threat of bankruptcy. The company had never reached a low as deep as this. There were now no partners available, the work by FCP bore no fruit, and the merger did not materialize with Stolt Finans. HT had burned through 25 mill NOK of private and public capital and was staring into the abyss. Five years of building the company, and still no revenues. The entrepreneurs questioned themselves: Had they wasted five years and almost 25 mill NOK in invested capital to build something completely useless? HF1 had sunk all his savings into the company to keep it afloat, which now could all be lost alongside with a major reputational loss. It was entirely up to the entrepreneurs to find a solution that would save the company and shareholder value.

HF2 and HF1 discussed different options in these weeks. One of the options was to explore a new financial technology called security token offerings based on the blockchain, to raise capital internationally. The cost of going ahead with such a project would be around 300,000 NOK. It was risky, and meant the entrepreneurs had to invest more of their own capital. But it could be a gateway to raising more funds to sustain HT until it achieved revenues. In c3 it was crucial for HT to reach revenues, as only then could the company raise further capital from investors and expand further. HF1 discussed this with his wife, who suggested that perhaps it was time that he took the loss and closed down HT. Another HF1 business partner suggested the same. Accept he had lost and cut. HF1 toyed with idea for some time. HF2 was, however, reluctant to give up. HF1 also had too much invested in the company to let it fail. In the middle of all this the patent applied for in 2014, five years ago, was granted and a global fintech research firm (Fintech.Global) nominated the company as one of 100 game changers globally in wealth management. A lot of prestige and honour. But it felt like a hollow victory. There was nobody who cared about it. The only thing HF1 was thinking about was the company's survival.

Shortly after Stolt left the merger talks, another blow struck. Tiago, one of the HT programmers, decided to resign. He was tired of the ups and downs of the company and wanted to find something else. The bottom seemed to be endless, the next blow for the company perhaps being declaring bankruptcy. HF1 and HF2 decided to take time-out to think about the possibilities the company had. HT had at this point less than a month of capital left, and would have to formally declare bankruptcy in less than 20 days. HF2, after some weeks of reflection, and even closer to the deadline, called HF1.

He was in a meeting with Stig, the founder of the Norwegian fund manager Dovre Forvaltning. He and his business partner had approached HF2 after being introduced through an early-stage investor in the Stavanger-region. This network increased the trust-level between the parties and opened things for another strategic dialogue with a potential partner. Dovre Forvaltning was a household name in the Norwegian finance industry, and Stig was probably one of the most well-known financial analysts in the country. Dovre was, however, now in fund-raising mode. Stig, together with a local Norwegian investor, had bought the company back from former owners. It was based in Norway and Lithuania and had currently 400 investors and around 150 mill NOK in assets under management (AUM). HF2 asked whether HF1 would agree to a meeting with Stig, who came over on the same day.

Dovre's problem was that they did not have any technology or Intellectual Property Rights (IPR). It was a traditional financial company that depended entirely on staff. HT had technology and was now probably one of Norway's best known fintech companies at the time (2014–2018).

Dovre had what HT lacked, AUM and an administration that could take over the leadership of the company. It was too good to be true. Almost a miracle, and much better than the Stolt deal. The process HT had gone through with Stolt had also not been in vain. The due diligence meant that all the paperwork was ready to get things moving fast and to merge Dovre with HT. Dovre also had their own fund management license in Lithuania. They were therefore not worried about the German license. They were mostly interested in the HT technology. A new company was put on the drawing board, and an agreement was signed. The new board of directors would consist of HF2 as Chairman, HF1 and one of the investors from Dovre Forvaltning as board members. Stig would be the new CEO and the overall administration would be taken over by Dovre staff in the merged company. The exchange ratio would be 26% to existing Dovre shareholders and 74% to the existing HT shareholders.

Finally, the company, which had passed through c1 and c2, was now well positioned to grow in c3. The new name of the company would be HT, and the case company would therefore continue under its initial name and branding. The news was applauded by investors, and faith was regained in HT. Fast-forwarding to the end of May and the company was merged into one entity and profiled on the first page in Finansavisen and other both national and international newspapers (Finextra, 2019; Nikolaisen, 2019). The new HT had more than 10 employees, offices in London, Vilnius, Oslo and Stavanger, more than 150 mill NOK in assets under management (AUM), and over two thousand investors on the platform. It seemed like the entrepreneurs had turned the company from zero to hero in the matter of months. HT. The major bumpy ride for HF1 as an entrepreneur and action-researcher, had now finally come to a kind of an end. Stig was a capable leader, and the new company was much better equipped to survive.

HT, after the merger, raised more than 10 mill NOK from existing and new investors to continue operations and commercialize its technology and incorporate it with Dovre's funds. HT later in 2019 signed a major agreement with one of the largest banks in the world, BNP Paribas, to build and commercialize the Fintech-platform Qinfen, based on the HT technology developed since 2014 (Charlesen, 2019; Erichsen, 2019). The agreement segmented HT's strategy of moving away from B2C and to B2B. In 2020, Dovre funds were divested to Opera, a US-listed technology company, and Stig became Head of Assets Management (Bjergaard, 2020). John, a seasoned finance professional took over as CEO, and the company was listed in that year on the Oslo Stock

Exchange under the ticker HUDL (Bærland, 2020). The listing price was set at 228 mill NOK, and after three months the share-price tripled. At the time of writing, the company is valued at 687 mill NOK, and HF1 continues as a board member (Meisingset, 2021).

4.3 Norsk Solar

Norsk Solar (NS) is the third company included in this study. All the entrepreneurs in this company were familiar with government funding policies and raising capital from private investors, one of the entrepreneurs being a private investor who funded the start of the company. Entrepreneurs are described using NF as an acronym, which stands for 'Norsk Solar Founder, each entrepreneur is numbered, with NS as a denotation for both the entrepreneurs and the company together.

NF1 – Murshid M. Ali

NF2 – Petter S. Berge

NF3 – Øyvind L. Vesterdal

NF4 – Are Selstad

NF5 – Lars Helge Helvig

4.3.1 Background and roles

NF1 had, as one of the entrepreneurs of Norsk Solar, many roles in the firm. He was officially Chief Investment Officer and board member of the company (from 2017 until the time of writing). NF3 was the CEO of the company from the start. NF1, due to his involvement in HT as CEO until 2018, only held a 20% position in Norsk Solar, but in 2018 transitioned to full-time in the company.

NF1 worked mainly with strategy, financing and new projects and was involved in government funding applications through the years since inception. He was also involved in pitching to private investors and securing financing for all three action-cycles. The team was highly complementary, as were the teams of the other two companies used as case studies. NF1, NF2 and NF4 had commercial backgrounds, while NF5 and NF3 were both engineers.

4.3.2 First cycle (2017–2018)

Norsk Solar started with the consultancy company, Kolent, which was established in 2014, to help small companies in the Stavanger-region with innovation and international business development. NF1, NF2, NF3 and NF4 were the founders, and the company had focused from 2014 till 2017 on delivering services in the region, and abroad. In April of 2016, NF4 and NF1 travelled to Indonesia, mainly Banda Aceh, to explore the opportunities for developing a solar farm there. NF4, a veteran in international business development, was convinced there was a surging market in the solar industry, and they embarked, through utilising existing networks, on an exploratory tour. Opportunities to find and develop these assets often came *ad hoc* through the networks the entrepreneurs had. The team had limited knowledge about the solar farm development process.

There were few Norwegian renewable energy companies in 2016. The most notable ones at the time were probably REC and Scatec Solar, and also large government companies such as Statkraft and SN Power. NF1 and NF4 travelled to Banda Aceh, and had meetings with government officials and other stakeholders. There was a high level of interest in solar among the stakeholders, both local businesses and the government. Contracts were not abundant, but there were positive signals, especially for companies that were Nordic. They quickly realized that being Nordic set them apart from the other big players in the industry, which were mainly US or Chinese. NF4's impression was that Norway had a lot of soft power abroad due to, for example, the Nobel Peace Prize and high living standards. One of the main challenges for Kolent, as a consultancy, was that it lacked a track-record of developing solar assets. It also lacked the equity capital needed to secure projects.

Solar projects are heavily capital intensive. Like property development, they require at least 20% equity in the form of cash contribution to borrow the remainder of the capital. The entrepreneurs continued exploring the possibilities, visiting multiple countries that year, and establishing a network within stakeholders in the industry. One of the important partners at the start was another consultancy, established by former Scatec employees. They had the know-how and industry contacts to understand the market and provided insights into the projects being evaluated. The idea of the company was to find projects, initially develop them, and then bring them to, for example, Scatec Solar, who could provide equity and financing to bring the projects to reality.

Through NF4's former contacts, they setup a meeting with Scatec Solar, NF4 and NF1 meeting the SVP for development in their headquarters in Oslo. They presented a project to Scatec that they had found in Bangladesh. The meeting went very well, and NF4 and NF1 were asked to return with more projects. They were, however, told that they should keep in mind that Scatec only evaluated projects above 50 Mega Watt (MW). Scatec's target strategy was to focus on large-scale utility projects, which are larger than these. Solar can be mounted on the ground, on a roof or at sea using floating technologies. The buyers of the electricity are typically a government, or a private actor. Utility-projects are projects often with a government buyer and mounted on the ground.

Scatec's main strategy was, at the time, to focus on utility-based solar, and large projects above 50 MW. The entrepreneurs at NS analysed the market and concluded that there was probably room for a Norwegian solar company that would take projects smaller than 50 MW and position themselves under Scatec. It furthermore became evident, when evaluating more and more potential project opportunities through their networks, that finding and developing projects was less profitable than becoming an Independent Power Producer (IPP) such as Scatec Solar. An IPP requires financial capabilities and a track-record from earlier projects.

This was, for Kolent, a classic chicken and egg problem situation, the entrepreneurs needing capital and track-record to proceed. Capital was easier to acquire than a track-record as an IPP. This was about to change, when the entrepreneurs from Kolent met with entrepreneur NF5 at the beginning of 2017. NF5 was at the time a veteran in the renewable energy business. An engineer by training, he had established NVE in 1996, and for many years worked building wind power plants in Norway. The company had taken a long time to develop but experienced a breakthrough at the beginning of the 2010s with new government subsidies and a focus on renewables. This allowed NVE to build and sell its first large wind power plant and, by 2017, the company had become one of the largest private wind power developers in Norway.

NVE was 70% owned by NV, which was the last company NF5 solely owned. The company had developed, built and sold wind farms for 800

MW since the implementation of new regulations, establishing a solid track record and sales to buyers such as BlackRock, Facebook and Google. NF5 had also built up a strong capital base. The first meeting with NF5 was organized through NF4's network. It was hosted by NF2 and NF4, who presented the work of Kolent on developing solar assets, the pipeline of projects and the team. This meeting was successful. A broader consultation with all the entrepreneurs was therefore organized. The ideas related to solar in Kolent were described, and the project pipeline that was being developed was presented.

It was clear that there were two things that hindered Kolent from realizing their ambition of becoming an IPP. Sufficient capital and a track-record. These were two things that NVE had. So, it seemed to be a perfect match. NF5 asked, after these meetings, if he could invest in Kolent. Discussions pursued, and after a few weeks it was decided that NF5, through NV his fully owned company, would invest 22.5 million NOK in Kolent, and acquire a 60% stake of the company. To make things simple, a new company would be formed. The name of this company was Norsk Solar. Ownership in NS would be 60% by NV, and 10% by each of the other entrepreneurs. NV would provide cash contributions in tranches, and the Kolent entrepreneurs would provide their shares in Kolent in return for their stake.

The agreement was informally agreed through a handshake and mutual understanding at the beginning of 2017, subject to approved due diligence by NV's lawyers. The due diligence took many months, but all agreements were finally signed in June 2017. NS was formally registered as a company with a shareholder capital of 450,000 NOK. The payment of 22.5 million NOK was structured in three tranches, and NV could decide whether they would transfer the money, this being based on milestones that NS was to attain. One of these milestones was the financial close of a solar power plant. This is a stage in which all parties involved in the development of a solar project agree on the financing and, together with the banks, invest in building the solar power plant. The NS entrepreneurs wanted to develop Intellectual Property (IPR) for the business, in addition to finding projects, financing, and developing them.

Floating solar was targeted as a potential area for growth. An application to IN was filed, accepted and granted in August 2017, some months after the incorporation of the company. IN had at that time launched a new first phase grant that was smaller but required no match-up capital. This grant was also received in less than two weeks after application and was an enormous improvement over the first grant received by the RS case company in 2013. The amount was 100,000 NOK and was granted to investigate the business opportunities for developing new floating technologies. NS now had capital, could leverage the track-record from NV, and had a pipeline of projects to start developing and potentially closing.

Proximity to investors, and leveraging some network and knowledge related to the sectoral innovation system of oil and gas, were important factors in the start-up of the company. NS was, however, an international company from day one, with a focus on finding and developing solar assets abroad. The years 2017–2018 involved a lot of traveling for the NS entrepreneurs. It was important to establish a broader network and build up a pipeline of projects that could potentially be developed. NF1 had to balance this role with his work at HT. It was difficult and required a lot of time and effort. NF1 tried, in the earlier years, to combine the two jobs, which he did with some success. At the end of 2017, NF4 and NF1 travelled to Sri Lanka to explore the possibilities of developing solar power assets in the country.

NF4, who had worked in international business development for many years, had a broad range of high-level contacts in the country. A dialogue was started through these contacts with several large renewable energy companies in the country, most notably Windforce Limited. The Sri Lankan company, established in the early 2000s, had become one of the largest renewable energy companies in the country, focusing on developing wind assets. The first meeting was with the CEO of the company, NS discovering that there were many similarities between the two. Just like NS, they had started looking at solar power plants, and through this work, developed and invested in their first solar power plant, Harappa Solar, based in Pakistan. This plant was around 30 MW and had been co-developed with a local Pakistani partner. The project gave Windforce its first track as an IPP within solar, an important achievement.

The entrepreneurs, after raising the capital from NV, assumed that they had what they needed to become a solar IPP, namely a track record from developing renewable energy assets, and capital. They soon, however, realized that many of the utility-projects they explored required experience from building and being involved in the development of *solar power projects*, not just wind. NS did not have this. The strategy was therefore now to find a project, similar to Windforce and Harappa Solar, and join in as a minority owner, to gain the track record. This was easier said than done. 2017 passed quickly, and the team had not been able to find and close a solar power project. The next tranches of financing from NV required the team to have found and commercialized a project. All focus in 2018 was therefore on achieving this.

The technology development for floating solar progressed, and in early 2018 the team applied for a pre-IRD grant (towards renewables called Miljøteknologiordingen) and was granted 500,000 NOK in that year by

Innovation Norway. They previously received phase 1 financing of 100,000 NOK. The reason for not applying for a phase 2 grant, was that IN recommended that they instead went directly to a pre-IRD grant. Once that was approved, they would have a much higher chance of receiving a IRD grant of more than 3 million NOK. They therefore decided to aim directly for a pre-IRD grant. The support from IN was important in investing in technology development. The core focus was, however, to find solar projects and develop them.

They started investigating, in this period, suitable government funding for when the company reached c2 and c3. NS, being a path renewal company, did not have access to many targeted government funding policies, especially from NRC. These funding programs were mostly targeted at oil and gas, and in 2020 their DEMO2000 program was still solely based on oil and gas companies. There were also other government mechanisms, such as The Norwegian Export Credit Guarantee Agency (GIEK). These two organizations often work hand-in-hand in providing Norwegian export companies with cheap financing to foreign buyers. GIEK was in 2017–2018 mainly focused on oil and gas and shipping and provided only very expensive debt for projects in emerging markets. For GIEK in particular, doing business in these markets represented a risk, requiring a high premium to participate.

In 2018, the entrepreneurs set a strategy which focused on finding strong local partners primarily in development countries, and work with them to develop solar power projects. They saw, during their extensive travels, that local partners in emerging markets often had a good local network but lacked the capital and know-how to raise the project to the next level. These companies were like a local version of Kolent prior to the funding and track-record of NV being injected into the company. NF1, NF2, NF3 and NF4 travelled throughout this year in search of projects and partners. NF4 and NF2 travelled to Vietnam and met with potential local companies that had good projects. NF1 also, in this year, stepped down as CEO of HT and resumed a 100% position as Chief Investment Officer at NS.

A lot of the projects that came to NS were funneled through existing networks. NS would be very opportunistic and jump on a flight to find new projects. An example of this was a project brought to them through NF1’s regional network in Nicaragua. They had meetings with several Norwegian stakeholders on this project, including Ove, a Norwegian national living in Nicaragua. Ove had many years of experience from the renewable energy sector, but primarily from wind. He had married a local Nicaraguan and lived in the capital, Managua. NF1 met him in Oslo a few times, and meetings were scheduled through other contacts in Nicaragua to discuss solar opportunities. In mid-2018, NF4 travelled with NF1 to Nicaragua to explore the opportunities. They met both private and public actors, the meetings going very well.

The project was a 36 MW solar power plant, to be built in the Puerto Sandino region of the country. Nicaragua is a small country, with friendly people, and not a lot of competition from other multinationals. A project size of under 50 MW made it less attractive for companies like Scatec. In 2018, NS setup an office in Managua, and started the process of establishing a local company, to start developing a solar power plant in Puerto Sandino. There was a lot of traveling and meetings throughout 2018, the team exploring many countries. NF3 and NF4 travelled to Ukraine several times, to investigate the opportunities there. Time was, however, against the team. They still had not fulfilled the goals of the agreement with NV, and there was a risk that the tranches would not be paid out, leaving the company capital constrained.

This changed during 2018 when the CEO of Windforce resumed the dialogue. Windforce had started developing a new project in Pakistan, called Gharo Solar, with their local partner. This project was even larger than their first project, a total of 50 MW to be developed. Their Pakistani partner had been informed that NS would be interested in acquiring a stake in the project and being part of the development. NF1 was put in touch with their CEO, a young, Stanford educated Pakistani, with huge ambitions for the country. He was traveling in Europe at the time, and decided to make a stop in Oslo, where NF1 met him for dinner. They discussed the project, and other things, and the meeting opened up the possibility for NS to participate in Gharo.

The Gharo solar power plant was important in many ways. First it gave the NS entrepreneurs the opportunity to reach certain goals set out in the agreement with NV, and therefore receive the rest of the 22.5 million NOK capital injection. Secondly, it provided the company with the necessary track-record to qualify for future solar power projects in the countries in which they had worked up a pipeline of projects in 2017 and 2018. FMO, a Dutch Development Bank, also participated in the transaction. Being part of the deal allowed the team to put FMO on their list of partners. NS ended up, after discussions with the Pakistanis, being allocated a 10% stake in Gharo, which also meant that they had to invest that amount as a cash contribution of the equity component. In 2018 this was approx. 1.5 million USD, or 14 million NOK.

The negotiations continued from the summer of 2018 until the end of 2018 when the financial close was reached, 1.5 million USD having to be transferred to Pakistan. The amount of time available for due diligence was limited. The Norsk Solar entrepreneurs therefore decided to make a decision based on the fact that both FMO and Windforce had invested heavily in the project. Both had already concluded their due diligence and found the project bankable. NS could also receive 15%

annual dividends on the investment, which meant they could expect recurring payments of close to 3 million NOK every year for 25 years. The NS board voted around October 2018 to make the investment and in November 2018 14 million NOK was transferred from Norway to Pakistan. NS had reached its milestones, and the full 22.5 million NOK investment was now paid out. NS also now had a solar power project under its belt (see appendix 3, 1).

4.3.3 Second cycle (2018–2020)

The investment in Gharo Solar in Pakistan was important to NS ability to gain a foothold in the solar industry, and also to gain a track record that would make the company eligible for more projects. This solar power plant investment was concluded at the end of 2018, which represented enough progress to move the company onwards to c2. NS still had not led and developed its own project. The financial close on Gharo, however, gave access to the whole 22.5 million NOK investment from NV and opened up new doors. The investment in Pakistan was covered by the Norwegian newspaper Dagens Næringsliv, and gave NS a position in the country as a credible IPP (Løvås, 2019). A lot of the projects the team assessed came through their network at the end of 2018 and towards the beginning of 2019.

NS continued with the technology development of floating solar. NS, after receiving the pre-IRD grant in 2018, applied for another IRD grant in 2019, and was granted 3.2 million NOK at the beginning of the year to develop the solution. The team primarily consisted of the entrepreneurs. They had limited technology expertise in floating structures. NS therefore partnered up with a local company, Global Maritime, for the development process. Global Maritime, an oil and gas company owned by the private equity fund HitecVision, was based in Stavanger, and helped NS develop the first solution prototype. The plan was to find a buyer of electricity through the floating power plant in Sri Lanka. They had a stronghold there through networks and contacts. The technology project was carried out in parallel with other activities. The development of solar power plants was, however, the prime focus of the team.

As in c1, the team travelled extensively in 2019. NS was introduced, through NF4's existing network in Sri Lanka, to market opportunities for solar in Ukraine. The government of Ukraine had announced a world-leading tariff program, providing foreign investors with a high subsidy to invest and develop projects in the country. The contacts via NF4 setup multiple meetings with government officials and private companies, NF4 and NF3 travelling regularly to the country to find suitable projects. The team, through these meetings, became acquainted with Pro Energy, a small Ukrainian firm that wanted to get into the solar development business. In early 2019 an agreement between Pro Energy and NS was signed, and they setup a local office and a company in the country.

The large and attractive subsidies provided by the government meant a number of foreign renewable energy companies established in Ukraine at this time, including Scatec. Scatec invested heavily, and accumulated projects for around 140 MW. NS, on the other hand, focused on smaller projects, and found a 9 MW project in the Semypolky region of Ukraine that they could develop with Pro Energy. The local partner would organize everything in the area, including negotiating and securing power purchasing contracts (PPA) with the national electricity company Oblenergo. NS role would be to lead project management, provide guarantees, and invest the necessary equity capital into the solar power plant, including arranging debt from financial institutions.

The project developed quickly, and the local partners delivered on their responsibilities. There were, however, a couple of challenges. First, it was extremely difficult to find debt financing for the projects in Ukraine at the time. One of the reasons was the Crimea incident, in which Russia (reportedly) had invaded parts of the Ukraine and created instability. Another reason was that development banks preferred to invest in larger projects, at least 25 million EUR investments. This was because the banks needed to deploy a large volume of debt each year, and it took as long to assess a small project as a large-scale project. Many of the banks that NS approached therefore declined to finance the project due to size and to potential instability.

The Semypolky Project was a potential game-changer for NS. Successfully starting, developing and financing this project would make NS an IPP that covered all verticals, from A to Z. It would provide a great track-record for the company, high revenues, and a solid platform for growth. Closing Semypolky would, in many ways, be NS commercialization, and help NS move from c2 to c3. The entrepreneurs hired Ove in Nicaragua to handle project management, who had experience in development and operations. A new employee, Rosty, a Ukrainian with many years of experience in the solar industry, would be NS representative in Ukraine and help them with local partners. The main focus in 2019 for NS was therefore to make Semypolky Solar a reality. Other projects such as developing the floating technology platform were carried out in parallel.

The entrepreneurs also travelled extensively in 2019. A new trip to Sri Lanka was undertaken by NF4 and NF1, who also visited the Maldives. Setting up a floating solar power plant in the Maldives seemed to be much easier than in Sri Lanka. They therefore decided to launch the technology there. They were introduced, through their contacts in Sri Lanka, to a Maldivian renewable energy company with a solid network in the country. Things started to progress from there. They had meetings with higher government officials, partners and other stakeholders. They had also had meetings with the Norwegian government in, for example, Sri Lanka, Ukraine and Vietnam through the embassies, but received no help that could move the company forward. In contrast, private actors through personal relationships and networks helped the company tremendously in this phase, doing much more than government actors.

NS still faced huge challenges in finding debt providers to finance the Semypolky project solar power plant. NS tried sending applications for export loans to IN and had many meetings with the organization. They were, however, declined, due to lack of revenues in the company at the time. NF2 and NF1 also travelled to many countries, and met with most of the development banks globally, both in Europe and in Asia. Most of these banks had the same structure. They had a minimum debt of 15 million USD. NS, however, only needed 4.5 million EUR for Semypolky Solar. The team was introduced, through NF4's network, to a Nordic bank NEFCO, which is part of Nopef. NF4 had many years of experience of working with NOPEF and could, through his network, introduce NS to the right people in NEFCO. The bank had a mandate to finance smaller industrial projects, from 1-5 million EUR.

The introduction to NEFCO was important, as it allowed NS to raise debt financing for the project. The bank started its due diligence of the project. NS had, simultaneously, to solve another pressing problem. All the traveling, salaries, new hires and the 14.5 million NOK investment in Gharo meant that most of the capital available in the company had been used up. The total cost for Semypolky was close to 100 million NOK. NEFCO could finance 50% of the project. Around 50 million NOK therefore had to be injected as a cash contribution to build the solar power plant. NS had at the time around 5 million NOK in its bank account. The challenge before them was therefore large and needed to be solved in a matter of months to ensure the financial close of Semypolky Solar. Development costs of the project started eating into available capital. The entrepreneurs therefore had to find 50 million NOK to finance it.

They tried again to raise financing from IN through export loans, but this failed. The solution was to syndicate the equity contribution to the project with others that were known in the Ukraine market, and were willing to take the risk. The networks that were established through building several companies now really came into effect. NS, after investing in Gharo Solar, built a strong relationship with Windforce and their owners, and also with their Pakistani partners who co-invested in Semypolky Solar. They would contribute 7.5 mill NOK each of the equity required for the project, in total 15 million NOK. NF1 also contacted international investors that he had been exposed to in London during his period as CEO of HT. One was a London-based investor, with a family office in Monaco.

This group committed 10 million NOK, the speed of the raise and the opportunities only being possible because of the network, trust and experience all the private actors had established with each other. Now NS had to raise an additional 25 million NOK to develop, invest and build Semypolky Solar. Time was running out fast, and they were only months away from having to transfer the capital to Ukraine, to start building the solar power plant for it to be ready for operation before 2020. NV, after many discussions, contributed the rest of the capital, and NS had raised all the funds needed for Semypolky Solar just before the summer of 2019 through a convertible note of 50 million NOK. Now NS had the equity needed for the projects, and the debt financing. The only thing missing for the entrepreneurs to reach the deadline, was getting the structures in place.

Their Asian partners did not want to invest in Semypolky Solar through a Norwegian company. NS therefore had to set up a UK-based entity. NF1 knew accountants and auditors in London from his HT experience and network and could easily arrange this. Other potential stumbling blocks for the project were simple things such as a UK bank account. NF1 knew, from experience, that setting up an account in the UK would take months. This would mean that NS wouldn’t be able to invest in time, and the project would be lost. Meeting the deadline was therefore technically impossible for NS. NS, however, found out that a European Fintech company Transferwise could set up a EUR account in a few of weeks. NS started the process and managed to reach financial closure for Semypolky Solar in June 2019 (NEFCO, 2019). This was a major milestone for NS (see appendix 3, 2).

The project in Ukraine generated over 40 million NOK in revenues for the company and provided NS with a 3 million NOK profit for 2019. They had been, as entrepreneurs, extremely close to failure and had barely made it past the finishing line. However, with the inclusion of Gharo Solar, they now had 59 MW of solar power projects under development and Semypolky, the first solar power project in which NS covered all verticals. NS bought in the solar power panels, hired the local staff, and led operations and maintenance. Now NS was a fully-fledged IPP, just like its larger equivalent Scatec, with a track-record, capital and a pipeline of projects that continued growing. NS added a new team member to the company at the end of 2019. Filippo, a seasoned solar energy developer from Italy, was introduced to NS through its Pakistani partners.

Filippo had over 10 years of experience in developing solar assets globally and had operated in areas such as Afghanistan and Iran, developing and building power plants. He had both the experience and the technical know-how that most entrepreneurs in NS did not have. He was hired as VP of Business Development, NS at the end of 2019 now having 7 employees. NS transitioned from c2 to c3 after closing Semypolky. The company had now commercialized its products and services, having raised capital to reach the cycle. However, unlike the other case companies, most of the capital raised by NS in c2 was invested directly in Semypolky equity. The equity invested in Gharo and Semypolky would pay 5 million NOK a year, but only from the end of 2020.

NS entered 2020 with a stronger team and a better track-record. It also had 50 million NOK in convertible debt and a bank account that was growing emptier for each day. The entrepreneurs, knowing the capital-intense business of solar, wondered how they could take the company to the next level.

4.3.4 Third cycle (2020–)

NS was, in early 2020, in the growth phase, and hired an additional resource for the Oslo office, Ludvig. He had a couple of years of experience in the renewable energy industry, particularly within financial modelling. Ludvig therefore brought a specific skillset into the company that none of the NS employees had. There were a number of things NS had to control at this stage to grow further. The first was that the bank account was starting to become empty, and the second was that they still had to find new solar power projects to develop, finance and build. NV, their largest owner, had signaled that they would not finance more projects and that NS had to fund its own path going forward.

NS started, through its existing networks, a dialogue with Norwegian investment banks in Oslo and Stavanger. Norway was between 2018 and 2021 experiencing a so-called 'green hype'. There was therefore an intensive focus on renewable energy companies. This worked in NS's favor, the company having multiple meetings with banks that were eager to help them with financing. Many of these banks suggested NS issued a bond of 150 mill NOK, targeted at institutional investors. The capital would help NS grow and would allow it to invest in new projects. The challenge with a bond was that interest payments started on all of the 150 mill NOK immediately. The amount of interest would make it difficult for NS to operate the company without cash-flow problems.

The burn rate in NS was also now an issue. NS was, due to the salaries and new staff, running out of capital and none of the entrepreneurs could raise more capital from NV. They therefore tried approaching IN once again. After numerous meetings in which they explained the product and solutions, they submitted an IN application for an export loan at the beginning of 2019. The loan was granted some months later, NS receiving 5 million NOK to help them in the growth phase. This loan was important to bridging the burn-rate and prolonging the company's survival for at least another year without revenues. NS, around this time, also received some media attention around its growth (Erichsen, 2020), and on grants from NORAD for business development in emerging markets. These grants were very important in this phase, developing a solar project being so costly and risky, only a few of the 100 solar power projects assessed leading to a project.

The IN capital allowed NS to hire more employees and add a financial analyst to the team. The greater attention on NS in the media and elsewhere also opened new doors for the company and more projects. NS also started streamlining its project development processes, dedicating specific tasks to each employee. NS progressed from being a start-up in which things happened on an *ad hoc* basis, to routines being implemented and the company transitioning into a company that is more like a corporation. The main focus of the company was, as in the earlier years, finding and developing solar power plants. There was, however, a subsidiary focus on the development of floating solar power plants. A PPA with a Maldivian buyer was signed in 2020 and the floating project was finally set to be commercialized.

The projects in Vietnam started to move in the same year. NF2 and NF4 had previously travelled to Vietnam and met with a local partner. An agreement was signed, the plan being to position NS as a solar power producer for large multinational companies. Managing to get Facebook or Google onto NV's track-record could help the company secure more clients. Projects started materializing in 2020, more clients being interested in solar power. NS could deliver solar power energy at a much cheaper price than electricity bought from the grid, so making it a very attractive choice for private clients. This segment is called C&I, corporate and industrial clients. Nicaragua also started reaching financial close. This project required more than 60 million NOK in equity capital, the largest to date, but money NS did not have.

NS, as in the earlier years, did not find it fruitful to work with Norwegian Export Credit or GIEK. International banks and funds were much more competitive, and it made more sense to do business with other European development banks. The main reason for this was probably their greater experience in the emerging markets in which NS was operating. None of the other government subsidies or grants, other than the export loan from IN, and funding from NORAD, were of importance to NS in this phase. Not even SkatteFUNN was a benefit, because most of the investments NS made went directly into the development and building of solar power plants in emerging markets. The sectoral innovation system was only a benefit when developing floating technologies. Most of the private partners were otherwise foreign.

It was decided in 2020 that NS would raise financing from private investors to allow further growth, and to fund the projects in Vietnam and Nicaragua. NV had clearly stated that they did not want to contribute more capital. The entrepreneurs had to therefore look for new investors. SR-Markets, a local investment bank, was hired as the book-runner for this fund raise. They were selected because SR-Bank was evaluating the possibility of providing NS with a 50 million NOK credit facility to develop more projects. The team had a plan to raise 50 million NOK, minimum, from private investors and, with the debt from SR-Bank, would have 100 million NOK. This was more than enough to develop the projects in the pipeline and reach an estimated revenue of over 120 million NOK combined for both Nicaragua and Vietnam.

NS also worked in parallel on securing debt financing from banks and funds in Europe, for the projects in Vietnam and Nicaragua. The team of Filippo, Ludvig and Filip was evaluating more and more projects globally. 50 million NOK was the largest private fund raise that NF1 had participated in, almost as much as all of HT funding raised between 2014 and 2020. This time, however, it was easier. NF1 received a call at the beginning of 2020 from an investor he knew in Oslo. They had shared offices when NF1 was CEO of HT. He had read about NS in a start-up magazine, and about the company's growth. He was now the CEO of the listed renewable energy company Aega ASA. This company had recently sold all their assets and become an investment company with a focus on investing in renewable energy companies, preferably within solar.

NS and Aega had a few meetings, NF1, NF2, NF3 presenting the company and future prospects. SR-markets were, meanwhile, working on a valuation of NS, and on documentation for the fund-raising process. After a few months, they presented a 100-page document that outlined the NS business and prospects in detail. NS was, based on their calculations, valued at 283 million NOK, a valuation that was much higher than the earlier case companies, and achieved in a much shorter timeframe. This material was used to pitch the company to several larger investors, opting for 50 million NOK, including Aega ASA. The meetings were scheduled by SR-Markets, and led by NF3, accompanied by either NF2 or NF1. In the same year, NF4 decided to step down from the business and retire.

Aega made an investment decision quite quickly and committed 20 million NOK. NS was granted, in the summer of 2020, the 50 million NOK credit facility from SR-Bank, so ending up with a total of 130 million NOK in investments. This was enough capital to fund the next projects in Vietnam and Nicaragua and grow further (Harnes, 2020). NS hired more people in a short timeframe at both their Stavanger and Oslo offices. Former employees from Scatec such as Charlotte, and a legal officer Trond, were hired. The company was now in fast growth, with more than 15 employees, and had the capital it needed to move forward. Filippo and NF3 had also worked for months with FinnFund to establish a joint-investment platform for C&I projects in emerging markets. FinnFund, the Finnish equivalent of Norfund and a Finnish development bank, invested in emerging market projects.

FinnFund is owned by the Finnish state, the dialogue with NS therefore being focused on establishing a joint-investment alternative for their operations in South East Asia, particularly Vietnam. The FinnFund investment committee decided in November 2020 to invest 75 million NOK in this joint platform. NS in the same month signed a large-scale agreement with Central Retail, a C&I client, to build, invest and operate over 50 MW of solar power plants across Vietnam. NS ended 2020 with an estimated 50 million NOK in revenues and 4 million NOK in profits. The company had positioned itself as one of the largest companies in Norway focusing on C&I solar, with enough capital to expand further. Norsk Solar was, on the 19th of April 2021 and after raising an additional 110 mill NOK, listed on the Oslo Stock Exchange under the ticker NSOL. The total market capitalization of the company was 710 mill NOK (Nikolaisen, 2021).

5 Overview and analysis

The case companies presented in this study give a unique insight into the 'inside-out' process experience of an entrepreneur, irrespective of path variable. The research has longitude characteristics, and spans from the first company (RS) to the last company (NS) across a period of seven years. Many of the findings show that tacit knowledge, networks and industrial experience play a role in the success of a company, which is also reflected in studies on the subject (Asheim & Coenen, 2005; Forbes, 2005; Howells, 1996; Kerr et al., 2014).

Only three out of five case companies transitioned from c2 to c3. The Norwegian innovation system, and its sectoral sub-system, has over the years invested in nurturing sectors in which three of the case companies operate, including the oil and gas and maritime sector (Fagerberg et al., 2009). One of the assumptions at the start of the study was that companies within path dependencies would experience a high degree of support from the innovation systems, including government funding policies, and in all action cycles. This follows the rationale of papers written on the topic (Asheim, 2003; Narula, 2004). The results, however, show a very different picture.

This chapter provides a summary of the action-research in Chapter 4 and is presented on a case-by-case basis. The BMC is used to map all critical actors in each cycle, and to gain a firm understanding of the impact government funding policies have had on each case. A short analysis is then performed, the companies being discussed in relation to the theory described in Chapter 2. This analysis has its background in the practice of reflection in action-research, and the method of abduction, using problematization to understand the impact of policies (Alvesson & Kärreman, 2007; Visser, 2010). Government funding policies are represented through the duality of support from IN and NRC, which aim to correct market failures and to support national champions and existing innovation systems.

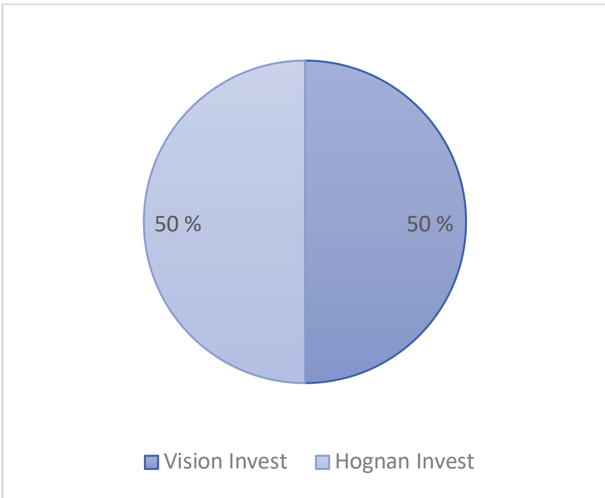
5.1 Case company 1 (2009–2020)

Type: IDE Entrepreneurship
Business: Oil and Gas
Industry segment: Path Dependent

VIO, an oil and gas technology firm, was established in 2009 in Stavanger, Norway. The main goal of the company was to commercialize its digital inspection camera solution for deep wells in the oil and gas industry. It is therefore assumed, based on this, that the company belongs to a sectoral innovation system and is *path dependent*. The company was started by VF1 and VF2, two entrepreneurs in their 40s. VF1 was the commercial founder, VF2 having the technical know-how and skills. They owned the company through their private holding companies Vision Invest Stavanger and Hognan Invest and, at the inception of the company, owned 50% each.

Figure 11

VIO Ownership Structure 2009, (Ali, 2020)



5.1.1 The first cycle: Startup (2009–2012)

VIO started with almost no government funding, primarily because the entrepreneurs did not have the insight or knowledge required to leverage government funding. The company managed to raise 30,000 NOK in a symbolic grant from IN to investigate the business opportunity for digital down-hole cameras in the oil and gas industry. The company, on the other hand, raised 10 mill NOK from private investors that believed in the team and the business idea.

5.1.2 BMC in the first cycle

Table 5

VIO first BMC cycle, (Ali, 2020)

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
Adsign Firmware Cyviz Stavanger Venture Leogriff		Digital down hole inspection tools More efficient than existing analog solutions		
	KEY RESOURCES		**CHANNELS**	
	VF1 VF2			
COST			**REVENUE STREAMS**	

1) Key partners

VIO was based in Forus in the early stages, and had direct access to multiple suppliers who could develop and test their ideas. The Forus Area in Stavanger is a cluster of hundreds of oil and gas related companies, most deriving a large proportion of their income from the national oil and gas giant Equinor. Key partners at the start were Cyviz (hosting offices), Firmware AS (development of algorithms for video), and Adsign for marketing, all in close proximity.

Access to development partners was just a step away from the offices. Stavanger Venture, a newly established venture arm of the family office TD Veen AS, was also central in funding VIO at the start. Leogriff, a patent office based in Oslo, was an important partner in trademarking the products and filing patents, the first patents being filed during the invention/idea stage. There were no government key partners in c1.

2) Key resources

The team was compatible. VF1 had many years of experience as an entrepreneur and had previously built-up businesses, his expertise being in raising finance, strategy, business models and the commercial aspect of building a company. VF2 had a technical background, his background as Vice President of Archer Well Service meaning he had a network of industry peers, and an understanding of what was needed to succeed. Both entrepreneurs also were connected to private investors with experience in investing in oil and gas related technology companies.

3) Value proposition

There was, in 2009, limited innovation in down-hole camera inspection. The largest companies in camera inspection were giants such as EV and Expro, who had many business segments to focus on. Camera inspection therefore had not been developed to the standards of the 2000s and digital solutions. Most of the products on the market were completely analogue solutions.

Cameras also had to be flown to each platform every time there was an issue, resulting in production downtime, transportation and other costs. VIO's value proposition in the first action-cycle was therefore to develop and provide a digital downhole camera called ReadyCam, that could be based on each platform, ready for inspection when needed. This provided a unique solution based on new technology and represented a new business model for oil companies.

5.1.3 The second cycle: Development (2012 – 2015)

The company benefitted greatly in c2 from the government funding policies targeted on path dependent technology companies. It was easy for the founders, due to close proximity and former networks, to find partners from major oil companies. The first partner was Halliburton, for the development of FlexCam, a pivot from the first ReadyCam, and then ConocoPhillips for MudCam, another pivot that the company made in the second cycle.

Meetings were also held with officials from IN and NRC, and applications were filed online. There were clearly many funding policies that were targeted at companies such as VIO. The aim of most of the grants was not market failure correction, but supporting innovation systems, existing industries and companies within path dependencies. The close proximity to partners such as Halliburton helped VIO both receive capital and close clients. VIO and Halliburton carried out an IRD with IN for the development of FlexCam.

This camera system was a company maker and also provided revenues to VIO, these revenues and additional government funding allowing the company to raise more capital from private investors, which covered the match-up requirements from the Norwegian government. VIO raised more than 20 mill NOK in c2 in government funding through IN and NRC. They raised the DEMO2000 grant through NRC, which is designed for oil and gas companies. They also received SkatteFUNN every year. They, in comparison, raised 10 mill NOK from private investors in the development stage, half of the government funding granted.

5.1.4 BMC in the second cycle

Table 6

VIO second BMC cycle, (Ali, 2020)

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
Calidus Leogriff IK Group Deepwell Firmware BP Norge Archer Equinor Welltec IN NRC	R&D of the camera series	Digital inspection tools instead of analog Several different types of cameras		
	KEY RESOURCES		**CHANNELS**	
	VF1 VF2 Tore Ivar			
COST			**REVENUE STREAMS**	
Cost of building tools			Rental of tools	

1) Key partners

Partnerships with a number of private companies in the Stavanger region were entered into in c2. Partners such as Firmware and Cyviz were still important. The company now, however, added new business and distribution partners due to having products they could sell into the market. Close proximity to other oil and gas companies allowed the company to meet and sign agreements with a number of players in the industry, including end-clients such as Equinor, Welltec, BP, Halliburton and Deepwell, and distributors such as Archer Well Service.

VIO had only one foreign partner, Calidus Engineering, a firm based in the UK It was, at the time, fully owned by Badger Explorer, a Stavanger company that was a spin off from the University. IN and NRC were important partners in this cycle. They provided government funding that helped the company pivot and adapt the business model into a product that generated income. It is notable that the government funding policies played a key role in c2, in addition to the sectoral innovation system.

2) Key activities

VIO changed in c2 from development and sales of the ReadyCam to customization of camera technologies for end-clients such as Halliburton, ConocoPhillips and BP Norway. VIO emerged as an external R&D unit for these companies, utilizing government funding to mitigate capital risk, and developing cameras that could also be sold to other end-clients. Networks, through the founders and new employees, and close proximity to partners allowed them to quickly manoeuvre and find projects to develop. Government funding initiated a pivot and shift from focusing on developing and selling one specific product, to a broader range of products tailor-made to the client's needs. Funding policies had a positive impact in c2.

3) Key resources

Entrepreneurs VF1 and VF2 continued to be a key company resource in c2. The company, however, recruited several new employees in these years, mostly technical staff, to help develop the product and later commercialize it towards end clients. Important new resources were Tor Ivar, a sales engineer. VIO's strategy was to be a technology-provider, leaving other companies to distribute the products. Investors also provided contacts and insights in c2.

4) Value proposition

The main value proposition in c1 was to develop ReadyCam, a fully digital inspection camera, which could be stationed on platforms at all times. The camera would provide better images, so allowing engineers to make quicker decisions during a well shutdown. Cameras could be onsite and, therefore would not need to be flown offshore from land, reducing transportation costs. The value proposition was slightly pivoted in c2.

The core camera technology remained the same. VIO, however, developed several different camera systems, customized for each client. The FlexCam would allow camera inspection in the flexible risers on a platform. WellCam/MudCam would allow observations as deep as 7,000 meters, with high resolution and numerous other functions that would help oil operators reduce severe risks for example from hazards, accidents, and blowouts. ReadyCam was also offered as one of three camera systems VIO now rented out to oil companies.

5) Cost structure

VIO costs included the staffing and running costs of the company, and the cost of building each inspection tool. Running costs in c2 amounted to 7-8 mill NOK annually. Much of this was, however, reimbursed by the government through various grants.

6) Revenue streams

VIO’s business model was to rent out cameras on a daily basis to oil operators globally, the company in c2 starting to make revenues. The company made 15 mill NOK in turnover in 2013, increasing its revenues over the next years in the development stage. The R&D and customization approach towards end-clients and utilizing government funding policies strategically was successful for the company.

5.1.5 The third cycle: Scaleup (2015–2020)

VIO aimed, having achieved increased revenues and with multiple products launched in the market, to establish its business internationally in c3. The firm operated within a path dependency and had many clients in close proximity. It was, however, not easy to scale and expand the business. There is a lack of structured government backed organization for companies that have reached c3, which was very clear with VIO. IN provided an export loan of 6.5 mill NOK in this stage, and the company received a grant from Nopef. These grants and loans were given based on the revenues and the maturity of VIO as a company. They, however, had minimal impact on the business. The company also raised 10 mill NOK from private investors to expand into new markets.

5.1.6 BMC for the third cycle

Table 7

VIO third BMC cycle, (Ali, 2020)

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
Interwell Archer Welltec Schlumberger Weatherford BP Norge Halliburton Expro Norwep	Business development	Digital inspection tools instead of analog	Experienced and technical sales	B2B2C For customers in oil, gas, water and geothermal
	KEY RESOURCES		CHANNELS	
	VF1 VF2 Robert Rolf Curtis Ørjan		Distribution with oil service companies	
COST		REVENUE STREAMS		
Cost of building tools		Rental of tools		

1) Key partners

Key partners in the growth and export stage were Interwell, Archer, Welltec, Schlumberger, Weatherford, BP Norge, Halliburton, Baker Hughes, and Expro. These companies were large oil service suppliers that had good relationships with oil operators worldwide. Another key partner was Norwep (former INTSOK), a Norwegian government organization dedicated to promoting Norwegian energy companies abroad, and with a strong focus on oil and gas. The first foreign market for VIO to explore was the Middle East.

VIO, through Norwep (then INTSOK) the government organization for promoting Norwegian energy companies worldwide, signed an agreement with SG Petroleum in Saudi-Arabia to deliver and sell its equipment to Saudi Aramco. The agreement did not work out as anticipated but was the first step towards commercialization and export of the early camera systems. The second market VIO entered was the Malaysian market, again through a network developed through Norwep. This resulted in a partnership with the Indonesian oil service company Iliadi, based in Jakarta. The company did not, however, manage to fully set up business abroad in the last action-cycle.

2) Key activities

Key activities are business development, export, customer request follow up and onsite visits to ensure camera inspections are performed on time and to the clients' satisfaction. VIO's c3 sales activities were mainly through distribution agreements with oil service companies. The strategy of the company was to remain a technology company, delivering solutions to others who sell on to end-clients and can deliver a better, more all-round service. VIO staff, regardless of this, still travelled and attended oil and gas fairs such as ADIPEC in the Middle East and ONS in the Stavanger region.

3) Key resources

There was a large expansion in staff in c3. Key resources in this stage changed from the entrepreneurs to business developers and salespeople. Robert, regional sales manager, Curtis, area manager, Ørjan, technical sales and former CEO Rolf became more important to the growth and export of the business than the entrepreneurs. VF2 took over as CEO in 2020.

4) Value proposition

The value proposition of the company was still a fully digital camera that was better and more efficient than the older analogue solutions available on the market. The company went in c2 from offering one specific product, the ReadyCam, to offering several products developed in close collaboration with the end-client. These products, FlexCam and WellCam, were marketed in c3 and sold to a wider range of clients.

5) Cost structure

Costs increased in c3 as the company started hiring more professional staff. Costs, however, switched from development to manpower costs. The company also worked to setup offices internationally to sell and rent out their equipment.

6) Revenue streams

VIO's business model was, in c3 and as in earlier cycles, still to rent out cameras daily to oil operators globally. VIO had at the end of this cycle (2020), a turnover of approximately 35-40 mill NOK a year and was a profitable company.

7) Customer Relationship

VIO in c3 hired dedicated technical salespeople with industry experience who would focus on personal relations sales, and long-term contracts with their clients. Their main concept was to deliver technology and training to distribution staff, distributors handling logistics and marketing.

8) Customer segments

VIO focused on B2B2C customers, mainly within targeted industries such as oil and gas, water and geothermal.

9) Channels

The primary channels for reaching out to clients were direct, and industry fairs such as ONS in Stavanger and ADIPEC in Abu Dhabi.

5.1.7 Analysis

VIO is an IDE-enterprise that supplies technology to the oil and gas industry, an industry that has the characteristics of a sectoral innovation system within the Norwegian national innovation system. This categorizes VIO as a case company that falls within path dependencies (Engen, 2009; Frick & Ali, 2014; Holden, 2013), and with proximity to suppliers, a research institution with sectoral expertise, and regional tacit knowledge related to private capital, technology development, partnerships and marketing (B. T. Asheim & Gertler, 2009; Powell & Grodal, 2005). Our assumption at the start of the thesis was that VIO, and similar companies, would experience strong support from innovation systems, and through government funding policies.

Our GMC analysis in c1 shows that government funding policies, including actors, had little or no impact. This contradicts earlier assumptions of strong government support based on sectoral preferences and path dependencies (Narula, 2004). VIO only raised a symbolic sum from IN at the start. The company, in contrast, raised 10 mill NOK from private investors. None of the founders were very familiar with IN, and preferred the speed of building a new product, as opposed to writing applications. VIO was started by a team with industry experience and established entrepreneurs. This confirms the results of studies that show serial entrepreneurs find it easier to raise additional capital for new ventures (Kenney, 2015; Ries, 2016; Wasserman, 2006).

The reason for the weak impact of government funding policies in c1 was probably a lack of understanding of the process of application and of approaching IN and NRC. This changed in c2, VIO being one of the case companies that received most government funding support. The first grants were given to support innovation systems, through IN and their IRD grants. These funding policies were targeted at improving networks, and collaboration between private and public actors (Klette & Møen, 2012; Kuhlmann & Arnold, 2001), so acting as a catalyst for VIO technology validation. This confirms earlier findings that government policymaking can directly trigger innovation (Mazzucato, 2017).

NRC was also important in c2, including the large-scale grants from DEMO2000 that VIO received twice. The company filed several grant applications, which were, however, only approved where VIO collaborated with large corporates such as BP (British Petroleum) and ConocoPhillips. This supports earlier findings that NRC programs tended to support national champions and bigger companies (Fagerberg & Srholec, 2008). The SkatteFUNN scheme was also highly important, indicating that the policy works well in supporting new technologies in Norway, as other research suggests (Cappelen et al., 2010, 2012b; Frick & Ali, 2014).

The earlier findings from BR Industrier suggest that SMEs benefit more from the SF program (Frick & Ali, 2014). Other research on SF also confirms these findings (Cappelen et al., 2012a). SF was only relevant to VIO where enough private capital had been raised. BMC analysis showed very weak government support in c3, no grants for companies such as VIO being available in the international growth stage. The company received an export loan from IN, based on the revenue figures posted in 2018. There is therefore much room for improvement in Norwegian government funding policies for companies in the last cycle.

5.2 Case company 2 (2013–2020)

Type: IDE Entrepreneurship

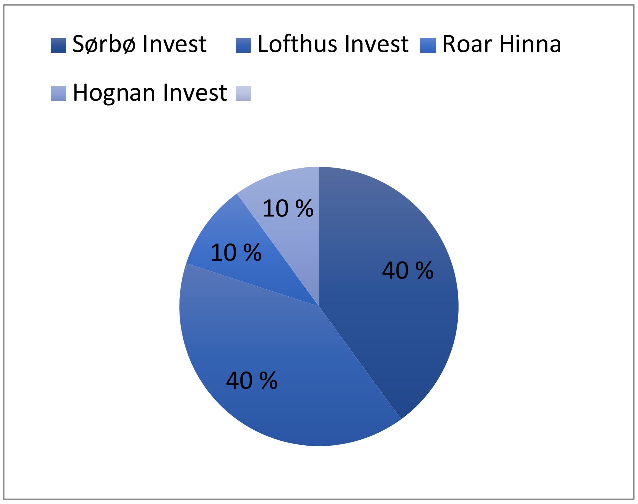
Business: Oil and Gas

Industry segment: Path Dependent

OF1 and OF2 established Oil Tools of Norway (OTO) in 2013 after meeting at Tetra Technologies where OF2 was Managing Director and OF1 was a technical engineer. OTO was, like VIO, considered to be part of the sectoral innovation system within oil and gas, and a *path dependent* company. OTO also had a technical and a commercial founder whose skills complemented each other. The duo established the company with two other investors. The founders owned OTO through Sørbø Invest and Lofthus Invest, and held an equal stake of 40%. The remainder was owned by the initial investors in the company, each holding 10%.

Figure 12

OTO ownership structure, 2014, (Ali, 2020)



5.2.1 First cycle (2013–2015)

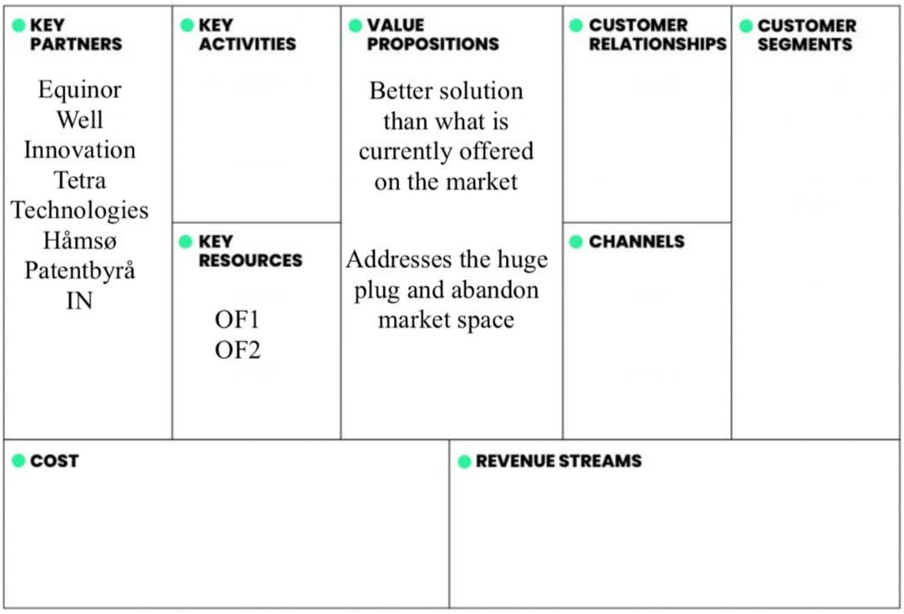
OTO was established because the founders were convinced there was a market for the DURA product. This assessment of the opportunity of the company was conducted using technical know-how, industry experience and discussions with evaluators within the industry itself, including investors and purchasers in oil companies. The company received a jump-start when Equinor decided to issue a grant of 500,000 NOK for the development of the product, as part of a R&D program initiated to help suppliers with new technologies. This also meant Equinor would be one of the company's first customers once the product was ready. OTO also received 300,000 NOK as an establishment grant for the initial development phase of the projects, based on the new grants structure. This money was used by the company to develop the first initial technical drawings of the product.

The technical drawings opened up interest from oil majors, who invited the entrepreneurs to informal meetings. Proximity to suppliers and clients was a key factor in the fast development. The company also fell within path dependency, investors and buyers therefore understanding their value proposition. The company, shortly after this, raised the remainder of the establishment funding available from IN through the 600,000 NOK phase 2 grant. OTO raised in total 900,000 NOK in government funding in the first phase, and over 2 mill NOK in private capital from investors and Equinor, which is twice as much as that received from the government. The estimated costs for developing DURA were set at 2.5 mill NOK. The company was therefore off to a flying start.

5.2.2 BMC the first cycle

Table 8

OTO first BMC cycle, (Ali, 2020)



1) Key partners

OTO, like VIO, had access to many suppliers and technical know-how on developing and commercializing the solution. The company offices were, in the first year, at Tetra Technologies in Dusavika, Stavanger. Dusavika is also a base for companies within the oil and gas industry, many of the companies in this sector being in close proximity. The first partners were Well Innovation and Equinor. Both provided technical support and resources in the form of hours or capital, to develop the DURA technology. IN was, through providing initial grants of almost 1 mill NOK, an important partner. Håmsø Patentbyrå, a patent office based in the neighboring city of Stavanger, was also central in helping to write the first DURA patent and submitting it.

2) Key resources

OF1 invented DURA and had many years of experience from the wireline industry. He had a technical background, had worked offshore, and knew about the challenges oil companies face. OF2, on the other hand, had many years of commercial experience as managing director of Tetra Technologies, and other oil and gas companies. Both founders were experienced in the oil and gas industry. They therefore understood well the opportunities in the area, and how to find a business idea that could turn into a viable company.

3) Value proposition

There was a strong emphasis from the oil and gas companies, during the development of DURA, on so-called P&A operations (plug and abandonment) and increasing the efficiency of production and oil well plugging. DURA would solve one of the many challenges that oil companies faced when drilling wells. Wells blocked by lose strings that de-attached after the completion of operations, was a massive problem. DURA was in effect an integrated cutting mechanism in the completion equipment, that could capture and store strings that were cut off.

5.2.3 Second cycle (2015–2020)

The first cycle of OTO was a mix of Mode-1 and Mode-2 action research, the company both writing and applying for grants, and being in active dialogue with a number of clients and potential partners. The second cycle, the development of DURA, was estimated to proceed quickly. Equinor, Well Innovation and now TCO, a new oil client, had been lined up to test and commercialize the product. OTO received more than 4 mill NOK in additional government funding to develop and commercialize the DURA product, based on these partners and targeted applications submitted to both IN and NRC.

OTO was granted 2.25 mill NOK through the large-scale DEMO2000 program from NRC. The company also received 1.8 million NOK from IN, through the IK programme, TCO being an end-client. OTO had also been granted SkatteFUNN. This was, however, not that beneficial due to a lack of R&D costs in the company. OTO did not raise any more money after the initial 1.5 million NOK from private investors in the first cycle.

5.2.4 BMC in the second cycle

Table 9

OTO first BMC cycle, (Ali, 2020)

<table>
<tr><td rowspan="2">KEY PARTNERS
Equinor
Well Innovation
TCO
Tetra Technologies
Håmsø Patentbyrå
IN
NRC</td><td>KEY ACTIVITIES
Development of DURA</td><td rowspan="2">VALUE PROPOSITIONS
Better solution than what is currently offered on the market

Addresses the huge plug and abandon market space</td><td>CUSTOMER RELATIONSHIPS</td><td rowspan="2">CUSTOMER SEGMENTS</td></tr>
<tr><td>KEY RESOURCES
OF1
OF2
Roar</td><td>CHANNELS</td></tr>
<tr><td colspan="3">COST
Building the tool</td><td colspan="2">REVENUE STREAMS
Rental of the tool</td></tr>
</table>

1) Key partners

The key partners in c2 were same as the key partners in c1. TCO, an oil technology supplier, however, became a client once the product was ready. TCO had been instrumental in providing testing facilities to the entrepreneurs, including onshore and offshore. Well Innovation built and developed the product for the OTO team. As in the first cycle, OTO was based at Tetra Technologies, who also received solid government financing from IN and NRC.

2) Key activities

Key activities for DURA during the research and development phase included testing the design and keeping in mind the strict oil and gas regulations (NORSOK requirements). A gap analysis and a stress analysis were also carried out. The initial design and drawings were developed by OF1. OF2 and OF1 decided, in the research and development phase, to build and deliver customized service pumps to the industry through OTO. They sold pumps for more than 1 million NOK in the first year, and for a similar amount in the two following years. This gave the company a revenue stream that could be used as match-up capital for the government grants in the development cycle.

3) Key resources

Only the two founders OF1 and OF2 were engaged in the company in the first cycle. In the second cycle (2014–2016), however, the company hired one employee, Roar Hinna, also from the oil and gas industry. Roar was also one of the first investors in OTO when the company was established in 2013. OTO's core competence was to develop concepts for completion equipment and services and tie up with nearby design and test facilities. Both entrepreneurs had extensive experience from the oil and gas industry.

4) Value proposition

OTO developed a conceptual design and verification process in c2 through assembly of a controlled umbilical cord cutting device during downhole operations. This minimized operational risk and provided savings for operators in terms of current solutions. Equinor alone completes more than 80 wells annually in the North Sea with such solutions in different types of metallurgy.

The value proposition had not changed since the first cycle. The founders had, however, found that the solution had a lot of opportunity in the market space. They found that the savings just from avoiding downtime caused by loose strings in the well was 450,000 – 1.8 million

USD pr well. Existing solutions were outdated, the products having been used for over 10 years without any improvement. Partners and potential clients were both excited by the prospects of DURA.

5) Cost structure

The costs of the second cycle include one full-time employee for parts of the period, and then supplier and sub-contractor development costs. There is a cost attached to building the DURA tool, but it can be rented out for 10-15 years.

6) Revenue streams

The DURA tool was to be rented out to oil and gas companies.

5.2.5 Analysis

OTO, like VIO and RS, was an IDE enterprise that had connections to a sectoral innovation system in close proximity. It was therefore a part of path dependencies. This meant, like VIO, it was easier to partner with suppliers, find investors and clients. These findings reflect studies on this topic that suggest that companies within path dependencies have a greater chance of succeeding due to strong sectoral support (Lundvall & Borrás, 2005; Wicken, 2009a).

OTO had a kick-start in c1. The company received an R&D contract from Equinor for the development of their technology, which almost guarantees a commercial buyer. Equinor had, since the early 1970s, developed suppliers (Engen, 2009) through such grants, spearheading technology development in the sector. Both OTO entrepreneurs also had a background from the industry, and experience and a network with suppliers and buyers. Studies indicate that experienced founders, with a background from the relevant industry, have a high likelihood of succeeding with their first company (Azoulay et al., 2018; R. D. Hisrich, 1990). These findings reflect the findings of research into the support of early-stage ideas, formation of companies (Lazonick & Mazzucato, 2012; Mazzucato, 2015), and the importance of collaborative networks (Aghion et al., 2011; S. Y. Lee et al., 2004; Tödtling et al., 2011).

There was, however, a notable difference. OTO had no serial entrepreneurs with experience in raising capital, or networking among investors. This might explain why OTO did not manage to raise further funding from private investors between c1 and c2. The firm is, in this, comparable to the founders of RS, who also lacked the network required to raise capital. This is in line with earlier studies that suggest serial entrepreneurs find it easier to raise private capital (Euchner, 2013; Gompers et al., 2007; Kortum & Lerner, 1998), than first time entrepreneurs.

OTO received strong support from government funding policies in c1 and c2. This is what the company had expected, and reflects findings on support for companies within sectoral innovation systems and path dependencies (K. E. Meyer, Mudambi, & Narula, 2011). The first IRD contract was with a company in close proximity, the large-scale funding from NRC only being granted after they had acquired a large corporate end-client (which was Statoil/Equinor). These findings reflect our experiences with the other case companies, especially VIO, and that path dependency-related companies experience strong government support due to proximity and sectoral preferences (Minniti, 2005; Narula, 2002). OTO did not, however, make use of the SkatteFUNN program. This is primarily because of the lack of private capital raised to transition to c3.

The entrepreneurs of both OTO and RS were not experienced entrepreneurs, and they did not have the network required to raise sufficient private capital to build and commercialize their products. The findings suggest that government funding policies are important, and that these may help such companies to transition beyond c1. These companies will not, however, survive the 'Valley of Death' if they do not manage to raise additional funding. Existing research on this topic suggests that there is a high risk that first time entrepreneurs will fail to raise private capital (Langeland, 2007; Wright et al., 1998).

5.3 Case company 3

Type: IDE Entrepreneurship

Business: Maritime

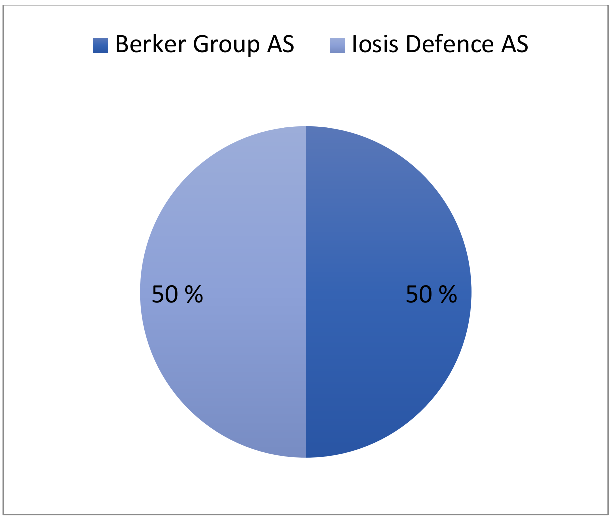
Industry segment: Path Dependent

Reemsys AS (RS), a development company for maritime technology, was established in 2013 to commercialize the RescuePod concept. The company developed technology and safety equipment within the maritime industry. It was therefore assumed that it was a company that benefited from both sectoral innovation systems and being *path dependent*.

RF1 and RF2 established the company, which was the first action-research company founded in this study. RS was 50% owned by the Berker Group AS and 50% by Advanced Ballistics AS at the time of the formation of the company. The company was established because the founders believed they could see a profit opportunity that could help fill a gap in the market (Kirzner, 1979).

Figure 13

RS Ownership Structure 2013, (Ali, 2020)



5.3.1 The first cycle: Startup (2013–2015)

This is the first action research company in this study. A great deal of Mode-1 and Mode-2 was therefore conducted. This included research into various grants, understanding the grant structures and navigating among the government funding policies. RS underwent quite a turbulent c1, the company struggling to raise private capital from investors The founders therefore had to take tremendous risks to raise the necessary match-up capital for the IN grant.

RS was granted 150,000 NOK and 600,000 NOK from IN in the first cycle. These grants required 50/50 match-up capital, none of the founders having this capital available at the time. The founders, to solve this problem and progress further towards c2 and development, obtained bank loans from their local bank secured by personal guarantees. This strategy was highly risky and could lead to the entrepreneurs have to personally bear a large debt to the banks if they failed to create a successful company. Government funding policies can trigger unwanted challenges, given that most companies fail.

5.3.2 BMC in the first cycle

Table 10

RS first BMC cycle, (Ali, 2020)

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
University of Stavanger Ipark RPC Håmsø Patent Pivot Produktdesign Rødne IN Kyllingstad		RescuePod Zero Hypothermia Better and safer solution		
	KEY RESOURCES		CHANNELS	
	RF1 RF2			
COST		REVENUE STREAMS		

1) Key partners

Government funding policies and support systems were important in the first cycle. RS collaborated with the University of Stavanger and with RPC AS, the technical partner. It also had access to development facilities at Completion Technology Resources AS, including development and drawings of the first RescuePod prototype. Other partners were activities and input from Ipark (the government-backed incubator based in Stavanger) and a private incubator based in Stavanger East, where the first RS offices were located.

Håmsø Patentbyrå helped form, write and submit the patent ‘infant floatation device’ for RS. Rødne Rederier and Redningstjenesten gave valuable input and functioned as validators for proceeding with the business idea. These partners were the core components of the agora. Government support systems such as IN were also vital. Pivot Produktdesign replaced RPC, and helped RS develop more prototypes, furthering innovation. The law firm KyllingstadKleveland helped RS during the conflict in the agora with RPC. NRC and the support grants available in c1 were of lesser importance.

2) Key resources

The main resource, at the start of the business idea, was RF2. He had a technical background, knowledge of how to develop the product, and is the author of this thesis. He had a commercial/business background and the knowledge of how to commercialize and sell the product in the market. The founders therefore consisted of a technical and a commercial co-founder, a combination that is highly recommended by entrepreneurs and in the research on innovation (Kawasaki, 2004; Ries, 2016; Thiel, 2014).

3) Value proposition

There was no adequate personal flotation device solution for infants at sea at this point in time. The number one reason why infants die at sea is not by drowning, but from hypothermia. Hypothermia is a lack of body heat, and death is caused by freezing. A new and novel product could be introduced to the market by developing a solution that could prevent this. The RescuePod was a solution that could improve safety at sea for infants, and therefore represented a clear opportunity, as no company had developed a safety technology that specifically targeted infants. It was a sympathy product, and had a certain novelty value around it (R. Hisrich et al., 2007).

RF2, as an engineer, also had some technical insights into how the product could be developed and function - expertise, passion and opportunity all in one. The RescuePod also had the characteristics of innovation-driven entrepreneurship. A large amount of R&D would be necessary before the product could be launched (Field, 2014). The trigger (validation point) for deciding to go forward with RescuePod as an idea/invention, and the trigger point for its commercialization was, however, being shortlisted for the DNB Innovation Award 2013 (Sandø, 2013) from 700 business ideas nationwide. DNB is Norway's largest financial group, and their innovation award was at the time one of the most prestigious in the country.

5.3.3 The second cycle (2015–2020)

RS, after receiving the initial first grants from IN, moved on to c2, the development phase. The second cycle is the most difficult of all. The large Norwegian conglomerate BR Industrier, which became part owner of RS in c2, allowed the company to raise MAROFF from NRC. MAROFF, a funding grant targeted at improving existing industries, was granted to RS only after BR Industrier become a major shareholder. This was primarily because NRC wanted a large and stable owner that could provide the company with solidity.

The MAROFF grant was 3 mill NOK and required, like all other grants, 50/50 match-up funding from the owners of RS. RS also raised 1.8 mill NOK from IN in an IRD grant. The capital was given to a project in which Rødne Rederier, a local shipping firm, was onboard as end-client. This grant was, however, targeted more at improving innovation systems than correcting market failures. It furthermore helped the company hire a new CEO. RS was 51% acquired by the industrial group Acerdo AS in 2017, and subsequent shifts in management and then a lack of focus and capital resulted in RS never managing to proceed onwards to c3.

5.3.4 BMC in the second cycle

Table 11

RS second BMC cycle, (Ali, 2020)

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
Pivot Produktdesign Seilmaker Mathisen Inventas BR Industrier Sub Sea Services Force NRC IN	Development of the RescuePod	Unique product		
	KEY RESOURCES		CHANNELS	
	RF1 RF2 RF3 Julie			
COST			REVENUE STREAMS	
Unit cost pr. RescuePod built			One off sale	

1) Key partners

Key RS partners in the period from 2013 to 2018 were mostly technical and development partners. The company first used Pivot Produktdesign in Oslo to build the first prototype, Pivot being chosen following a recommendation received through the founders' network. Pivot had some experience from maritime design. RS however decided, after building the first prototype, to find a local partner, Inventas being selected. Inventas had a close relationship with Seilmaker Mathisen, an experimental boutique development house in Stavanger, and was also engaged in the RescuePod project.

BR Industrier AS in 2015 bought 33% of RS AS and was a development partner. They, however, sold their stake in 2017, Sub Sea Services then acquiring 51% of RS. Both NRC and IN were very important partners during the RescuePod research and development stage. The project was granted IFU (research development) funding from IN, and MAROFF (large scale) funding from NRC to develop and commercialize the project. All these partners were based in close proximity.

2) Key activities

Developing a new product such as the RescuePod in c2 requires several critical elements to be researched and delivered. RescuePod, being a safety device, also needed to be certified by the authorities before it could be sold to the public. The main activities, and research questions that must solved therefore are:

- Construction of chassis
- Design, breathing and floatability
- Product and material development

- Certification

3) Key resources

The most important resources from the start of c2 were RF2, the author, RF3 (CEO from 2015 to 2017), and then CEO Julie (2017–2019), before Morten took over in 2019. Lead designers from Sub Sea Services were also added to the project, the expected launch of the RescuePod product being in 2019, 6 years after the company was started. The author held the position of Chairman until Sub Sea Services, through the Acerdo Group, purchased 51% of the company and Jostein became Chairman.

4) Value proposition

The product did not pivot. It did, however, change substantially in c2 when it went from a hard-shell product to an inflatable solution. RescuePod is still a safety device designed for infants at sea. There are no adequate solutions for infants on the water, infants using safety vests similar to those for children and grown-ups. These do not, however, prevent hypothermia, the number one reason why infants die in sea accidents. RescuePod completely covers the infant, and therefore provides additional safety.

5) Cost structure

Building and assembling the RescuePod involves a cost. Sub Sea Services found subcontractors in China that could produce the product much more cheaply, the important components being assembled in Norway. The goal was to scale the product and position it for mass-production.

6) Revenue streams

RescuePod was to be sold to ferry and ship owners directly. RS was, at the time of writing, still working on the business model, several models having been investigated. One is direct sales to customers; another is a rental model in which B2C clients rent the RescuePod directly from RS. This distribution model means that stores in Norway could re-sell the RescuePod directly to customers. RS had, by 2020, little revenue and the product was still in the development phase.

5.3.5 Analysis

RS is a company with the same characteristics as VIO and OTO, all three being related to a sectoral innovation system. The assumption is that all will, based on earlier studies (Isaksen & Karlsen, 2013; Wicken, 2009a), receive strong government and private support due to path dependency preferences. There was, however, a notable difference. RS was established by first-time entrepreneurs, without experience or relevant networks within the targeted sector, the maritime industry. This represented a weakness, studies showing that these entrepreneurs struggle to raise capital from private investors (Vass, 2008; Wasserman, 2006; Wright et al., 1998), to validate their business ideas.

The research complies with earlier findings, the entrepreneurs having to take personal risks and loans from the local bank. This contradicts Schumpeter (1934) and his theory that risk is not borne by the entrepreneur. This risk was triggered by the need for private capital, government funding policies requiring (for phase 1 and 2 in 2014–2015) a 50/50 match-up. These findings reflect other studies that indicate that first-time entrepreneurs carry the highest risk (Fowle, 2018; Wasserman, 2008), often because of a lack of networks, no access to private investors, and little knowledge of alternative financing (Azoulay et al., 2018).

Taking personal loans to solve phase 1 and 2 funding was possible. Raising the match-up capital required by the IRD grant from IN was, however, not. The entrepreneurs solved this challenge by finding an industrial owner for RS, who bought 33.3% of the shares in the company. The new investor triggered a large-scale grant from NRC, the MAROFF program, which had previously been declined. This further confirms our earlier findings and relevant studies that NRC tends to support national champions and big corporations through large scale grants (Clausen, 2009c).

There was a gradual movement away from Mode-1 to Mode-2 throughout the cycles, as shown in the BMC analysis. The University of Stavanger was important to RS in c1 and 2, in providing introductions to relevant partners in the industry. SkatteFUNN did not have a major impact on RS, mainly due to the company not raising enough private capital. This supports earlier findings on case companies and the BR portfolio, and studies on SkatteFUNN (Cappelen et al., 2012b). The company did not move past c2 and into c3, as the product was not developed and commercialized.

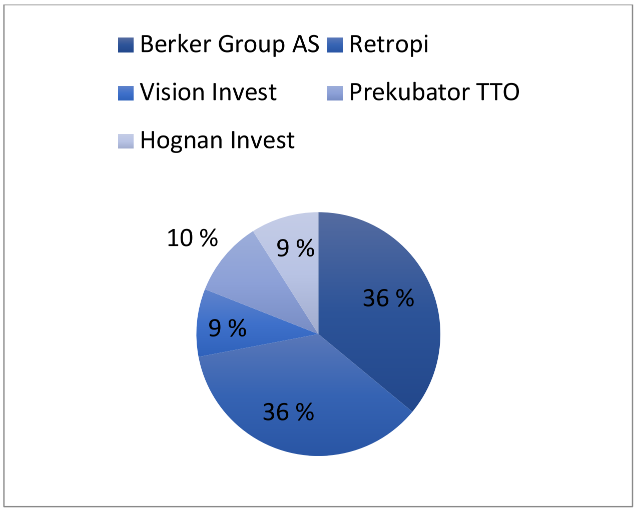
5.4 Case company 4

Type: IDE Entrepreneurship
Business: Financial Technology
Industry segment: Path Creation

Huddlestock Fintech AS (HT) is a financial technology company that was established in 2014 to commercialize the idea and platform for Huddlestock Crowd-trading Technology, HCT. The company was the second case company founded. Huddlestock is in a sector and industry that has not been part of a sectoral innovation system in Norway. The company is therefore assumed to be within the *path creation* category. HF1, HF2, HF3, HF4 and HF5 were all part of the founding team of the firm. The founders had complementary skillsets, experience from the industry and from raising capital. HT was, at inception, 36% owned by Berker Group AS, 36% by Retropi Limited, 10% by Prekubator TTO, 9% by Vision Invest and 9% by Hognan Invest.

Figure 14

HT Ownership Structure 2014, Ali, 2020)



5.4.1 The first cycle: Startup (2014–2016)

Action-research work for HT in c1 involved thorough investigation of the funding policies for newly started technology companies that fall outside path dependencies. There was a higher level of Mode-2 interactions in HT, including meetings with IN and NRC staff, to understand the possibilities. HT was first denied the first phase grant from IN, after being asked for proof that the company was an IDE enterprise. The first grant was therefore awarded through HF4, after a few months of meetings and research. This grant was pivotal in establishing the company, building an MVP, hiring students, and applying for a patent. Once a patent was applied for in August 2014, IN accepted that HT was an IDE enterprise and granted the phase 1 grant.

The grant funded the work carried out by Wiersholm, the law firm, that confirmed that the financial solution was legally possible. This opened up additional funding from private investors. A total of 5 mill NOK was raised through a private seed-round, 4 mill NOK injected as equity capital in return for shares. The remaining 1 mill NOK was bought by existing shareholders. A total of 1.125 mill NOK was raised in this cycle through government funding policies, almost four times that raised through private funding. All attempts in the first cycle to raise capital from NRC (primary FORNY2020 funding) failed. HT therefore transitioned to c2 based on funding from private investors and government grants.

5.4.2 BMC in the first cycle

Table 12

HT first BMC cycle, (Ali, 2020)

<table>
<tr><td rowspan="2">KEY PARTNERS
Prekubator TTO
University of Stavanger
Brann AB
Wiersholm
IN
Private Investors</td><td>KEY ACTIVITIES</td><td rowspan="2">VALUE PROPOSITIONS
Better than existing solutions
Scalability
More attractive to investors
Cheaper</td><td>CUSTOMER RELATIONSHIPS</td><td rowspan="2">CUSTOMER SEGMENTS</td></tr>
<tr><td>KEY RESOURCES
HF1
HF2
HF3
HF4</td><td>CHANNELS</td></tr>
<tr><td colspan="3">COST</td><td colspan="2">REVENUE STREAMS</td></tr>
</table>

1) Key partners

Key partners in the first cycle in the validation of the idea and raising financing, included the University of Stavanger, via Prekubator TTO and IN. The grants from Prekubator enabled the company to write and file patents and hire students. The Swedish company Brann AB, a patent bureau that was introduced through the University, was also an important partner. They helped file both a PCT patent (covering 167 countries), and a US patent written by HF1 and HF2 and filed in 2014. IN later approved its first phase grant, which enabled HT to raise capital from private investors.

2) Key resources

A key in-house resource at this stage was HF4, brought in through a project manager at Prekubator TTO, and through HF1, HF2 and HF3. HF4 contributed through Prekubator TTO, and later became the first CEO of HT. HF2's expertise from the hedge fund industry, which spanned more than a decade of experience in the industry, was very important. He also had a passion for changing the financial industry for the better.

HF1 lead the early business development and was responsible for all government funding applications. HF3 also contributed with insight and knowledge. He was a reputable serial entrepreneur from the Stavanger area, with experience from building technology companies. The first in-house team was important in convincing IN to fund the first cycle of the company.

3) Value proposition

There were limited options for investors in the financial markets in 2014. They either invested through a fund manager, who typically charged a 2% management fee and a 20% performance fee, or they invested online (or through a broker themselves). HT's value proposition was that volume could be created by grouping hundreds of investors together in one trade, that in turn would trigger professionals to distribute their ideas to everyone. These professionals would in return receive a percentage of all profits made in HT.

Crowd-trading would be initiated through an easy-to-use and easy to understand mobile or desktop interface, so that it would be accessible, even to retail investors. The benefits would be lower fees, access to professional investment ideas, and better returns on investment for everyone. The value proposition was untraditional and outside path dependencies and typical innovation for the region. Capital was, however, raised from both private and government funding sources.

5.4.3 The second cycle: Development (2016–2018)

The development cycle involved an increase in the activity of both Mode-1 and Mode-2 action research. There firstly was a need to establish partners to develop the HCT product. The HT team established an office in London (where most of the partners were found) due to difficulty in finding partners in Stavanger. This move was made possible by the financing received in c1—both from private and government funding. HT applied and was granted IK funding twice in c2, IRD grants requiring an end-client that contributed to the project. The company therefore had to work with several potential partners to find a suitable candidate. This had an indirect positive effect in that it brought potential partners into a closer collaboration than would otherwise have developed.

This was not true for HT's first partner, RD Capital Partners, a private equity firm in London, but was true for the second IRD partner, Lakeview Systems GmbH, based in Switzerland. These grants were highly important to the company in the 'Valley of Death' phase. They were also very important to the company in the future, as it tied the knot with Lakeview several years later when it acquired 100% of that company. Securing the grants was not easy, and required a number of interviews with IN, answering analytical questions on the collaboration and how the collaboration would lead to success for HT as a company.

These grants, as in c1, were given on a match-up capital basis. This meant that the entrepreneurs had to be able to match the grants given by IN or raise the remaining capital from investors who were interested in investing in the company. The development stage was difficult. But the company managed to launch the HCT platform live in 2017 and raise additional funding from private investors. HT did not, despite applications for programs being filed including two Eurostar applications, receive any large-scale grants from NRC.

The company was, however, granted the SkatteFUNN grant, which was very important to the company in c2. Most of the interactions with NRC involved Mode-1 action-research. The government funding policies granted in c2 amounted to over 10 mill NOK, including funding from both IN and NRC. This triggered 15 mill NOK in financing from private investors, one and a half times the government funding. The financing from private investors in c2 was, as in c1, higher than the grants given by the government.

5.4.4 BMC in the second cycle

Table 13

HT second BMC cycle, (Ali, 2020)

<table>
<tr><td rowspan="2">KEY PARTNERS
Adsign
Level39
Lakeview Systems
Sapia
Thomson Reuters
KAS Bank
IN
NRC</td><td>KEY ACTIVITIES</td><td rowspan="2">VALUE PROPOSITIONS
Cheaper, easier and better way of investing into the financial markets</td><td>CUSTOMER RELATIONSHIPS</td><td rowspan="2">CUSTOMER SEGMENTS</td></tr>
<tr><td>KEY RESOURCES
HF1
HF2
HF3
Kai
Nick and team</td><td>CHANNELS</td></tr>
<tr><td colspan="2">COST
Development costs in the start to make the HCT platform.</td><td colspan="3">REVENUE STREAMS
Participation fees and performance fees.</td></tr>
</table>

1) Key partners

Key partners in this stage included both Stavanger and London based companies. Adsign, a technical development partner based in Stavanger, mostly on the commercial side, was important in HT's R&D process. Adsign developed both the iOS and the Android mobile application for the company. Level39, London's largest financial incubator, was also very important in the facilitation of growth, and partners for HT. Diverse Interactive Limited (based in Guildford, United Kingdom) was important in developing the backend of the HCT system from 2016 to 2017, HT after this hiring in-house programmers in London for this.

HT was, through Sapia Partners Limited (based in London), regulated as an appointed representative through the UK Financial Authorities. HT established HT Limited in 2016, a fully owned subsidiary of HT in Norway. This company had offices in Level39, and became a member of Innovate Finance, a Fintech membership organization. Lakeview Capital Markets (Germany) was important from 2017 to 2018 in organizing regulatory issues, and passporting HT into the whole of Europe.

KAS Bank (based in the Netherlands) provided custodian services for banking, and Thomson Reuters (based in the US) provided financial data. NRC, through its funding grant SkatteFUNN and IN, through its IRD grant, were also key partners, as they were in the first cycle. All of these partners were important in the raising of additional funding and moving the company forward towards the last AR cycle.

2) Key activities

The HT technology was developed in a systematic way, based on a series of principles and methods derived from research (Hart, 2012). It was highly important that the entrepreneurs secured IPR and developed and tested the MVP with potential users. Testing and implementation in c1 were carried out at the University of Stavanger, prior to the research and development phase.

Further developments aligned with regulatory applications were performed after MVP deployment and verification. HT had to be registered with the Financial Authorities in Norway or be classified as an agent for a fund manager or bank that was registered with the Financial Authorities (passported from another European country) to be permitted to execute trades for clients.

This required more in-depth expertise. Most of the development work was therefore outsourced to private firms in Stavanger and London. The key activity in this phase included development to achieve the launch of a product, the HCT platform. This required more than two years of development, both on the legal and technical side, due to it being a financial technology under strict regulatory control. The beta-version was launched in 2017, additional work on design, and platform improvements being carried out prior to final launch.

3) Key resources

The key resources and management of HT changed in c2. HF2 stepped down as CEO, HF1 taking over. The team in Norway was also strengthened by hiring Kai, a former director at Tidal, to become HT's Chief Product Officer. He became responsible for upgrading the design and user interface of the HCT platform. Nick, who had many years of technical experience from developing and building software, was hired as CTO. Rui, a Senior Programmer in the company, Tiago a front-end developer and Vas a back-end developer was also hired. Evrin was hired as Chief Strategy Officer.

HF1 was responsible for administration, marketing, and overall strategy. HF2 was important to the execution of trades and managing the capital that was on the platform. He also had an important role in introducing the company to his network in London. HF3 stepped in as Chairman and took responsibility for raising private capital. The in-house resources of HT increased substantially in this cycle, a move that at the time was deemed necessary to raise additional capital and prepare for the scaleup cycle.

4) Value proposition

HT had, by 2018, a patented, real-time, share-investing platform that allowed anyone, regardless of investment size, to directly take part in investment ideas sent to them by financial market professionals. All trading and related functions were executed by HT. It was, however, difficult for the company to convey the value proposition to investors. Therefore, at the end of 2018, the company started investigating alternative business models and value propositions, shifting from the initial B2C towards B2B. The work towards B2B was funded by IN and its IRD grant. IN does not require the partner to be a Norwegian company, a London or Swiss based company could also be a partner. IN funding had a huge impact on the change in the value proposition in c3.

5) Cost structure

HT used around 7–8 mill NOK a year on HCT platform research and development in 2017 and 2018. Running costs were mainly salaries of in-house staff, costs for financial information, regulation and legal fees and other administration costs including auditors and accounting. A large proportion of the development work was still being carried out by external companies, based both in London and in Stavanger. HT was granted SkatteFUNN for the development of the platform from 2014 and onwards, based on the running R&D and cost setup. The

SkatteFUNN grant was quite important to the company in transitioning from c2 to c3.

6) Revenue streams

The HCT platform had, after launching the product, two intended revenue streams. These were the participation fees charged on every traded investment idea, and performance fees charged on the performance of traded investment ideas. The B2C platform had, after the launch, around 1,500 users and around 10 mill NOK managed on the platform. The revenues from these users were marginal and forced the company to change its business model and value proposition to B2B in c3.

5.4.5 The third cycle: Scaleup (2018–2020)

HT did not receive any government funding in c3. The company tried to raise government funding through export loans, through Nopef and similar platforms, but failed. The main reason for this was the shortfall of revenues in relation to costs. None of the government funding policies, neither correcting market failures nor improving existing technologies, were relevant in this last cycle. The company continued to receive SkatteFUNN for the development and iterations for suitable B2B clients.

This grant, however, became less and less important in the scaleup cycle, the main driver for company funding coming from private investors. The company raised 20 mill NOK in private capital to facilitate growth, this round of capital coming from Norwegian and international investors. The money allowed the company to develop and launch the product Qinfen for BNP Paribas in Germany in 2020, and also start developing partnerships with other banking and financial institutions.

It became very clear in c3 that the Norwegian government funding policies were very weak and non-existent for companies such as HT. The British government was, in contrast, very pro-active, UK government involvement being due to HT having an office in London. Several meetings with suitable end-clients were setup in various European countries through the British Trade Organization, often with high-profile diplomats such as the British Ambassador fronting the meetings and trade delegations.

5.4.6 BMC in the third cycle

Table 14

HT third BMC cycle, (Ali, 2020)

<table>
<tr>
<td rowspan="2">KEY PARTNERS
Lakeview
Acuity
Dovre
BNP Paribas</td>
<td>KEY ACTIVITIES
Development of the new B2B platform
Sales towards B2B</td>
<td rowspan="2">VALUE PROPOSITIONS
A fully digital platform for traditional financial institutions and banks</td>
<td>CUSTOMER RELATIONSHIPS
Distribution models/ Digital marketing</td>
<td rowspan="2">CUSTOMER SEGMENTS
B2B Financial institutions and banks</td>
</tr>
<tr>
<td>KEY RESOURCES
HF2 HF3
Kai/ Simen / Stig/ John/ Nick/ Peter</td>
<td>CHANNELS
Through existing financial incumbents</td>
</tr>
<tr>
<td colspan="2">COST
Development costs and customisation</td>
<td colspan="3">REVENUE STREAMS
Percentage of assets under management and transaction fees conducted by investors</td>
</tr>
</table>

1) Key partners

Major changes took place in HT between c2 and c3. The team almost completely changed and HT in 2019 merged with Dovre Forvaltning, a traditional fund management company in Norway, after a couple of months without a CEO and of being deep trouble. Stig took over as CEO of the company after the merger, 5 people from Dovre Forvaltning joining the company's payroll. HT purchased 100% of Lakeview Capital

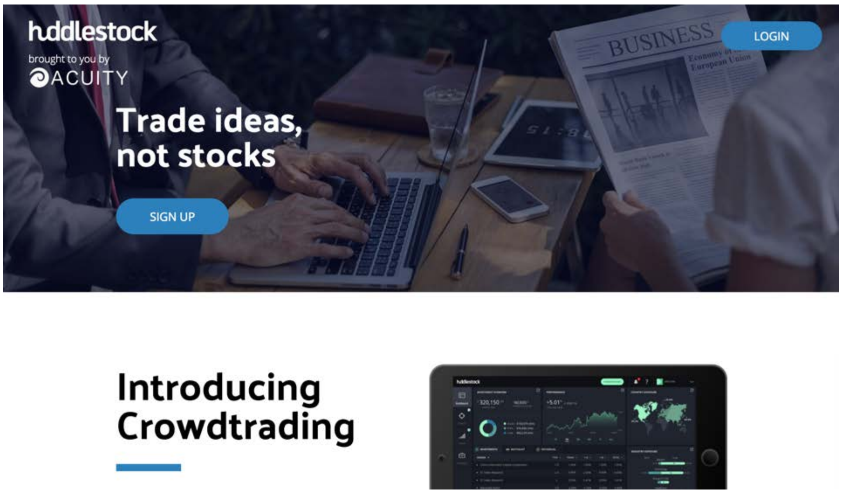
Markets GmbH in 2020, through this gaining access to a Europe wide investment management license. The large shift in team and new acquisitions, plus a complete turnaround to B2B, gave the company new management and new partners.

BNP Paribas was signed as the first break-through B2B client in 2019, after initial testing in Sri Lanka with B2B client Acuity Partners. The Sri Lankan project did not reach success but opened doors to a new agreement with a much larger B2B client. KAS Bank was replaced by BNP Paribas as the custodian bank, and HT closed down all its operations in London, including its office at Level39. This pivot caused a complete change in key partners but positioned the company for the scaleup cycle. The company gained control in this stage of its own license and formed a solid relationship with a new custody bank.

2) Key activities

Key activities in c3 included continuing to iterate the platform towards a B2B product. Part of this transition included sales and customisation for BNP Paribas, and the development of the new platform, Qinfen. The B2C platform was closed down in 2020 as part of this strategy, including divestment of Dovre Forvaltning to Opera in the same year. The strategy for the company shifted completely towards B2B, all parts linked to B2C therefore being closed down or terminated.

The entrepreneurs, after launching HT in 2017, developed a partnership solution that could be sold to banks, Acuity Partners in Sri Lanka becoming the first partner in 2018. The Department of International Trade in the UK was very pro-active in promoting HT in Europe and other areas in the world. The Acuity partnership evolved after a personal introduction to the firm by friends of the entrepreneurs.



HT/Acuity Co-Branding site, 2018

Sales to B2B clients was now the focus, several new clients being signed during the scaleup stage, including an important deal in Malaysia. These agreements came into place without any notable government assistance. The strategy was, in c3, very much *ad hoc* driven, and by individual opportunities.

3) Key resources

HF1 stepped down as CEO of HT in August 2018. Simen, with an extensive background from technology-related businesses, took the helm. He had a strong knowledge of building B2B2C businesses, but resigned after a few months, the founders having to find a replacement. This led to the merger with Dovre Forvaltning in 2018. New key resources emerged after the merger, including Stig as CEO, who had many years of experience in the Norwegian financial industry.

Key resources changed quite substantially in c3. Kai, HF2 and Nick were all important in the development of the B2C platform, all except Nick leaving the company after the new strategy was formed. Closing down the London office also meant that all staff there, including Tiago, Evrin, Rui and Vas also left the company. HF3 and HF1 remained as very active board members, contributing to helping the company pivot, and scaling further.

Peter also became an important key resource in the company after HT bought Lakeview Capital Markets GmbH. He also brought a wealth of experience from the financial industry. HT divested Dovre Forvaltning to Opera in 2020, a Nasdaq-listed company, and Stig became Head of Asset Management in Opera as part of the deal. HT then appointed John, a financial industry veteran, as new CEO of the company.

4) Value proposition

The value proposition in the new growth and export model was targeted at existing financial incumbents such as Acuity Partners. These were old financial investment banks, with no focus on the development of online investment platforms. HT offered them the functionality to:

1. Launch quickly and digitally with a proven concept.
2. Earn revenues on their AUM and transactions in the system.
3. Easily integrate and roll out into the markets.

As a partner, they enjoyed the benefits of launching a platform in the markets with little development work. HT had already integrated APIs for BNP Paribas and could offer low-cost trading and a complete digital white-label solution.

5) Cost structure

The new strategy shift towards B2B also involved a large cost-cutting exercise. First of all, the London office running costs ended when it was closed. Secondly, all costs related to in-house development staff were cut once HT divested Dovre Forvaltning to Opera, development costs instead being completely outsourced. Major costs now included sales personnel and maintaining the license in Germany, which allowed the company to operate. This meant an annual cost of 2–3 mill NOK, substantially lower than the costs in c2. HT had by now developed most of its technology and was ready to be sold to a large B2B market.

6) Revenue streams

Almost all the building blocks in the business model canvas were drastically changed in the scaleup cycle, including revenue streams. Moving from a B2C to B2B setup represented a major change. First, HT charged its clients an up-front fee to customize and develop the technology and to integrate it into their systems. Then all assets under management generated an income, including transaction fees. It was estimated that HT in 2020 would receive revenues in excess of 3 million NOK, primarily from customization deals, and then recurring revenue streams from 2021 and onwards. The company targeted break-even and profitability in 2021, after 7 years of development, several pivots and more than 50 million NOK in funding.

7) Customer Relationships

The HT customer relationship setup underwent a major change when the company decided to pivot from B2C to B2B. HT moved from a completely digital presence to a more technical relationship, management being through webinar presentations email newsletters.

8) Customer segments

Customer segmentation changed between c2 to c3, to financial incumbents and traditional banks such as BNP Paribas, Finanzen.net and Solarisbank, and to service being delivered through a B2B and B2B2C segmentation.

9) Channels

HT's primary channels for reaching clients were through direct phone calls and emails, but also through distributors and consultancies that acted as re-sellers of the technology.

5.4.7 Analysis

HT, a financial technology company, fell outside of the sectoral innovation system, and the path dependencies of NIS. Firms within path dependencies have characteristics that are similar to others in close proximity (Narula, 2002; P. Patel & Pavitt, 1997). The company, irrespective of this, raised as much capital through government policies during the two first action-cycles as the companies within path dependencies. This is in contrast to the expectations that were based on former studies on the topic (Fagerberg et al., 2009; Wicken, 2009a). Most relevant government funding was granted, but through policies implemented to correct market failures, and primarily through IN.

This suggests that IN has a more agnostic approach to correcting market failures, and takes path dependencies less into consideration, perhaps in contrast to NRC. BMC analysis shows that a number of government actors were important to HT in c1 and c2. They include Prekubator TTO, which provided and funded HT's first CEO, and provided enough capital to build the initial MVPs. Prekubator TTO provides indirect funding through SIVA and FORNY, two government programs with strong links to NRC. The trickle-down effect of the funding seems to have strengthened capital flows to research spin-offs regardless of sectoral preferences.

The government, through the University, was therefore in many ways a de-facto founder and an important part of making HT a reality. This is interestingly in contrast to traditional Schumpeterian (1934) theory that the entrepreneur is the driving force behind the innovations. HT was not, however, granted any large scale programs from NRC, perhaps indicating that they prefer to support companies within path dependencies, thus confirming earlier studies on the topic (Clausen, 2009c). It is also interesting to note that HT obtained IRD funding from IN. However, due to the lack of partners in close proximity, the company found partners in London, which is arguably an area with a high degree of sectoral innovation within the financial industry (Laursen & Salter, 2005).

A strong complimentary team that had experience and networks, both from the industry and through raising private capital, was important in c1, c2 and c3. These are in line with existing findings from entrepreneurship studies (Euchner, 2013; McGinn, 2012; Phan & Der Foo, 2004). Private capital was raised based on the validation gained from government funding policies, including regulatory clarifications. Government funding acted as a validator and triggered more private capital. This has been argued in earlier literature (Lazonick & Mazzucato, 2012; Mazzucato, 2017), the SBIC programme probably being one of the best known examples.

The government funding policies were pivotal for HT in c1 and c2, even if the sectoral innovation systems in both cycles were weak. Product launch required international expansion to London, and later Germany. Earlier research suggested that companies that fall outside of innovation systems and path dependencies, receive less or little government support (Narula, 2004). It is, however, evident from HT that the company would probably not exist today without the government funding policies. This implies that there is a RIS, built to support spin-offs from the University of Stavanger, that is not weakened by being outside of path dependencies.

Earlier research with BR Industrier companies indicated that large companies would benefit less from SkatteFUNN than small R&D performing companies with access to private capital. This proved to be correct for HT. The company benefitted from the subsidy program, which served as a catalyst for surviving the 'Valley of Death'. The government funding policies in c1 and c2 were overall positive, except for the need for match-up capital. This could have created problems. It was, however, solved due to the network the entrepreneurs in the company had with private investors, and contradicts studies (Castellacci et al., 2009) that indicate that Norway lacks early stage funding for entrepreneurs.

There were no government funding policies in place for HT in the last cycle, the company therefore being entirely reliant on private capital to fund the growth stage. This is probably one of the more significant findings for this case company, and an area in which Norwegian government policies can be improved. The Norwegian funding policies were weak and non-existent compared to the support provided by the British government to the London company. This could be due to HT being a company outside of path dependencies. This, however, can be a severe showstopper for Norwegian companies and their global growth.

5.5 Case company 5 (2017–2020)

NORSK SOLAR

Type: IDE Entrepreneurship

Business: Renewable Energy

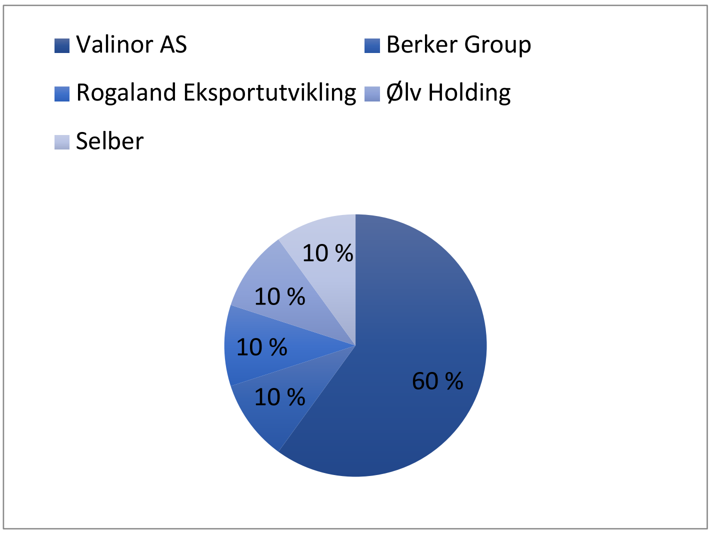
Industry segment: Path Renewal

Norsk Solar (NS), a renewable energy company, was established in 2017 to develop, build and operate solar power plants in emerging markets. NS was the third and last case company founded in this study. NS is a company that does not belong to traditional industries supported in the past by Norwegian government policies. It is, however, an industry that can build on the oil and gas sectoral innovation system (Klitkou & Coenen, 2013), having many synergies and opportunities of knowledge sharing and technology-transfer. NS is therefore defined as a *path renewal* company.

NF1, NF2, NF3, NF4 and NF5 were all part of the founding team of the firm. The company was, on founding, 60% owned by Valinor, 10% of the remainder held by each of the founding entrepreneurs. The company was founded after initial discussions and pre-projects in emerging markets, where the founders saw a clear opportunity for developing, building and operating solar power plants.

Figure 15

NS Ownership Structure 2017, (Ali, 2020)



5.5.1 First cycle (2017–2018)

NS was established in 2017 with an initial funding of 22.5 mill NOK from NF5. The other founders of NS committed their shares from another company as an investment into the new company, valued at 3.75 mill NOK each. The capital injected into the company was to be used to pay salaries, and to develop the company into a growth stage. Most of c1 funding was, therefore, used to target and find solar development projects.

NS received both phase 1 and phase 2 funding from IN in c1, totaling 600,000 NOK. The grants from IN changed in size over the years, as did the match-up requirements. IN started granting the first phase grant as a 100% fund in 2017, with no requirements for match-up capital. The second phase required 50-75% match-up capital. Government funding was not important to NS in c1, mainly due to the large amount of private capital raised from NF5.

5.5.2 BMC in the first cycle

Table 15

NS first BMC cycle, (Ali, 2020)

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
NV IN Windforce Harappa		Track-record and know-how from Valinor Capital towards development of assets Norwegian soft-power angle		
	KEY RESOURCES		**CHANNELS**	
	NF1, NF2, NF3, NF4 and NF5			

COST	REVENUE STREAMS

1) Key partners

NS had a few key partners in the beginning. The most important partner was the principal and majority investor NF5. NF5 had, since 1996, built up a substantial portfolio, track-record and capital base as the leading private wind producer in Norway. This included the sale of developed wind farms to Facebook and Google. The suppliers of solar panels and technology were almost all foreign companies and not in close proximity to NS.

NS applied for the first phase grant from IN and was granted 100,000 NOK, and later an additional 500,000 NOK in a second phase grant. The founders were introduced to Windforce through NF4’s network, Sri Lanka’s largest wind-producer. The team also travelled extensively and was introduced to Harappa Solar, Pakistan’s largest solar power producer at the time. These two partners were important to NS in starting the development of solar assets and establishing a track record within the industry.

2) Key resources

The key resources at this stage were NF5, and the other entrepreneurs. NF3 had recently been the CEO of Kolent and had many years of experience in project management in the oil and gas industry. NF2 came from RS as the former CEO and had a strong financial background and international experience. NF4 had more than 25 years of experience from Rogaland Eksportutvikling and a large network abroad, NF1 at the time having almost 8 years of hands-on international business development and entrepreneurship experience.

3) Value proposition

The founders had, prior to establishing NS, been abroad and studied the need for solar energy in emerging markets. There was a clear need in the market, but only a few fragmented players, and only one Norwegian company that was focusing on financing, developing and building solar power plants internationally. That company was Scatec Solar.

Many local developers had the network and contacts to get the contracts but did not have the capital required to develop or finance their solar power projects. NS, driven by technology entrepreneurs, also wanted to explore and develop solar floating technologies. The key value proposition was therefore driven by the track-record of NF5, capital, soft-power and efficient financial solutions.

5.5.3 Second cycle (2018–2020)

It became evident in the second cycle of NS how capital-intensive development, construction and financing solar power parks would be. The company raised more than 25 mill NOK in a convertible note from NF5 at this stage, primarily to invest in and develop its first major project. NS was the lead developer in this project with Semypolky Solar, from the Ukraine. The project was a commercial break-through for NS and enabled the company to post more than 40 mill NOK in revenues in 2019. Government funding policies became more and more important in the second cycle, primarily through NORAD.

NS raised an additional 3.5 mill NOK through an IK grant from IN. The grant was targeted on the development and launch of floating solar power plants in the Maldives. This was, however, an R&D initiative that was not a central part of the operational business of Norsk Solar. The funding the other case companies received was, however, for the central operational business. NORAD, an increasingly important partner in developing solar projects in emerging markets, provided a 50/50 grant for development costs. These grants were important to the company's ability to develop projects and transition to c3. These grants were, however, most helpful in c3.

5.5.4 BMC in the second cycle

Table 16

NS second BMC cycle, (Ali, 2020)

<table>
<tr><td rowspan="4">KEY PARTNERS
FMO
NEFCO
Windforce
Empower
Harappa
Pro Energy
NORAD
IN</td><td>KEY ACTIVITIES</td><td rowspan="4">VALUE PROPOSITIONS
Efficient financing and structuring.
Norwegian soft power in emerging markets.
New solar technologies.</td><td rowspan="2">CUSTOMER RELATIONSHIPS</td><td rowspan="4">CUSTOMER SEGMENTS</td></tr>
<tr><td>Development of solar assets in emerging markets</td></tr>
<tr><td>KEY RESOURCES</td><td rowspan="2">CHANNELS</td></tr>
<tr><td>NF1, NF2, NF3, NF4, NF5, Filippo, Ludvig, Ove and Rosty</td></tr>
<tr><td colspan="2">COST
Running organizational costs.</td><td colspan="3">REVENUE STREAMS
Developer and EPC-margins, and equity returns on invested capital.</td></tr>
</table>

1) Key partners

Key partners in c2 continued from c1 to be Windforce and Harappa Solar. Pro Energy, the local partner in Ukraine, and Empower/Singularity, a family office based in Monaco, also emerged as important private partners. These partners were all instrumental in making Semypolky Solar a reality and provided capital to fund the development of a solar power plant in Ukraine. There were a lot of other partners, such as accountants and lawyers. These were, however, not key partners in the mission to accomplish NS first lead-developed solar power plant.

Other funding partners were debt providers, such as FMO and NEFCO. FMO provided the loan for the solar power plant that NS jointly developed in Pakistan, and NEFCO (a Nordic Investment Bank funded by the governments of Scandinavia) provided the debt funding for the project in Ukraine. NS also received SkatteFUNN in c2 from NRC, to develop the floating power plants and related technologies in the Maldives. The impact of this was, however, minimal. The company also received funding from IN, which was funneled into R&D projects, but was not targeted towards the main business driver.

2) Key activities

Key activities in the second cycle of the company were still finding solar power opportunities, and developing, financing and operating these assets. The process, however, became much more structured in c2 than the *ad hoc* activities in c1. Hiring new, and experienced employees from the solar power industry and a clear objective created a streamlined organization with targeted tasks assigned to each employee. Projects now underwent a thorough screening process, before being vetted, qualified and brought forward to investment.

The founders also travelled extensively at this stage, meeting with stakeholders internationally such as development banks, funding agencies, investors and more. The entrepreneurs carried out most of the traveling. NS, in addition to the income driver of developing solar power parks, also invested in floating solar R&D. These investments were made as part of the IN grant but were not directly related to the core business. There was a shift in activity in c2, moving away from purely investing in solar assets towards the need to also be part of the development process. The main goals of the key activities were to secure so-called Power Purchase Agreements (PPAs) from off-takers and to reach project financial closure.

3) Key resources

The company grew quickly in c2 and added new employees. Filippo, a solar business developer with more than 10 years' experience from the field joined the team. Rosty, a technical advisor within solar and with more than 20 years' experience also joined, as did Ove who also had many years of experience from the renewable energy industry. Ludvig, a financial analyst, was hired, the team's headcount growing from an initial small team to more than 10 people in c2. NF5 hired a new CEO, Pål, who became Chairman of NS, and took over much of the day-to-day interaction with the team from NF5.

One of the founders, NF4, decided to retire in the second cycle, and left the company. The company had started to become an organization that operated autonomously and almost without the need for the entrepreneurs. Three of the initial founders were still onboard in the second cycle, the aim being to expand and grow the company further.

4) Value proposition

The value proposition remained somewhat unchanged from c1, but with some minor changes. It was first decided that NS would not engage in purely investment activities, such as the company in Pakistan and the Gharo Solar plant. NS also had a Nordic edge when abroad.

Many of the other market players were either US-based, Chinese or Canadian, the locals in the emerging markets having heard a lot of positive things about Norway, and preferred working with Norwegian companies. NS also brought financing, a combination of equity and cheaper debt financing than was available in these emerging markets.

5) Cost structure

NS had added a lot of new employees in c2, the running costs of the organization amounting now to around 1 million NOK a month. Accumulating such a high burn-rate also meant that the company had to raise additional capital to be able to grow even quicker.

6) Revenue streams

NS made most of its income through developer and EPC margins, also return on invested capital in the solar power plants.

5.5.5 The third cycle: Scaleup (from 2020 and onwards)

NS transitioned in 2020 into c3 when the company raised 130 mill NOK in a combined equity and debt financing to spur further growth. The company raised the funds from Aega ASA, listed on the Oslo Stock Exchange, a series of private investors, and SR-Bank, a regional bank headquartered in Stavanger. IN, however, provided prior to this a critical 5 mill NOK loan, that helped the company survive from c2 to c3. This loan was made possible by the revenues that NS achieved in 2019. NORAD in the same year granted a 6 mill NOK framework agreement, in which NS would receive 50/50 financing for its development costs from the Norwegian government. NS would in total receive 11 mill NOK in government funding policies but raised more than 14 times this in private capital for financing growth. The company was, by 2020, growing fast. It now had more than 20 employees, operations in a number of countries, and offices in Norway, Nicaragua, Ukraine and Vietnam. FinnFund later that year provided NS with an additional 75 mill NOK in match-up capital to develop assets, on commercial terms.

5.5.6 BMC in the third cycle

Table 17

NS third BMC cycle, (Ali, 2020)

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
FinnFund Norfund Aega SR-Bank Local partners NORAD	Development of solar assets in emerging markets targeted towards C&I	Efficient financing and structuring. New solar technologies. Development of C&I assets as a specialized segment.	Technical management	B2B2C Corporate and industrial clients. Utility off-takers.
	KEY RESOURCES		CHANNELS	
			Distribution through local partners	
COST		REVENUE STREAMS		
Running organizational costs, and business development costs.		Developer and EPC-margins, and equity returns on invested capital.		

1) Key partners

Key partners in c3 included Aega ASA, SR-Bank, FinnFund, local partners at different sites, and NORAD. NS was an industrial company that built, financed and developed solar power plants, and therefore operated in a very capital-intensive business. The founders had managed to build the company, to position it for growth, and to secure partners so that it had the capital strength required to help NS grow further. The company also established a common investment platform with the Finnish government, FinnFund, which would invest 50/50 in solar projects that NS would develop in emerging markets. Norfund, the Norwegian emerging market development fund, also joined as co-investor in projects that NS operated in Vietnam.

2) Key activities

The business development efforts became much more professional in c2, including screening processes and qualification gates. Key activities and strategy were, in c3, tilted towards the development of solar power parks for corporate and industrial clients. NS had previously focused on a broad range of clients, including utilities. Utilities are typically government off-takers, with long decision-making processes to secure PPAs. NS now, instead, focused on finding corporate off-takers such as large multinationals, that wanted to install solar power at their facilities.

This strategy was initiated partly because the market space became crowded with players trying to secure PPAs from utility-off takers, but also because NS saw an opportunity to build an edge within the C&I segment. This strategy paid off in 2020, when NS secured a pipeline of more than 50 MW of solar power projects with corporate off-takers in Vietnam. This represented an aggregate value of more than 500 mill USD in project budget. INTSOK (later Norwep) had little or no impact on business possibilities for NS in emerging markets, which differs from the experience of for example VIO. NS also had the financial strength in c3 to explore the development of more in-house technologies, the floating solar project in the Maldives also continuing.

3) Key resources

Key resources shifted in c3, as it did in VIO, from the founders towards the employees. NF3 still remained CEO of the company but brought new and experienced people into the management. This included staff with legal expertise, logistics backgrounds and more. NS hired employees from Scatec, and other large competitors. New people were also hired in Vietnam, where many of the C&I activities of NS had expanded. NF1 and NF2, the third entrepreneur that started the company, remained active employees in the company.

4) Value proposition

The value proposition remained somewhat the same as in c1, but with some minor changes. It was first decided that NS would not engage in purely investment activities, as in Pakistan and the Gharo Solar plant. NS also had a Nordic edge when abroad.

Many of the other players in the market were either US-based, Chinese or Canadian, the locals in the emerging markets having heard a lot of positive things about Norway, and preferred working with Norwegian companies. The company also brought financing, a combination of equity and cheaper debt financing than was available in these emerging markets.

5) Cost structure

The cost structure in c3 expanded rapidly on that of c2. The company added more employees, business developers and set up more offices abroad. Running costs increased, including the monthly burn-rate. The company had, however, raised enough capital to grow rapidly in the last cycle.

6) Revenue streams

NS still, as it did in c2, made the most of its income through developer and EPC margins, and the return on invested capital in the solar power plants.

7) Customer Relationship

There are, after building a solar power plant, always running management and operations for clients. NS therefore built and maintained local technical staff with the expertise needed to assist clients on the ground.

8) Customer segments

NS first focused entirely on developing and building so-called utility assets for government buyers of electricity. The company shifted strategy in 2020 towards C&I clients, now focusing on multinationals instead of government, and moving from B2G to B2B.

9) Channels

NS management represented the company in seminars, webinars, and conferences. NS also, using local partners, had a distribution channel in place for reaching out and finding new projects.

5.5.7 Analysis

NS, established in 2017, is the last case company. The company is a renewable energy company, which has certain characteristics of a sectoral innovation system. It, however, represents in this thesis *path renewal*. According to Isaksen et al. (2018), path renewal is the best way of improving from path dependencies, and moving towards industries that are in fast growth, and to some degree related to sectoral innovation systems. As discussed in Chapter 2, path renewal evolves from industries that have similar characteristics, such as the transition in the 1970s from the sectoral innovation system within shipping in Norway, towards oil and gas (Engen, 2009; Fagerberg et al., 2009).

The renewable industry represents a path renewal in Norwegian industry. A lot of companies in this green industry started gaining popularity in Norway in the 2010s, including the solar giant Scatec, NTB, NEL and SN Power (Klitkou & Coenen, 2013). Many companies were listed in the 2020s as part of the green wave on the Oslo Stock Exchange, on Merkur Markets. Norway experienced a 'green' wave as the transition into renewables gained pace, particularly heavy investments from oil and gas companies into offshore wind (Mäkitie, Normann, Thune, & Sraml Gonzalez, 2019). This path renewal was built on the competence, knowledge and innovation systems of the traditional oil and gas industry, just as this industry was built on other industries such as shipping and fisheries (Wicken, 2009b).

NS, besides being a path renewal company, is also unique because it is the last case company established by founders with many years of experience within the industry (or related industries) and that are serial entrepreneurs. The company should therefore have a strong basis for survival, as earlier studies indicate (Azoulay et al., 2018). NS did not need to focus on raising government funding, as it had raised quite a large amount of private capital in c1. This unique situation allowed the entrepreneurs to focus on building the company and establishing a track-record within the industry, this contradicting findings that Norway lacks critical early stage funding (Castellaci, 2008).

Government funding policies were not important at the beginning of the company's lifecycle. They did, however, allow NS to focus and build IPR and technology in-house, for example the floating solutions deployed in the Maldives. This funding helped NS secure clients and sign an agreement (in the Maldives), as it did for VIO with FlexCam. This is in line with research that suggests that government funding policies help companies survive the 'Valley of Death' (Hawkins, 2015; Mazzucato, 2017). Government funding was not critical to the company's survival, as it was for VIO, HT and OTO. The export loan given by IN provided great help in progressing towards c3. This indicates that government funding policies had some relevance in mid-cycle but were not as important as they were for the other case companies.

NS was also the case company that raised by far the most private capital. An important reason for this is the tacit knowledge of the entrepreneurs, and the 'green wave' in Norway in the 2020s. It is interesting to note that government funding policies were most important to NS in c3. The company was granted a framework funding agreement from NORAD in the last cycle, the structure of this agreement giving NS a distinct competitive advantage in emerging markets. It allowed the company to take more risk than it usually would have done, which reflects that stated in papers on this topic (Frick & Ali, 2014).

6 Complimentary Research

Five research papers were written as part of the doctoral thesis (see appendix 4). These are in addition to other qualitative studies. The most relevant papers to this thesis are ‘The importance of emerging markets for oil technology companies in Norway: Management and entry operation strategies’, and a survey conducted of 9 large companies from the BR Industrier group. The intention of presenting these findings in this chapter, is to provide more data on both the SkatteFUNN research of case companies, and on the topic of NORAD and Nopef grants in the last cycle.

6.1 Large corporations and SkatteFUNN

Government funding applications for nine external companies were filed between 2014 and 2015 in conjunction with this thesis. All these companies were part of the Rogaland-based conglomerate BR Industrier. The objective of this was to obtain material on large companies, and the SkatteFUNN scheme. BR Industrier is owned by Bjørn Rygg and is the biggest corporation in the Rogaland area, with a turnover of 4 billion NOK (2019). Part of the study was to research all possible government funding policies for the group.

Most of the companies were path dependent, and part of a sectoral innovation system - oil and gas or agriculture. All of the nine companies were organized under a parent company, and therefore were viewed as representing a large corporation, irrespective of their actual size. The companies were all more or less in cycle 3 and had transitioned out of the development stage. More than nine SkatteFUNN applications were filed. All were granted funding by the Norwegian Research Council.

6.1.1 Study results first batch (2014)

Almost all projects, except Forsand Betong, were granted SF (99.75% acceptance rate). Forsand Betong, a cement producer, had no innovative applications. The tax subsidy was, however, given as a 20% grant. 87 million NOK in grants were therefore applied for, total project size being 421 million NOK. NRC granted 66 million NOK. SF reports at the end of each year, each company being required to submit their project budgets, verified by an accountant. The 20% tax subsidy requires each company to use 5 million NOK to receive 1 million NOK in grants. The study tracked nine of the BR companies over the period to see how much each company received.

Table 18

Results for SF for 2014 (Frick & Ali, 2014)

Company	**Potential grant***	**Actual grant***
Flowtec AS	1.6	0.559
Kjemi AS	1.6	0.460
Landbruk & Maskin	1.6	0.037
Metallteknikk	1.6	0.296
MT Technology	1.6	0.034
NOS	1.6	0.526
NOT	1.6	0.024
Xnor	1.6	0.505
Total	**12.8**	**2.431**

**In million NOK*

SF is granted at the beginning of each year, the maximum amount granted to each company being 1.6 mill NOK in 2014, based on a total R&D budget of 8 mill NOK being reached. The potential grant for all the eligible BRI companies totaled 12.8 mill NOK in 2014. However, only 2.431 mill NOK was utilized of the SF incentive, which is about 18.9% of the potential. These findings reflect similar studies, which indicate that the SkatteFUNN scheme by NRC is more beneficial for smaller R&D companies than large corporations (Cappelen et al., 2012b; Clausen, 2009c).

6.1.2 Study results second batch (2015)

The Norwegian government increased the potential grant from 1.6 to 4 mill NOK in 2015, as part of a strategy to create incentives in the economy due to the fall in oil prices. Large companies such as BR Industrier AS, with a turnover of more than 500 mill NOK a year (group turnover), received 18% in SF, compared to the 20% given to SME companies. Most of the companies in BR, except Xnor, have an average turnover of 35-40 mill NOK, and a lot of in-house development of projects for the oil and gas industry.

Table 19

Results for SF for 2015 (Frick & Ali, 2014)

Company	**Potential grant***	**Actual grant***
Flowtec AS	4.0	0.795
Kjemi AS	4.0	0.4
Landbruk & Maskin	4.0	0.04
Metallteknikk	4.0	0.1
MT Technology	4.0	0.06
Norwegian Oilfield Supply	4.0	0.472
NOT	4.0	0.018
Xnor	4.0	0.37
BRI Cleanup	4.0	0.46

Total	**36.0**	**2.715**

**In million NOK*

The utilization rate was low in BR Industrier companies in 2014. The management of each company was therefore urged to keep track of their R&D budgets, and to write off all costs associated with any development. All companies were also informed that the government had increased R&D incentives from 1.6 mill a year to 4 million, giving each company a higher potential and return on their R&D budgets. It, however, became evident at the end of the year that the result was the same as for 2014, as the table above shows. Only 2.715 mill NOK of the SF granted was utilized. A higher amount but lower compared to the total potential (7.5%) for that year.

6.2 Research on government funding: NORAD and Nopef

Part of the work of this thesis is a paper written with Professor Jan Frick on the differences in government funding policies between large companies and SME companies in c3. The financial support from Nopef and NORAD were the incentives studied. The Nordic Council of Ministers administers the Nopef fund (Nopef, 2014). 124 new applications were registered in 2012, 78 being approved. A total of 77 projects were concluded, 26 leading to long-term investment in the project country, Nopef lending in 2012 amounting to 2.5 million EUR.

Nopef loans are granted within the limits of the financing assets at the disposal of the fund.

Granted loan financing is, over time, to show a reasonably even distribution between the Nordic countries. Expenditure financing in 2012, according to the Nordic Council of Ministers' allocation key, is as follows (Nopef, 2014): Denmark 22.2%, Finland 17.8%, Iceland 0.8%, Norway 29.2% and Sweden 30.1%. NORAD or The Norwegian Agency for Development Cooperation, is a directorate under the Norwegian Ministry of Foreign Affairs. Its task is to ensure effective foreign aid and has about 26.6 billion NOK under management.

NORAD is aimed at Norwegian businesses that set up in developing countries. The funding is divided into two: one for the pre-research phase, the other phase for actual establishment, hiring and teaching of local personnel. NORAD gives up to 2 million NOK in grants or 50% funding to each project/company that qualifies for the program. Applications for these grants, to both NORAD and Nopef, are standardized and detailed. Each company needs to describe their export strategies, their internationalization of technology management, and the budget that is planned to be used on establishing in a new country.

6.2.1 Longitudinal data sets

The study collected data from 60 different technology companies, from 1995 to 2014, and from this assessed how many projects were concluded and how many led to long-term investment (Ali & Frick, 2013). A qualitative approach was used when calculating and assessing the numbers in our paper. The data was collected from Rogaland Eksportutvikling (REU), one of the oldest export advisories in Rogaland. The companies were REU clients and had written the applications. Data from a total of 60 companies was collected. REU has an overview of all applications submitted to government organizations in the period 1995-2014.

All applications state grant size and the amount given by the government to each company. Case companies are classified into two main groups, SME companies and large companies. Companies are characterized as SME if they have less than 50 million EUR in revenues, fewer than 250 employees and are not owned by a large company. Large companies have more than 50 million EUR in revenues, and more than 250 employees. They can be owned by a major company/cooperation (NRC, 2013). All our case companies are classified as either SME or large companies, and all are registered in Norway. Grants are only given to profitable or financially sound companies.

Each company must have 10 million NOK in turnover to qualify for both programs. Applications filed to either NORAD or Nopef are usually either rejected or accepted within a timeframe of 1-2 months. The government organizations, in this period, assess each company's accounts and their ability to succeed in establishing abroad. If they are found to be eligible, then they are granted funding. They otherwise receive a letter of rejection. Programme grants range from 100,000 NOK to about 2.4 mill NOK (Ali & Frick, 2013).

6.2.2 Findings from 1993 – 2014

Table 20

Gov Scaleup Funding From 1995 – 2003, (Frick & Ali, 2014)

No.	Name	Size	Funding received*	Success/Failure
1	Espeland AS	SME	1	Success
2	Skanem AS	Large	1.5	Success
3	EWOS AS	Large	1.2	Success
4	Skretting AS	Large	0.5	Success
5	Netpower AS	SME	2.4	Success
6	InBusiness AS	SME	0.75	Success
7	Bulldog AS	SME	0.5	Success
8	Reslink AS	Large	0.1	Failure

No.	Name	Size	Funding received*	Success/Failure
9	Upstream AS	SME	0.1	Failure
10	Aanestad Engineering	SME	0.1	Failure
11	Fantoft AS	SME	2	Success
12	Møkster AS	Large	0.1	Failure
13	Novatech AS	SME	1	Success
14	Sørco AS	Large	0.1	Failure
15	Norlense AS	SME	0.5	Failure
16	NUT AS	SME	0.5	Success
17	Oceantex AS	SME	0.1	Failure
18	ONS	Large	0.1	Failure

**In million NOK*

Most of the companies in the first batch from 1995-2003 are not in the oil and gas industry. This is interesting, and is probably due to the Norwegian supplier industry not expanding internationally before the 1990s (Engen, 2009). All companies received on average a 50% funding of overall estimated budgets. Both NORAD and Nopef have therefore supported the 60 case companies with approximately 28.1 mill NOK.

Table 21

Gov Scaleup Funding From 2003 – 2010, (Frick & Ali, 2014)

No	Name	Size	Funding received	Success/* Failure
19	Rakon AS	SME	0.1	Failure
20	Solstad Offshore	Large	0.1	Failure
21	Grenland Group AS	Large	0.1	Failure
22	Ibruk AS	SME	1	Success
23	Pipetech AS	SME	0.1	Failure
24	Malthus AS	Large	0.1	Failure
25	SAR Gruppen AS	Large	0.5	Success
26	Peak Well Innovation AS	SME	0.1	Failure
27	Sense – EDM AS	SME	0.1	Failure
28	Technor AS	Large	1	Success
29	Ferguson Norge AS	SME	0.1	Failure
30	Deep Ocean	SME	0.3	Failure
31	Teo AS	SME	0.3	Failure
32	Noreq AS	SME	0.1	Failure
33	Roxar AS	Large	1	Success
34	BIS Industrier AS	Large	0.1	Failure
35	RESQ AS	SME	0.1	Failure
36	Øglænd Systems AS	Large	0.1	Failure

No	Name	Size	Funding received	Success/* Failure
37	Nortrain AS	SME	1	Success
38	Fluid Control AS	SME	0.1	Failure
39	Scana Industrier AS	Large	0.3	Failure

This gives the projects a total value of 56.2 million NOK over the 1995–2014 period. These projects are pre-projects - evaluation projects for setting up in foreign countries. A total of 27 pre-projects for export led to the company establishing in the country, 33 pre-projects ending without exports to the country. This was irrespective of whether support was from Nopef or NORAD (Ali & Frick, 2014).

Table 22

Gov Scaleup Funding From 2010 – 2014 (Frick & Ali, 2014)

No	Name	Size	Funding received	Success/* Failure
40	Capnor AS	SME	0.1	Failure
41	Steinsvik Group AS	Large	2.2	Success
42	Asco Group AS	Large	0.1	Failure
43	Parker Maritime AS	SME	0.1	Failure
44	Visco AS	SME	0.35	Failure
45	OTT AS	SME	0.6	Success

No	Name	Size	Funding received	Success/* Failure
46	Seabed Services AS	SME	0.3	Success
47	Link Arkitektur AS	Large	0.35	Failure
48	Smart Farm AS	SME	0.3	Success
49	RKK AS	SME	0.6	Failure
50	Tomax AS	SME	0.35	Failure
51	Alurehab AS	SME	0.1	Failure
52	Corporater AS	SME	1	Success
53	Seamap AS	SME	0.3	Success
54	Protech AS	SME	0.7	Success
55	Logistrans AS	SME	0.3	Success
56	On and offshore Group	SME	0.2	Success
57	Maritime Protection AS	SME	0.2	Success
58	CTR AS	SME	0.2	Failure
59	IK Group AS	SME	0.3	Success
60	Storm AS	SME	0.2	Failure

Most of the companies that received funding, did not manage to establish in a foreign country. The study shows that the 27 companies that succeeded in establishing abroad received a total of 22.45 mill NOK in support, the average being 832,500 NOK per company. The 33 companies that failed to establish abroad received a total of 5.65 mill NOK, which is 171,000 NOK per company from NORAD or Nopef. This suggests that the more funding a company receives, the more likely it is to successfully establish in a foreign country.

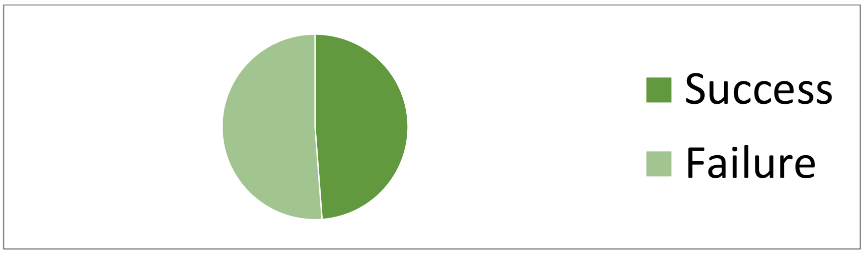
6.2.3 Notable differences between SME and large companies

It was also interesting to look at the differences between SME and large companies. The assumption was that SME companies struggle more to establish in a foreign country, due to a lack of resources and network compared with larger companies/corporations. Most of the case companies are classified as being SME.

More than 41 of the companies that applied for support are SME companies, 19 falling into the large company definition (NFR, 2013). The numbers show that about 20 of the SME companies were successful in establishing abroad (48.8%), 21 (51.2%) companies not being successful. The success rate is therefore quite high for the SME companies, almost half succeeding irrespective of the funding amounts received from Nopef or NORAD.

Figure 16

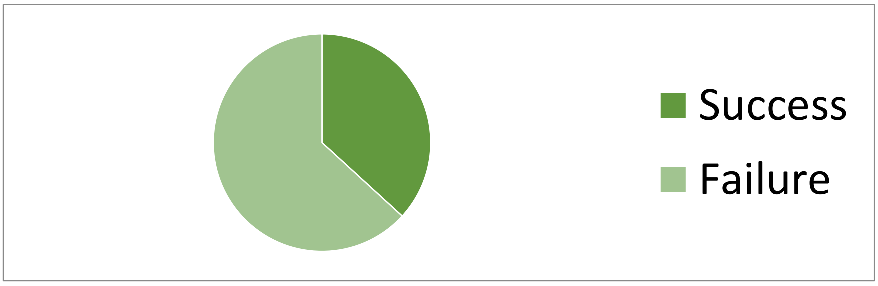
Establishment of SME in international markets, (Ali & Frick, 2013)



Only 7 (36.8%) of the 19 large companies that received export funding were successful in establishing in a foreign country, 12 of the companies failing to establish abroad (63.2%). The findings suggest that SME companies are more likely to survive than large corporations, when establishing abroad. This contradicts studies that suggest that large corporations are better at international expansion (R. Hisrich et al., 2007; Ruzzier et al., 2006).

Figure 17

Establishment of Large Companies in international markets, (Ali & Frick, 2013)



One explanation for these findings could be that most of the large companies in the study are non-oil related, while the SME companies are mostly oil related. This suggests an advantage due to the sectoral innovation system. Norwegian oil related SME companies tend to follow their customers, such as Equinor or other operators, into foreign countries. When a company such as Equinor opens operations in foreign countries, such as Russia, Brazil, and the Middle East, they often invite Norwegian suppliers to bid for work in those countries (Engen, 2009).

If these Norwegian companies win the contract, then they can establish abroad with minimal risk (less exposure to local companies, customs). This could be a reason for the high success rate of SME companies (Ali & Frick, 2013). The large companies received 9.55 million NOK of all funding, SME companies receiving 18.55 million NOK. Each large company received on average of 500,000 NOK per pre-project, smaller companies receiving 10% less, at about 450,000 NOK per pre-project. This suggests a disproportional distribution of grants towards large companies, supporting earlier research in this thesis that the government favors large companies, or national champions (Fagerberg & Srholec, 2008).

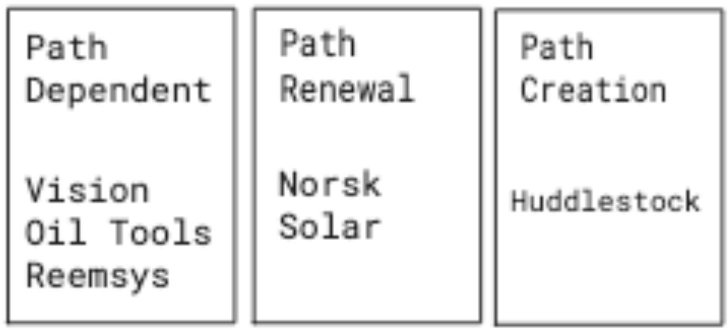
7 Review of Results

The objective of this research was to investigate the entrepreneur's view and process experience of government funding policies. The combined government and private capital raised by all case companies are summarized in this chapter, the three action-cycles being closely interlinked with the funding objectives of a start-up's journey, private funding and public funding. Companies first go through the pre-seed/seed stage of funding, then the development stage (also known as the Valley of Death), and lastly the scaleup/growth stage. Funding in these stages are known as seed, Series A and Series B (Gompers et al., 2007; Kenney, 2015). Both private and public funding are essential to a company's transition from one cycle to the next.

It was argued in the theory chapter of this thesis, that the traditional top-down studies of entrepreneurship caused insufficient attention to be paid to the learning processes of an entrepreneur, as experienced from their perspective (Iammarino, 2005). Mapping only individual characteristics such as education, ethnicity, age and other factors might provide a generalization that can help understand how entrepreneurs succeed and how government policies influence the entrepreneurs in the three cycles of a firm. Innovation and entrepreneurship literature also lack the inside-out viewpoint of the entrepreneur, so overlooking critical variables in the understanding of how policymaking can be improved (Flanagan & Uyarra, 2016).

Figure 10

Path Variables and Case Companies, (Ali, 2020)



Existing studies of Norwegian innovation systems suggest that companies that fall outside of path dependencies, and to a certain extend path renewal, do not receive the necessary government funding and support that is given to those within a path dependency (Narula, 2004). It was suggested that VIO, OTO and RS would experience a high degree of government funding due to the sectors they operate in. NS was also expected to experience a similar type of, but weaker government funding, HT being a company outside of path dependency experiencing little or weak government funding. The results are interesting, as they show that there is a strong link between government funding policies, private capital, and the experience and network of the entrepreneur.

Table 23

Norwegian Government Funding for Case Companies, (Ali, 2020)

	C1:	C2:	C3:	Path Variable
Vision Io	Low (0.03) *	High (20.5)	Medium (6.3)	Path Dependent
Oiltools of Norway	Medium (0.9)	High (5.5)	-	Path Dependent
Reemsys	Medium (0.9)	High (5.0)	-	Path Dependent
Huddlestock	High (1.125)	High (10.8)	Low (0)	Path Creation
Norsk Solar	Medium (0.6)	Medium (3.2)	High (10.0)	Path Renewal

** in million NOK*

C1: Low <0.5, 0.5< Medium <1, 1< High

C2: Low <2, 2<Medium <5, 5<High

C3: Low <5, 5< Medium <10, 10<High

The table above is an overview of the direct government funding granted to the 5 case companies. The funding ranges from c1 to c3, the last cycle requiring more capital than the earlier cycles. The table shows medium support in c1. The BMC analysis shows, however, that the government influence in both c1 and c2 is important, especially for first-time entrepreneurs. This influence is important to all case companies except NS. The main probable reason for this is the government organization NORAD, which was established to incentivize Norwegian companies to conduct business in emerging markets. Neither IN nor NRC have any relevant mechanisms for c3. The funding is, furthermore and as shown below, segmented based on duality, and includes private capital by the 3 action-cycles.

7.1 First action-cycle

Table 24

Total Case Company Funding for Cycle-1, (Ali, 2020)

Name	Vision Io	Oiltools of Norway	Reemsys	Huddlestock	Norsk Solar
Phase 1	0.03	0.2	0.3	0.125	0.10
Phase 2	-	0.7	0.6	0.8	
Plogen	-	-	-	0.05	
Local FORNY	-	-	-	0.15	
Seed Funding	10.0	1.5	-	4.0	22.5
Total	**10.03**	**2.45**	**0.9**	**5.125**	**22.6**

**in million NOK*

The results show that there is an equal amount of government funding, irrespective of path variable. VIO is an exception. The entrepreneurs, however, did not in the beginning focus on raising capital from public sources. There is also an inverse relationship between path dependency and private capital raised. This relates more to the experience and network of the entrepreneur than to path dependency or government funding policies. The results therefore indicate that there are little or fewer connections between the funding raised from the government and private investors.

Chapter 2 describes research that suggests that path dependencies and support from sectoral innovation systems led to the assumption that case companies within certain sectors would receive greater support (Fagerberg et al., 2009; Lundvall & Borrás, 2005; Narula, 2004; Wicken, 2009b). The results above indicate that this might not be the case. It is notable that all support is given entirely through Mode-1 interactions.

7.2 Second action-cycle

Table 25

Total Case Company Funding for Cycle-2, (Ali, 2020)

Name	Vision Io	Oiltools of Norway	Reemsys	Huddlestock	Norsk Solar
IK/IRD	5.05	1.8	1.8	5.0	3.2
SF	10.55	0.25	0.15	5.8	-
NRC – Large Scale	5.05	3.2	3.0	-	-
Series A funding	10.0	-	1	15.0	26.5
Total	**30.65**	**5.25**	**6.05**	**25.8**	**29.7**

**in million NOK*

The table above shows the grants and funding given during the second action-cycle, all companies raising a similar amount in this phase. The differences in private capital and public are, however, notable as in c1. The results show that the amount of private capital raised is not linked to government funding, but to the experience and networks of the entrepreneurs. The interesting aspect of these findings is that NRC tends to support path dependent companies within existing sectoral networks. The government support given by IN was deemed critical by many of the companies.

This support is given regardless of path variable, suggesting that IN has a broader reach. These funding policies are, as in c1, structured as grants that are given on a 50% basis, entrepreneurs therefore needing to raise private capital to complete the project. The most capital-intensive period in a company's cycle is c2, also known as the 'Valley of Death'. Companies that manage to raise enough capital in this stage, are able to commercialize their service and transition to c3. These companies were, as in c1, led by serial entrepreneurs.

7.3 Third action-cycle

Table 26

Total Case Company Funding for Cycle-3, (Ali, 2020)

Name	Vision Io	Oiltools of Norway	Reemsys	Huddlestock	Norsk Solar
NOPEF	0.3	-	-	-	0.15
NORAD	-	-	-	-	5.0
Export Loans	6.5	-	-	-	5.0
Series B funding	10.0	-	-	20.0	130
Total	**16.8**	**-**	**-**	**20.0**	**140.15**

**in million NOK*

Only three of the case companies, VIO, HT and NS, managed to transition to c3. They, interestingly, each belong to the three path variables. It is also notable that these companies were founded by entrepreneurs with experience and networks. NS represented an accumulation of experience from former companies. The entrepreneurs involved in both OTO and RS were, however, first-time founders. The case companies combined raised more than 160 mill NOK in private capital, irrespective of path variable. This is highlighted in green. The private capital funding in c3 is far higher than the funding from government funding policies.

The export loans from IN, which were only granted to VIO and NS because they could show substantial revenues, was helpful and gave an additional boost to the companies in their growth stage. There was, apart from this, however no or little support from IN or NRC in c3. The NORAD grants awarded to NS were valuable to the company, especially when expanding into emerging markets. These grants were, however, initiated as a form of development aid, to help Norwegian companies engage and do business in specific areas. VIO did business in oil rich nations and was therefore not eligible for the NORAD grants. There was no support in c3 for companies such as HT.

7.4 Total funding – private and public

Table 27

Total Case Company Funding for All Cycles, (Ali, 2020)

Name	Vision Io	Oiltools of Norway	Reemsys	Huddlestock	Norsk Solar
C1	10.03	2.45	0.75	5.125	22.6
C2	30.65	5.25	6.05	25.8	29.7
C3	16.8	-	-	20.0	140.15
Total	**57.48**	**7.7**	**6.8**	**50.925**	**192.45**

**in million NOK*

Following the companies from c1 to c3 shows that government funding policies play an important role in the first cycles, and perhaps even more so for first-time entrepreneurs and companies outside of path dependency. C2 is particularly important when validating and commercializing technology, IN and NRC both having the potential to act as a catalyst for more private capital, as shown by VIO and HT. There is, however and as the results from the table above show, a large difference between entrepreneurs that manage to raise enough private capital, and those who do not.

This has implications for survival from c2 to c3, not being able to cross the 'Valley of Death' stopping many companies from surviving. This is not just about capital. It is also about being able to commercialize technologies, and sell a service to create sufficient revenue, as exemplified by HT. There is clearly a lack of government funding policies that target c3. Policies should also not be dependent on path variable. It is notable, in this last table, that there is no relationship between path variable and the total funding given by both public and private actors.

7.5 Research Objective

7.5.1 First Research Question

How do government funding policies affect entrepreneurs in the early stages of a company, from inception to an actual company?

Studies of Norwegian private capital suggests that there is a lack of private capital for SME in the seed stages of growth (Langeland, 2007), and that this makes it difficult for SMEs to achieve sustainable growth. The findings in this thesis, especially for RS and OTO, suggest that this is true, which is further backed by data from the Norwegian Venture Capital Association (2016). An additional finding is that this applies more to first-time entrepreneurs than those with experience of establishing companies. It is also clear that the networks entrepreneurs have built up, for example amongst investors, as for the founders of HT, VIO and NS, make it easier to raise capital from private investors. This capability increases over time, giving the entrepreneurs valuable tacit knowledge and networks (both public and private) for raising funding. These findings are also backed-up by research that confirms that serial entrepreneurs find raising private capital easier (Gompers et al., 2007; T. Meyer et al., 2008).

NRC support in Norway for innovation seems to be policy-driven. It is centered on existing sectoral innovation systems such as oil and gas, and the maritime sector, this confirming research findings on the topic (Bekkers et al., 2015; Castellacci et al., 2009; Wicken, 2009a). The government strong support for both RS and HT was mainly provided through IN and its incubation facilities such as Validé and the University of Stavanger. The Norwegian innovation systems for R&D spin-offs from the universities is quite well developed and is exemplified by HT. It can therefore be argued that the University-related innovation systems might differ from sectoral innovation systems.

7.5.2 Second Research Question

How are entrepreneurs impacted by government funding policies in the development stage of a company?

The ‘Valley of Death’ is the most critical period in a company lifecycle. It is also the stage in which most companies fail (Euchner, 2013; Holcombe, 2003; Kawasaki, 2004). IDE entrepreneurs need to raise enough capital, commercialize the technology, hire the right people and position themselves for growth. According to Mazzucato (2014), governments contribute to these early stages by taking risks that private investors do not. The research in this study suggests that Norwegian government funding policies are strongest in c2, regardless of path variable, and confirms that grants help two out of three case companies move past c2 to c3.

Norwegian government funding, through the large-scale programs provided by NRC, is biased towards supporting existing industries and national champions, favoring companies within path dependencies (Engen, 2009; Lundvall & Borrás, 2005; Narula, 2012; Wicken, 2009a). This correlates with the findings in c1. This does not, however, apply to funding from IN, and the industry-agnostic tax subsidy scheme SkatteFUNN from NRC. This has a much broader approach to funding companies and supports instead smaller companies with access to private capital. This supports research on SF, and the findings on the experience of smaller companies versus large corporations (Cappelen et al., 2012b).

Companies that raised a lot of private capital, such as VIO and HS, benefitted the most from SF when compared with, for example, the BR Industrier companies. The differences are quite significant, and might explain why so few large companies apply for and are awarded SF (Clausen, 2009c). As in c1, there is a relationship between receiving private capital and raising government funds. All case companies received government funding in c2, but only the experienced entrepreneurs managed to raise private capital. This again indicates no multiplier effect through government funding policies, which contrasts the literature on the subject (Lazonick & Mazzucato, 2012; Mazzucato, 2015, 2017).

7.5.3 Third Research Question

What experience do entrepreneurs have of government funding policies for scaling and growing the company globally?

Reaching the growth or scaleup stage is one of the most important achievements of a new venture (Hart, 2012; Kawaski, 2000). It marks the transition from having a product or service, to having a sustainable company (Ries, 2016). Companies that enter the growth phase require Series B funding or similar from private investors to target international expansion (Gompers et al., 2007). The findings in this study suggest there is little relationship between path variable and the amount of capital raised in c3, either from private investors or through government funding. This also contradicts the theories presented in chapter 2 that state that path dependency increases the probability of government support (Narula, 2004).

The only funding available at this stage was export loans from IN. These loans were given to profitable companies at the time of application. Only VIO and NS therefore received these. The funding mechanisms are similar to bank loans, with interest being charged and a down-payment schedule being set. Banks are also important to companies in the growth stage, but only those that can meet the payment schedule. IDE enterprises that are not profitable are therefore usually excluded from this source of funding (Prelipcean & Boscoianu, 2008). Government funding from IN is limited to loans at this stage, which hampers global growth ambitions, and is probably why Norwegian technology companies are sold to foreign buyers before they reach a certain level of maturity (Frick & Ali, 2014; Sogner, 2007).

HT was therefore completely dependent on private investors for growth, a type of dependency that makes it more difficult for first-time entrepreneurs to reach c3. NS benefited from the NORAD grants, which helped the company develop assets in emerging markets. These grants are, however, targeted at specific geographical regions (emerging markets), and are not designed to help companies target and acquire clients abroad. This funding is path agnostic, and open to most

Norwegian companies looking to do business in these markets. The government funding policies in c3, by only focusing on IN and NRC, are however weak. This is an important finding, especially when considering that only one out of five companies reach this stage, and continue to grow (Fowle, 2018).

Another notable finding is that the sectoral innovation systems provide indirect support to path dependent companies. Examples are VIO being introduced to potential clients internationally through its network of partners, suppliers and investors in close proximity, and the Norwegian embassy trying to setup meetings for VIO in the Middle East. These findings are in line with assumptions that the existing sectoral innovation system makes it easier for path dependent companies to find clients and commercialize their solutions (Engen, 2009; Frick & Ali, 2014; Narula, 2012). This is exemplified by the action research, in which HS is shown to receive marketing support from IN when the Crown Prince made the first trade on the platform. This support is, however, *ad hoc*, and not structured enough to make an impact.

8 Conclusion

This chapter presents the conclusion, theoretical contributions, recommendations to both policymakers and entrepreneurs, and suggestions for further research. This thesis suggests that there is a duality in the Norwegian government funding policies, IN being the main institution to correct market failures, NRC being more structured for supporting existing national and sectoral innovation systems, especially companies within path dependencies and with a link to large corporations.

These findings relate well with the findings of studies that suggest that government funding policies on national and sectoral innovation systems are biased towards companies that fall within path dependencies, and that are interlinked with the existing interactivity of actors in close proximity (Narula, 2002, 2012; Powell & Grodal, 2005). This contrasts earlier studies which indicate that companies within a sectoral innovation system, and path dependencies, receive strong government support (Fagerberg & Srholec, 2008; Lundvall & Borrás, 2005; Narula, 2002), and that the experience and network of the entrepreneur is key to success regardless of path variable.

It was also notable that companies that demonstrate the characteristics of path creation, experience weak or no support from the sectoral innovation system (Hervas-Oliver et al., 2011; Narula, 2004). There is strong government support in c1 and 2, as shown by HT. This is, however, most likely due to the company being a spin-off from the University of Stavanger.

This thesis would not have been possible without action-research. The method, in combination with BMC analysis, provides an overview of funding received, but also valuable new knowledge about the impact and process experience of government funding policies, from an entrepreneur's point of view.

8.1 Theoretical contributions

Case company 1 (RS) to case company 5 (NS) show a clear network accumulation (both public and private), and of tacit knowledge, which was beneficial in the rapid growth from c1 to 3. The ability to raise private capital is particularly important, a factor that is firmly proven in many other studies (Cassar, 2004). The reason for SBIC's success was probably the high degree of matching capital, 3 to 1, so giving private investors a large incentive to risk their capital (Kenney, 2015). There is a 1-1 ratio in Norway for grants. The contributions of the study can be summed up as follows:

- Government funding policies and actors, such as the University of Stavanger and Ipark, were both important in influencing, introducing and helping first-time entrepreneurs with ventures, including RS and HT. In particular HT, as the government was a co-founder and early financier of the company.

- Funding from IN and NRC in c1 and 2 can create financial difficulties for first-time entrepreneurs with limited networks among private investors. The reason is the match-up capital requirements set by the government funding organizations.

- Correcting market failures as a support mechanism is mainly channeled through IN, while supporting national champions and innovation systems is facilitated by NRC.

- SkatteFUNN is important for smaller R&D companies with access to a high degree of private capital. The mechanism is most relevant in c2 and the 'Valley of Death', its importance fading once the company moves to c3.

- Government funding contributes to increased ownership of shares amongst entrepreneurs, as entrepreneurs do not need to give up equity in return for capital.

- The background, networks and experience of the entrepreneurs is more important in building and commercializing a technology than a path variable. Path dependent companies will, however, find it much easier to raise private and public capital, find partners and clients who are in close proximity.

- Findings suggest that the government funding policies do not provide a trickle-down effect of more private capital for the development and commercialization of new ventures in Norway.

- Norwegian entrepreneurs, regardless of path variable, lack critical support in c3. This is a challenge that needs to be addressed by policymakers, to create more sustainable global growth for companies. An exception is NORAD-related companies.

- The government funding policies work well, but only when they are targeted, specific, and manage to capture and increase wealth creation in combination with private investors. This is shown by the VIO, HT and NS examples (in c3). The funding policies from NORAD for the path renewal-company NS is a prime example of this and can be extended to more sectors.

8.2 Results of the case companies (per 04.2021) at the time of writing

All the case companies are still registered at the Norwegian registrar Brønnøysund, except OTO which was dissolved. The companies that passed onwards to the last cycle now employ more than 70 people and have a turnover of close to 100 mill NOK. Today VIO AS is a growing company with fifteen employees and a turnover of 38 mill NOK. The company has not grown in recent years due to the sectoral downturn in the oil and gas industry.

HT has thirty employees, 150 mill NOK of assets under management, two thousand investors on its platform and is listed on the Oslo Stock Exchange, on Euronext Growth, under the ticker HUDL. The company is still in its early growth phase but has started securing more and more large clients. The company has been described by CB Insights as one of eighty global companies that are changing wealth management.

Both OTO and RS are dormant companies. Neither managed to transition to c3. OTO has been closed down, and RS has been turned into an investment company after being acquired by the Acerdo Group. NS is, however, a company in fast growth. It has around 25 employees, and an expected turnover of more than 50 mill NOK in 2020. The company raised more than 130 mill NOK in c3 as growth capital, Aega ASA (a listed Norwegian company) being the lead investor.

NS also raised 75 mill NOK from the Finnish government, through FinnFund, for a joint initiative to invest in solar power plants in emerging markets. The company raised an additional 110 mill NOK in

March 2021 from leading investors through a private placement, and on the 19th of April of that year was listed on the Oslo Stock Exchange, Euronext Growth under the ticker NSOL (Nikolaisen, 2021).

8.3 Suggestions for policymakers

One of the largest challenges for entrepreneurs in the first cycles, regardless of path variable, is the match-up capital requirement. This requirement is found in both dualistic funding policies, that either correct market failures or support innovation systems. This research indicates that these policies create unfavorable conditions for first-time entrepreneurs with a lack of capital, or little or no private investor network. It also biases funding towards national champions and larger corporates, particularly funding from NRC, as we saw with both RS and HT.

This is an aspect that could be more critically examined, and more targeted policies could be implemented. Teams should therefore be assessed and ranked based on their experience, industry-background, networks and other key variables. This would allow optimal policies, instead of creating unnecessary risk for entrepreneurs, as for RS. Companies should also be assessed based on whether they represent key sectors (with the benefits of a NIS, RIS or sectoral innovation system), or whether they belong to a path variable that requires cross-border partnerships, as we saw with HT. A solution to this is the creation of arenas for connecting entrepreneurs with investors and corporates, and active education on fundraising and sales.

Another important take-away from cycle-1 is that private investments that provide match-up capital for Norwegian government funding schemes, could achieve much greater benefit than today. Early-stage investors in the UK are able to write off 25-30% of their total investment in IDE enterprises in year-end reporting to the government. This can be easily achieved by attaching investment transfer (dilution papers), and a simple form or presentation of the company that they have invested in. The company could apply for and receive IDE status so that investors can claim their tax relief.

This structure should be easy and straightforward to implement. It is far too complicated today for most investors, which points to the solution called KapitalFUNN. Investors in Norway are more likely to invest their excess capital into property, because these investments give greater taxation benefits than for example investments in start-up companies. The government would likely see a higher influx of private capital into start-ups if this was changed. A key consideration in improving the economics of government grants would be to issue grants through a separate investment vehicle or body, such as a sub-division of IN, that could manage the investment of seed capital into start-ups in c1 and 2.

Applications in these cycles could, for example, be assessed by the local IN committee, who then would rank the applications.

The ranking mechanism would put the application forward to an investment committee, which could for example decide to invest in the best ideas via match-up capital, which would also take a commercial stake in each company. This investment committee could be governed by successful entrepreneurs and IN staff. Invested capital would, in this way, not only achieve a multiplier effect through capital expenditure, but also a capital accumulation effect for the government through strategic investments in the best teams and the best ideas. Specific variables could also be implemented, such as positively favoring ideas and entrepreneurs from the North of Norway or smaller cities in the country.

This would attract talent and people to live outside the major cities, and help these areas thrive. Female, and/or minority entrepreneurs should be positively targeted, allowing a more diverse entrepreneur body, which would be beneficial for the whole nation. The IN sub-company could be a pre-seed facilitator with the ability to positively mold and change the Norwegian economy through targeted innovation responses. The correction of market failures would not only address economic factors, but also demographics and promote regions and the participation of larger parts of the country in creating a dynamic economy. This tactical policy implementation would propel the nation towards a more inclusive and productive economy, through nurturing technology development at its very earliest stage, and at its basic core.

C1 and 2, through these types of measurements, could be radically improved, making investments (already made by the government) much more efficient than today. Norwegian government funding policies in c3 need to be drastically improved. The country lacks the knowledge, network and proper governance to support companies that want to grow. Norway can be compared to other governments, such as the Swedish, Danish and British, that actively market and run trade missions to sell their solutions and technology around the world. This might explain why a number of Norwegian companies choose to sell their solutions to foreign (often US-based) corporations once they reach a certain maturity.

Lastly, but not least, c3 can also be improved by expanding the NORAD grants, so that they include more regions and more sectors. These grants were highly beneficial for NS and provided the company with a distinct advantage when competing against other companies in emerging markets, simply because it allowed the company to take more risk in developing projects.

8.4 Suggestions for entrepreneurs

The Norwegian government's support for start-ups in the first two cycles is probably one of the better implemented funding policies in the world. Entrepreneurs who want to optimize their companies in the Stavanger region, should ensure these essential and additional characteristics are in place. We use the acronym **TENK** (a Norwegian word that means think):

a. **Technology**. Develop a scalable technology/solution that addresses an important gap in the market/industry. Focus on targeting a niche, and then expand into the more general market afterwards.

b. **Experience.** Experience from an industry provides knowledge to all aspects of the business. For example, how regulations work, business models and customers. Experience from earlier start-ups is beneficial but not essential. Such experience could, however, give access to a pool of external investors/professional businesspeople that can provide further funding. It also increases the probability of knowing how to utilize government incentives and funding. Team up with others with this experience, if you do not have it yourself.

c. **Network.** With experience comes a network. This is important when developing a new technology or a product in any industry. Both networking and experience give the project greater credibility when applying for government funding/incentives.

d. **Know-how** in utilizing government funds and raising private capital. The process of learning how the different schemes work, writing applications, budgets and reports to IN and NRC can be arduous. Many entrepreneurs call this ‘slow’ money and prefer instead to go for ‘fast’ money, from generating a cash flow as fast as possible or bringing in private investors. This can, however, be a deal-breaker for cost-intensive projects. Both IN and NRC have improved on this in the last couple of years. Combine both!

T.E.N.K will open many doors, both public funding - but also private capital.

8.5 Limitations of the study

This thesis is based on companies in the Stavanger-region. The region is characterized by a high density of oil and gas companies, and the assumption that it belongs to a sectoral innovation system. A lot of the theory used in chapter 2 and chapter 6 is derived from international research. There may therefore be regional, national and industrial differences. There are restrictions on the applicability of some of the findings in this study from a geographical viewpoint, in particular government funding policies that are only found in Norway. There may be similar arrangements in other countries. It is not, however, known whether these are comparable with those in Norway.

Other limitations include the number of case studies involved. Five companies were started, these being within path dependencies, path renewal and path creation. One limitation is the number of companies investigated. Action-research can also be subject to bias and non-objective information. However, it becomes easier to investigate when only actual grants awarded are assessed. The Norwegian government-funding scheme is also complex, often academic, and requires insight, understanding, networking and knowledge. It also changes from year to year. Parts of the funding programs mentioned in this study will probably therefore be obsolete after a few years.

8.6 Further research

Mapping the impact of government funding policies on innovations is a vast field of research. One of the weaknesses, as mentioned in Chapter 1, has been that this research has mostly been top-down and focused on objective variables, without digging deep into the impact from an entrepreneur viewpoint, and the 'inside-out' based on different sectors. This study has followed a small number of case studies, and gives a perspective. It would, however, have been good to have much more comprehensive quantitative data on the impact from c1 to 3, and on the various types of companies based on their path variable.

Longitude data will help map the effect of government funding policies. This should, however, be combined with the experiences of the entrepreneurs themselves. This could be in the form of entrepreneurs being requested, once grants are given, to write a diary, and keep notes on the importance of the different policies. The research in this study shows that government funding policies are of primary importance to first-time entrepreneurs, these policies becoming less and less important the more experience, network and tacit knowledge the entrepreneur accumulates. However, and irrespective of this, government funding policies need to be drastically improved in c3. More research should therefore be conducted specifically into this, to find the best ways forward.

9 Bibliography

Acemoglu, D., & Robinson, J. (2014). Why nations fail. *Revija Za Socijalnu Politiku*. https://doi.org/10.3935/rsp.v21i3.1238

Acs, Z. J., Audretsch, D. B., Lehmann, E. E., & Licht, G. (2017). National systems of innovation. *Journal of Technology Transfer*. https://doi.org/10.1007/s10961-016-9481-8

Adelman, C. (1993). Kurt Lewin and the Origins of Action Research. *Educational Action Research*. https://doi.org/10.1080/0965079930010102

Aghion, P., Askenazy, P., Berman, N., Cette, G., Eymard, L., Bocconi, L., … Companies, H. (2011). The relationship between R&D collaboration, subsidies and R&D performance: Empirical evidence from Finland and Germany. *Research Policy*. https://doi.org/10.1002/jae.992

Aldrich, C., & Morton, T. E. (1975). Optimal Funding Paths for a Class of Risky R&D Projects. *Management Science*. https://doi.org/10.1287/mnsc.21.5.491

Ali, M., & van Tol, M. (2019). *WO2016034542A1*. Retrieved from https://patents.google.com/patent/WO2016034542A1

Alsos, G. A., Clausen, T. H., Hytti, U., & Solvoll, S. (2016). Entrepreneurs' social identity and the preference of causal and effectual behaviours in start-up processes. *Entrepreneurship and Regional Development*. https://doi.org/10.1080/08985626.2016.1155742

Alvesson, M., & Kärreman, D. (2007). Constructing mystery: Empirical matters in theory development. *Academy of Management Review*. https://doi.org/10.5465/AMR.2007.26586822

Alvesson, M., & Sandberg, J. (2011). Generating research questions through problematization. *Academy of Management Review*. https://doi.org/10.5465/amr.2009.0188

Alvesson, M., & Sandberg, J. (2014). Problematization meets mystery creation: Generating new ideas and findings through assumption-challenging research. In *Critical Management Research: Reflections from the Field*. https://doi.org/10.4135/9781446288610.n2

Alvesson, M., & Spicer, A. (2012). Critical leadership studies: The case for critical performativity. *Human Relations*. https://doi.org/10.1177/0018726711430555

Amorós, J., & Bosma, N. (2014). *Global Entrepreneurship Monitor: 2013 Global Report*. *Recovered on February*.

Argyris, Ch., & Schön, D. A. (2010). Organizational Learning: A Theory of Action Perspective. *Reis*. https://doi.org/10.2307/40183951

Argyris, Chris. (2006). Single-Loop and Double-Loop Models in Research on Decision Making. *Administrative Science Quarterly*. https://doi.org/10.2307/2391848

Arogyaswamy, B. (2020). Big tech and societal sustainability: an ethical framework. *AI and Society*. https://doi.org/10.1007/s00146-020-00956-6

Asheim, B. (2012). The Changing Role of Learning Regions in the Globalizing Knowledge Economy: A Theoretical Re-examination. *Regional Studies*. https://doi.org/10.1080/00343404.2011.607805

Asheim, B. T., & Coenen, L. (2005). Knowledge bases and regional innovation systems: Comparing Nordic clusters. *Research Policy*. https://doi.org/10.1016/j.respol.2005.03.013

Asheim, B. T., & Gertler, M. S. (2009). The Geography of Innovation: Regional Innovation Systems. In *The Oxford Handbook of Innovation*. https://doi.org/10.1093/oxfordhb/9780199286805.003.0011

Asheim, B. T., & Isaksen, A. (2002). Regional innovation systems: The integration of local "sticky" and global "ubiquitous" knowledge. *Journal of Technology Transfer*.

https://doi.org/10.1023/A:1013100704794

Asheim, T. B. (2003). *Regional innovation policy for small-medium enterprises*. *Regional Innovation Policy For Small-Medium Enterprises*. https://doi.org/10.4337/9781781009659

Aslesen, H. W. (2009). The Innovation System of Norwegian Aquacultured Salmonids. In *Innovation, Path Dependency, and Policy: The Norwegian Case*. https://doi.org/10.1093/acprof:oso/9780199551552.003.0008

Aslesen, H. W., Isaksen, A., & Karlsen, J. (2012). Modes of Innovation and Differentiated Responses to Globalisation-A Case Study of Innovation Modes in the Agder Region, Norway. *Journal of the Knowledge Economy*. https://doi.org/10.1007/s13132-011-0060-9

Audretsch, D. B., & Belitski, M. (2017). Entrepreneurial ecosystems in cities: establishing the framework conditions. *Journal of Technology Transfer*. https://doi.org/10.1007/s10961-016-9473-8

Audretsch, D., & Thurik, R. (2004). A Model of the Entrepreneurial Economy. *International Journal of Entrepreneurship Education*.

Aulet, B., & Murray, F. (2013). *A Tale of Two Entrepreneurs: Understanding Differences in the Types of Entrepreneurship in the Economy*. *Ewing Marion Kauffman Foundation*. https://doi.org/10.2139/ssrn.2259740

Azoulay, P., Jones, B., Kim, J. D., & Miranda, J. (2018). Research: The Average Age of a Successful Startup Founder Is 45. *Harvard Business Review*.

Bærland, A. (2020, November 24). Huddlestock mot børs. *Finansavisen*. Retrieved from https://finansavisen.no/nyheter/teknologi/2020/11/24/7591715/huddlestock-mot-bors?fbclid=IwAR3OvZGJf_Y-_-zQje74LeFdL61XavBJvSYY6S5k-jtrYPSSBp8PvE-ucdg

Barrenhag, L., Fornell, A., Larsson, G., Mårdström, V., Westergård, V., & Wrackefeldt, S. (2012). Accelerating Success : A Study of Seed

Accelerators and Their Defining Characteristics. *Bachelor Thesis*.

Barrett, P. M., Satariano, A., & Burrows, P. (2012). Technology: Apple vs Samsung - The Longer View. *Businessweek*.

Bekkers, R., Bodas Freitas, I. M., Benavente, J. M., Bercovitz, J. E. L., Feldman, M. P., Bishop, K., … Knockaert, M. (2015). Subsidy and networking: The effects of direct and indirect support programs of the cluster policy. *Research Policy*. https://doi.org/10.1016/j.respol.2010.09.017

Berge, P., Ueland, G., Dagsland, T., & Ali, M. (2017). *WO2017126978A1*. WIPO/PCT. Retrieved from https://patents.google.com/patent/WO2017126978A1/fr?assignee=reemsys&oq=reemsys

Bjergaard, A. P. (2020). Tror teknologi vil knuse finansbransjen. *Finansavisen*. Retrieved from https://finansavisen.no/nyheter/finans/2020/10/06/7572959/stig-myrseth-tror-teknologiselskapene-vil-ta-over-hegemoniet-i-finansbransjen

Block, F., & Keller, M. R. (2011). Where do innovations come from? Transformations in the US economy, 1970–2006. In *Knowledge Governance: Reasserting the Public Interest*. https://doi.org/10.7135/UPO9780857285522.006

Bourdieu, P. (1977). Outline of a Theory of Practice. *Cambridge Studies in Social Anthropology*. https://doi.org/10.1590/S0103-20702013000100001

Bricki, N., & Green, J. (2007). A Guide to Using Qualitative Research Methodology. *Medecins Sans Frontieres*. https://doi.org/10.1109/PROC.1978.11033

Bryman, A. (1984). The Debate about Quantitative and Qualitative Research: A Question of Method or Epistemology? *The British Journal of Sociology*. https://doi.org/10.2307/590553

Cappelen, Å., Fjærli, E., Foyn, F., Hægeland, T., Møen, J., Raknerud, A., … Rybalka, M. (2010). Evaluation of the Norwegian R&D Tax

Credit Scheme. *Journal of Technology Management & Innovation*. https://doi.org/10.4067/S0718-27242010000300007

Cappelen, Å., Raknerud, A., & Rybalka, M. (2012a). The effects of R&D tax credits on patenting and innovations. *Research Policy*. https://doi.org/10.1016/j.respol.2011.10.001

Cappelen, Å., Raknerud, A., & Rybalka, M. (2012b). The effects of R&D tax credits on patenting and innovations. *Research Policy*. https://doi.org/10.1016/j.respol.2011.10.001

Cassar, G. (2004). The financing of business start-ups. *Journal of Business Venturing*. https://doi.org/10.1016/S0883-9026(03)00029-6

Castellacci, F., Clausen, T. H., Nås, S. O., & Verspagen, B. (2009). Historical Fingerprints? A Taxonomy of Norwegian Innovation. In *Innovation, Path Dependency, and Policy: The Norwegian Case*. https://doi.org/10.1093/acprof:oso/9780199551552.003.0005

Castellaci, F. (2008). Innovation in Norway in a European Perspective. *Nordic Journal of Political Economy*.

CB Insights. (2017). Global Wealth Innovators.

Ceulemans, S., & Kolls, J. K. (2013). Can the SBIR and STTR programs advance research goals? *Nature Immunology*. https://doi.org/10.1038/ni.2495

Charlesen, H. (2019). Huddlestock kapret BNP Paribas. *Finansavisen*.

Chemmanur, T. J., Loutskina, E., & Tian, X. (2014). Corporate venture capital, value creation, and innovation. *Review of Financial Studies*. https://doi.org/10.1093/rfs/hhu033

Chesbrough, H. (2006). Open Innovation: A New Paradigm for Understanding Industrial Innovation. *Open Innovation: Researching a New Paradigm*. https://doi.org/citeulike-article-id:5207447

Chesbrough, H. (2007). Business model innovation: It’s not just about technology anymore. *Strategy and Leadership*.

https://doi.org/10.1108/10878570710833714

Clausen, T. H. (2009a). Do subsidies have positive impacts on R&D and innovation activities at the firm level? *Structural Change and Economic Dynamics*. https://doi.org/http://dx.doi.org/10.1016/j.strueco.2009.09.004

Clausen, T. H. (2009b). Do subsidies have positive impacts on R&D and innovation activities at the firm level? *Structural Change and Economic Dynamics*. https://doi.org/10.1016/j.strueco.2009.09.004

Clausen, T. H. (2009c). Industrial R&D Policy in Norway: Who Gets the Funding and What are the Effects? In *Innovation, Path Dependency, and Policy: The Norwegian Case*. https://doi.org/10.1093/acprof:oso/9780199551552.003.0013

Clough, P., & Nutbrown, C. (2002). Research Design: shaping the study. *A Student's Guide to Methodology: Justifying Inquiry*.

Creswel, J. W. (2008). The Selection of a Research Approach. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. https://doi.org/45593:01

Creswell, J. W. (2007). Research Design: Qualitative, Quantitative and Mixed Method Aproaches. *SAGE Publications*. https://doi.org/10.4135/9781849208956

D'Andrea, M. (2013). The rise of the creative class revisited. *International Journal of Cultural Policy*. https://doi.org/10.1080/10286632.2012.730042

De Bernardi, P., & Azucar, D. (2020). Funding innovation and entrepreneurship. In *Contributions to Management Science*. https://doi.org/10.1007/978-3-030-33502-1_8

Delgado, M., Porter, M. E., & Stern, S. (2010). Clusters and entrepreneurship. *Journal of Economic Geography*. https://doi.org/10.1093/jeg/lbq010

Duening, T. N., Hisrich, R. D., & Lechter, M. A. (2015). Technology Entrepreneurship. *Technology Entrepreneurship*.

https://doi.org/10.1016/B978-0-12-420175-0.00003-8

Enersgård, B. (2018). Siri Kalvig skal lede Fornybar-fondet. *Rogalandsavis*.

Engen, O. A. (2009). The Development of the Norwegian Petroleum Innovation System: A Historical Overview. In *Innovation, Path Dependency, and Policy: The Norwegian Case*. https://doi.org/10.1093/acprof:oso/9780199551552.003.0007

Erichsen, V. M. (2019). Huddlestock landed avtale med europeisk storbank. *Shifter*.

Erichsen, V. M. (2020). Rakettvekst i fintech-gründerens solprosjekt. *Shifter*. Retrieved from https://shifter.no/nyheter/rakettvekst-i-fintech-grnderens-solprosjekt/181577

Etemad, H. (2009). Internationalization of Small and Medium-sized Enterprises: A Grounded Theoretical Framework and an Overview. *Canadian Journal of Administrative Sciences / Revue Canadienne Des Sciences de l'Administration*. https://doi.org/10.1111/j.1936-4490.2004.tb00319.x

Euchner, J. (2013). What Large Companies Can Learn from Start-ups. *Research Technology Management*. https://doi.org/10.5437/08956308X5604003

Fagerberg, J. (1988). International Competitiveness. *The Economic Journal*. https://doi.org/10.2307/2233372

Fagerberg, J. (1994). Technology and international differences in growth rates. *Journal of Economic Literature*. https://doi.org/10.2307/2728605

Fagerberg, J. (2002). A Layman's Guide to Evolutionary Economics. *Darwin*. https://doi.org/10.1038/210052b0

Fagerberg, J. (2003). Schumpeter and the revival of evolutionary economics: An appraisal of the literature. *Journal of Evolutionary Economics*. https://doi.org/10.1007/s00191-003-0144-1

Fagerberg, J., Feldman, M. P., & Srholec, M. (2014). Technological dynamics and social capability: US states and European nations. *Journal of Economic Geography*. https://doi.org/10.1093/jeg/lbt026

Fagerberg, J., Mowery, D. C., & Verspagen, B. (2009). *Innovation, Path Dependency, and Policy: The Norwegian Case*. *Innovation, Path Dependency, and Policy: The Norwegian Case*. https://doi.org/10.1093/acprof:oso/9780199551552.001.0001

Fagerberg, J., & Sapprasert, K. (2011). National innovation systems: The emergence of a new approach. *Science and Public Policy*. https://doi.org/10.3152/030234211X13070021633369

Fagerberg, J., & Srholec, M. (2008). National innovation systems, capabilities and economic development. *Research Policy*. https://doi.org/10.1016/j.respol.2008.06.003

Field, R. (2014). Disciplined Entrepreneurship: 24 Steps to a Successful Startup by Bill Aulet. *Journal of Business & Finance Librarianship*. https://doi.org/10.1080/08963568.2014.855091

Finansieringsordninger for oppstartsselskaper. (2020). Retrieved October 10, 2020, from https://www.innovasjonnorge.no/no/verktoy/verktoy-for-oppstart-av-bedrift/kan-du-fa-stotte-fra-innovasjon-norge/

Finextra. (2016). Huddlestock raises 1.5 mill USD in seed. *Finextra*.

Finextra. (2019). Huddlestock merges with norwegian fund manager, and names new CEO. *Finextra*. Retrieved from https://www.finextra.com/pressarticle/78323/huddlestock-merges-with-norwegian-fund-manager-names-new-ceo

Fitjar, R. D., & Rodríguez-Pose, A. (2015). Interaction and Innovation across Different Sectors: Findings from Norwegian City-Regions. *Regional Studies*. https://doi.org/10.1080/00343404.2015.1016415

Flanagan, K., & Uyarra, E. (2016). Four dangers in innovation policy studies – and how to avoid them. *Industry and Innovation*. https://doi.org/10.1080/13662716.2016.1146126

Florida, R. (2002). The Rise of the Creative Class. *Washington Monthly*. https://doi.org/10.1111/j.1467-8691.2006.00398.x

Florida, R., Adler, P., & Mellander, C. (2017). The city as innovation machine. *Regional Studies*. https://doi.org/10.1080/00343404.2016.1255324

Forbes, D. P. (2005). Managerial determinants of decision speed in new ventures. *Strategic Management Journal*. https://doi.org/10.1002/smj.451

Forskningsrådet. (2020a). Calls for Industry.

Forskningsrådet. (2020b). FORNY2020.

Forskningsrådet. (2020c). SkatteFUNN.

Fowle, M. (2018). The entrepreneurial dream: Happiness, depression and freedom. *Proceedings of the European Conference on Innovation and Entrepreneurship, ECIE*.

Frick, J., & Ali, M. M. (2014). The Importance of Emerging Markets for Petroleum Technology Companies in Norway: Management and Entry Operation Strategies. In *IFIP Advances in Information and Communication Technology*. https://doi.org/10.1007/978-3-662-44733-8_60

Friestad, J. H. (2017). Oljebedrift satser på redningsutstyr for spedbarn. *Stavanger Aftenblad*.

George, G., & Bock, A. J. (2011). The Business Model in Practice and its Implications for Entrepreneurship Research. *Entrepreneurship: Theory and Practice*. https://doi.org/10.1111/j.1540-6520.2010.00424.x

Giebe, T., Grebe, T., Wolfstetter, E., Acs, Z. J., Audretsch, D. B., Andersen, K. V., … Meissner, J. O. (2008). The Financing of Research and Development. *Research Policy*. https://doi.org/10.1002/jae.992

Gompers, P. A., Lerner, J., Silviera, R., & Wright, R. (2007). The Venture Capital Cycle. *Working Paper Available at*

Https://Www.Aeaweb.Org/Assa/2009/Retrieve.Php?Pdfid=11. https://doi.org/HG4963.G66

Gornall, W., & Strebulaev, I. A. (2015). The Economic Impact of Venture Capital: Evidence from Public Companies. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2681841

Grønning, T. (2009). The Biotechnology Industry in Norway: A Marginal Sector or Future Core Activity? In *Innovation, Path Dependency, and Policy: The Norwegian Case*. https://doi.org/10.1093/acprof:oso/9780199551552.003.0009

Habermas, J. (1991). *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society. Contemporary Sociology*. https://doi.org/10.2307/2072652

Hall, B. H., & Lerner, J. (2010). The financing of R&D and innovation. *Handbook of the Economics of Innovation*. https://doi.org/10.1016/S0169-7218(10)01014-2

Hansen, M. T., Chesbrough, H. W., Nohria, N., & Sull, D. N. (2000). Networked incubators. Hothouses of the new economy. *Harvard Business Review*. https://doi.org/Article

Hardaker, A. (2018). Fintech Startup gets new CEO. *BusinessCloud*. Retrieved from https://www.businesscloud.co.uk/news/fintech-start-up-gets-new-ceo/

Harnes, M. P. (2020). Solgründerne i Norsk Solar henter 130 mill NOK. *Shifter*.

Hart, M. A. (2012). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses Eric Ries. New York: Crown Business, 2011. 320 pages. US$26.00. *Journal of Product Innovation Management*. https://doi.org/10.1111/j.1540-5885.2012.00920_2.x

Hawkins, R. (2015). Marianna Mazzucato The Entrepreneurial State: Debunking Public vs Private Sector Myths. *Science and Public Policy*. https://doi.org/10.1093/scipol/scu071

Hervas-Oliver, J.-L., Gonzalez, G., Caja, P., Sempere-Ripoll, F., Breschi, S., Lenzi, C., … Schumpeter, J. (2011). Economic welfare and the allocation of resources for invention. *Research Policy*. https://doi.org/10.1108/13673270810902920

Hisrich, R. D. (1990). Entrepreneurship/intrapreneurship. *American Psychologist*. https://doi.org/10.1037/0003-066X.45.2.209

Hisrich, R., Langan-Fox, J., & Grant, S. (2007). Entrepreneurship Research and Practice: A Call to Action for Psychology. *American Psychologist*. https://doi.org/10.1037/0003-066X.62.6.575

Holcombe, R. G. (2003). The origins of entrepreneurial opportunities. *Review of Austrian Economics*. https://doi.org/10.1023/A:1022953123111

Holden, S. (2013). Avoiding the resource curse the case Norway. *Energy Policy*. https://doi.org/10.1016/j.enpol.2013.09.010

Howells, J. (1996). Tacit knowledge, innovation and technology transfer. *Technology Analysis and Strategic Management*. https://doi.org/10.1080/09537329608524237

Iammarino, S. (2005). An evolutionary integrated view of regional systems of innovation: Concepts, measures and historical perspectives. *European Planning Studies*. https://doi.org/10.1080/09654310500107084

Innovasjon Norge. (2020). In *Wikipedia*.

Isaksen, A., & Karlsen, J. (2010). Different modes of innovation and the challenge of connecting universities and industry: Case studies of two regional industries in Norway. *European Planning Studies*. https://doi.org/10.1080/09654313.2010.516523

Isaksen, A., & Karlsen, J. (2013). Can small regions construct regional advantages? The case of four Norwegian regions. *European Urban and Regional Studies*. https://doi.org/10.1177/0969776412439200

Isaksen, A., & Trippl, M. (2016). Path development in different regional innovation systems: A conceptual analysis. In *Innovation Drivers and Regional Innovation Strategies*.

https://doi.org/10.4324/9781315671475

Kamien, M. I., & Schwartz, N. L. (1978). Self-Financing of an R & D Project. *American Economic Review*.

Karlsen, J., & Larrea, M. (2018). Regional innovation system as a framework for the co-generation of policy: An action research approach. In *New Avenues for Regional Innovation Systems - Theoretical Advances, Empirical Cases and Policy Lessons*. https://doi.org/10.1007/978-3-319-71661-9_13

Karlsson, C., & Warda, P. (2014). Entrepreneurship and innovation networks. *Small Business Economics*. https://doi.org/10.1007/s11187-014-9542-z

Kawasaki, G. (2004). *The Art of the Start*. *Int J Syst Evol Microbiol*.

Kawaski, G. (2000). *Rules for Revolutionaries*. *Notes on the eCustomerExperience Conference*.

Kemmis, S. (2009). Action research as a practice-based practice. *Educational Action Research*. https://doi.org/10.1080/09650790903093284

Kemmis, S. (2010). What is to be done? the place of action research. *Educational Action Research*. https://doi.org/10.1080/09650792.2010.524745

Kenney, M. (2015). Venture Capital. In *International Encyclopedia of the Social & Behavioral Sciences: Second Edition*. https://doi.org/10.1016/B978-0-08-097086-8.73018-2

Kerr, W. R., Nanda, R., & Rhodes-Kropf, M. (2014). Entrepreneurship as Experimentation. *Journal of Economic Perspectives*. https://doi.org/10.1257/jep.28.3.25

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. *Nature*. https://doi.org/10.2307/2278703

Kirzner, I. M. (2009). The alert and creative entrepreneur: A clarification. *Small Business Economics*. https://doi.org/10.1007/s11187-008-9153-7

Klette, T. J., & Møen, J. (2012). R&D investment responses to R&D subsidies: a theoretical analysis and a microeconometric study) 'R&D investment responses to R&D subsidies: a theoretical analysis and a microeconometric study. *World Review of Science, Technology and Sust. Development World Review of Science Technology and Sustainable Development*. https://doi.org/10.1504/WRSTSD.2012.047687

Klitkou, A., & Coenen, L. (2013). The Emergence of the Norwegian Solar Photovoltaic Industry in a Regional Perspective. *European Planning Studies*. https://doi.org/10.1080/09654313.2012.753691

Kortum, S. S., & Lerner, J. (1998). Does Venture Capital Spur Innovation? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.10583

Kroknes, V. F., Jakobsen, T. G., & Grønning, L.-M. (2015). Economic Performance and Political Trust: The impact of the financial crisis on European citizens. *European Societies*. https://doi.org/10.1080/14616696.2015.1124902

Kuhlmann, S., & Arnold, E. (2001). RCN in the Norwegian Research and Innovation System. *Background Report No 12 in the Evaluation of the Research Council in Nor- Way*.

Lagendijk, A., & Cornford, J. (2000). Regional institutions and knowledge - Tracking new forms of regional development policy. *Geoforum*. https://doi.org/10.1016/S0016-7185(99)00031-7

Langeland, O. (2007). Financing innovation: The role of norwegian venture capitalists in financing knowledge-intensive enterprises. *European Planning Studies*. https://doi.org/10.1080/09654310701529029

Laursen, K., & Salter, A. (2005). Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms. *Strategic Management Journal*. https://doi.org/10.1002/smj.507

Lavoie, M. (2009). *Introduction to post-Keynesian economics*. *Introduction to Post-Keynesian Economics*. https://doi.org/10.1057/9780230235489

Lazonick, W. (2010). Innovative business models and varieties of capitalism: Financialization of the U.S. corporation. *Business History Review*. https://doi.org/10.1017/S0007680500001987

Lazonick, W. (2014). Profits without prosperity. *Harvard Business Review*. https://doi.org/10.1353/abr.2012.0147

Lazonick, W., & Mazzucato, M. (2012). The Risk-Reward Nexus. *Policy Network*.

Lee, P. (2016). Huddlestock aims to disrupt institutional asset management. *Euromoney*.

Lee, S. Y., Florida, R., & Acs, Z. J. (2004). Creativity and entrepreneurship: A regional analysis of new firm formation. *Regional Studies*. https://doi.org/10.1080/0034340042000280910

Level39. (2017). Norway's Crown Prince makes first live trade on Huddlestock.

Level39. (2018). Huddlestock announces Simen Teigre as new CEO.

Løvås, J. (2019). Vindvinner skal bygge solpark i Pakistan. *Dagens Næringsliv*.

Lundvall, B.-Å. ;, & Borrás, S. (2005). Science, Technology, and Innovation Policy. In *Oxford Handbook of Innovation*.

Lundvall, B.-Å. (2011). Notes on innovation systems and economic development. *Innovation and Development*. https://doi.org/10.1080/2157930x.2010.551064

Madsen, E., Alsos, G., Borch, O., Ljunggren, E., & Brastad, B. (2007). Developing Entrepreneurial Orientation-The role of Dynamic Capabilities and. In *Regional Frontiers of Entrepreneurship Research*. https://doi.org/papers://BA75DBD3-74D3-4A2D-AAAC-910414082C6C/Paper/p11814

Mäkitie, T., Normann, H. E., Thune, T. M., & Sraml Gonzalez, J. (2019). The green flings: Norwegian oil and gas industry's engagement in offshore wind power. *Energy Policy*. https://doi.org/10.1016/j.enpol.2018.12.015

Mazzucato, M. (2013). State of innovation. *New Scientist*. https://doi.org/10.1016/S0262-4079(13)62088-6

Mazzucato, M. (2015). *Building the Entrepreneurial State: A New Framework for Envisioning and Evaluating a Mission-Oriented Public Sector*. *SSRN*. https://doi.org/10.2139/ssrn.2544707

Mazzucato, M. (2017). Mission-oriented innovation policy. *UCL Institute for Innovation and Public Purpose Working Paper*. https://doi.org/10.1080/13662716.2016.1146124

McGimpsey, I., Tannock, S., & Lauder, H. (2016). Postcapitalism: a guide to our future. *British Journal of Sociology of Education*. https://doi.org/10.1080/01425692.2016.1223702

McGinn, D. (2012). Too many pivots, too little passion. *Harvard Business Review*.

McKinley, W. (2008). The mystery about mysteries: A commentary on Alvesson and Kärreman. *Academy of Management Review*. https://doi.org/10.5465/amr.2008.31193559

Mcniff, J., & Whitehead, J. (2002). *Action Research : Principles and Practice*. *Educational Research*.

McNiff, J., & Whitehead, J. (2006). All You Need to Know About Action Research (An Introduction). *Journal of Social Issues*. https://doi.org/10.4324/9780203305676

McNiff, J., & Whitehead, J. (2009). Writing an action research proposal. In *Doing and writing action research*.

Meisingset, S. (2021). Skulket og strøk på videregående: I dag er gründerselskapet verdt 600 millioner. *Dagens Næringsliv*. Retrieved from https://www.dn.no/teknologi/fintech/finansteknologi/borsnotering/skulket-og-strok-pa-videregaende-i-dag-er-grunderselskapetverdt-600-millioner/2-1-943305

Meyer, K. E., Mudambi, R., & Narula, R. (2011). Multinational Enterprises and Local Contexts: The Opportunities and Challenges of Multiple Embeddedness. *Journal of Management Studies*. https://doi.org/10.1111/j.1467-6486.2010.00968.x

Meyer, T., Stobbe, A., Kaiser, S., & Walter, N. (2008). Venture Capital : bridge between idea and innovation. *Economics*.

Meyers, K. (2020). Entrepreneurs of an certain age, in this uncertain time. *Kauffmann Foundation*.

Minniti, M. (2005). Entrepreneurship and network externalities. *Journal of Economic Behavior and Organization*. https://doi.org/10.1016/j.jebo.2004.10.002

Mokyr, J. (2011). *The Lever of Riches: Technological Creativity and Economic Progress*. *The Lever of Riches: Technological Creativity and Economic Progress*. https://doi.org/10.1093/acprof:oso/9780195074772.001.0001

Nair, R. (2003). The art of growing a company: An entrepreneurial monologue. *Vikalpa*. https://doi.org/10.1177/0256090920030106

Narula, R. (2002). Innovation systems and “inertia” in R&D location: Norwegian firms and the role of systemic lock-in. *Research Policy*. https://doi.org/10.1016/S0048-7333(01)00148-2

Narula, R. (2004). R&D collaboration by SMEs: New opportunities and limitations in the face of globalisation. *Technovation*. https://doi.org/10.1016/S0166-4972(02)00045-7

Narula, R. (2012). Do we need different frameworks to explain infant MNEs from developing countries? *Global Strategy Journal*. https://doi.org/10.1111/j.2042-5805.2012.01035.x

NEFCO. (2019). Norsk Solar to construct a solar power plant in Ukraine with NEFCO financing. Retrieved from https://www.nefco.org/news/norsk-solar-to-construct-a-solar-power-plant-in-ukraine-with-nefco-financing/

Nikolaisen, P.-I. (2019). Huddlestock og Dovre vil bli ny fintech-kjempe: “Flere bør slå sammen kreftene.” *Shifter*.

Nikolaisen, P.-I. (2021). Solgründere går på børs: Henter over 100 millioner. *Shifter*. Retrieved from https://shifter.no/nyheter/solgrndere-gar-pa-bors-henter-over-100-millioner/206068

Nordic9. (2014). Reemsys. Retrieved from https://nordic9.com/companies/reemsys-company8438495304/

NRK. (2015). Finansteknologi fra Universitetet. *NRK*.

NSA. (2017). National Winners 2017. Retrieved from https://nordicstartupawards.com/national-winners-2017

Ordanini, A., Miceli, L., Pizzetti, M., & Parasuraman, A. (2011). Crowd-funding: Transforming customers into investors through innovative service platforms. *Journal of Service Management*. https://doi.org/10.1108/09564231111155079

Osterwalder, Alexander;, & Pigneur, Y. (2010). *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. *A handbook for visionaries, game changers, and challengers*. https://doi.org/10.1523/JNEUROSCI.0307-10.2010

Osterwalder, Alexander. (2004). The Business Model Ontology - A Proposition in a Design Science Approach. *Business*. https://doi.org/10.1111/j.1467-9310.2010.00605.x

Osterwalder, Alexander, & Pigneur, Y. (2010). *Business Model Generation*. *A Handbook for Visionaries, Game Changers, and Challengers*. https://doi.org/10.1523/JNEUROSCI.0307-10.2010

Parker, D. (2020). Postcapitalism. *Counterfutures*. https://doi.org/10.26686/cf.v2i0.6437

Patel, N. (2015). 90% Of Startups Fail. *Forbes*.

Patel, P., & Pavitt, K. (1997). The technological competencies of the world’s largest firms: Complex and path-dependent, but not much variety. *Research Policy*. https://doi.org/10.1016/S0048-

7333(97)00005-X

Pavitt, K. (1984). Sectoral patterns of technical change: Towards a taxonomy and a theory. *Research Policy*. https://doi.org/10.1016/0048-7333(84)90018-0

Pernecky, Jack, M. (2016). Action Research Methodology. *Bulletin of the Council for Research in Music Education*.

Peyton, A. (2018). Huddlestock and Acuity bring mobile trading to Sri Lanka. *Fintech Futures*. Retrieved from https://www.fintechfutures.com/2018/01/huddlestock-and-acuity-bring-mobile-trading-to-sri-lanka/

Phan, P. H., & Der Foo, M. (2004). Technological entreprenuership in emerging regions. *Journal of Business Venturing*. https://doi.org/10.1016/S0883-9026(02)00116-7

Pitelis, C., Sugden, R., & Wilson, J. R. (2006). *Clusters and globalisation: The development of urban and regional economies*. *Clusters and Globalisation: The Development of Urban and Regional Economies*.

Plummer, L. A., Haynie, J. M., & Godesiabois, J. (2007). An essay on the origins of entrepreneurial opportunity. *Small Business Economics*. https://doi.org/10.1007/s11187-006-9036-8

Popper, K. (1963). Science as Falsification. *Conjectures and Refutations, Readings in the Philosophy of Science*. https://doi.org/10.2307/3517358

Powell, W. W., & Grodal, S. (2005). Network of innovators. In *The Oxford Handbook of Innovation*.

Prelipcean, G., & Boscoianu, M. (2008). Venture Capital Strategies for Innovative SME’s. *Annals of the University of Oradea, Economic Science Series*.

Produktdesign, P. (2015). Reemsys Process.

Quattrone, G., Proserpio, D., Quercia, D., Capra, L., & Musolesi, M. (2016). Who Benefits from the “Sharing” Economy of Airbnb? In

Proceedings of the 25th International Conference on World Wide Web - WWW '16. https://doi.org/10.1145/2872427.2874815

Reason, P., & Bradbury, H. (2006a). Handbook of Action Research. *Participative Inquiry and Practice London*. https://doi.org/0432

Reason, P., & Bradbury, H. (2006b). The Handbook of Action Research - Introduction. *The Handbook of Action Research - Concise Paperback Edition*. https://doi.org/0432

Ries, E. (2011). Build, Measure, Learn. *Inc.*

Ries, E. (2016). The Lean Startup by Eric Ries. *The Starta*. https://doi.org/23

Rodríguez-Pose, A., & Comptour, F. (2012). Do Clusters Generate Greater Innovation and Growth? An Analysis of European Regions. *The Professional Geographer*. https://doi.org/10.1080/00330124.2011.583591

Rothaermel, F., & King, D. (2015). Tesla Motors, Inc. *Harvard Business Review*. https://doi.org/MH0032

Ruzzier, M., Hisrich, R. D., & Antoncic, B. (2006). SME internationalization research: past, present, and future. *Journal of Small Business and Enterprise Development*. https://doi.org/10.1108/14626000610705705

Sandø, T. (2013). Disse seks konkurrerer om 1 million. *Stavanger Aftenblad*. Retrieved from https://www.aftenbladet.no/okonomi/i/7yOBW/Disse-seks-konkurrerer-om-1-million

Saxenian, A. (2015). Regional Networks and the Resurgence of Silicon Valley. *California Management Review*. https://doi.org/10.2307/41166640

Schacht, W. H. (2013). Small business innovation research (SBIR) program. In *Small Business Administration Programs: Overview and Considerations*.

Schön, D. A. (1983). From Technical Rationality to Reflection-in-Action.

In *The Reflective Practitioner. How Professionals think in Action*.

Schumpeter, J. A. (1934). *The Theory of Economic Development*. *Harvard University Press*. https://doi.org/10.1007/0-306-48082-4_3

Schumpeter, J. a. (1942). The process of creative destruction. *Capitalism Socialism and Democracy*. https://doi.org/10.1002/sej.36

Singer, S., Amorós, E., & Moska, D. (2015). *Global Entrepreneurship Monitor - 2014 Global Report*. *Global Entrepreneurship Monitor*. https://doi.org/ISBN: 978-1-939242-05-1

Sogner, K. (2007). The fall and rise of the Norwegian IT industry in the global age, 1970-2005. *Business History Review*. https://doi.org/10.2307/25097421

Sogner, K. (2009a). Innovation as adaptation: The digital challenge in the norwegian fishing industry, 1970-1985. *Business History Review*. https://doi.org/10.1017/S0007680500000556

Sogner, K. (2009b). Slow Growth and Revolutionary Change: The Norwegian IT Industry Enters the Global Age, 1970-2005. In *Innovation, Path Dependency, and Policy: The Norwegian Case*. https://doi.org/10.1093/acprof:oso/9780199551552.003.0010

Sprowls, C. (1994). Hard drive: Bill Gates and the making of the Microsoft empire. *The Journal of Strategic Information Systems*. https://doi.org/10.1016/0963-8687(94)90014-0

SSB. (2020). Nyetablerte foretaks overlevelse og vekst. Retrieved September 10, 2020, from https://www.ssb.no/fordem

Stake, R. E. (2005). Qualitative case studies. In *The sage handbook of qualitative research*. https://doi.org/10.1016/b978-0-08-044894-7.01532-3

Stangler, D. (2014). In Search of a Second Act: The Challenges and Advantages of Senior Entrepreneurship.

Talukdar, G. (2017). Acuity Partners teams up with ground breaking fintech innovation Huddlestock. *Daily Financial Times*.

Tandsæther-Andersen, B. (2018). Murshid Ali går av som CEO i Huddlestock - Simen Teigre tar over. *Shifter*.

Thiel, P. (2014). Competition Is for Losers. *Wall Street Journal*.

Tödtling, F., van Reine, P. P. homme, & Dörhöfer, S. (2011). Open Innovation and Regional Culture-Findings from Different Industrial and Regional Settings. *European Planning Studies*. https://doi.org/10.1080/09654313.2011.618688

Uyarra, E. (2009). What is evolutionary about "regional systems of innovation"? Implications for regional policy. *Journal of Evolutionary Economics*. https://doi.org/10.1007/s00191-009-0135-y

Uyarra, E., & Flanagan, K. (2010). From regional systems of innovation to regions as innovation policy spaces. *Environment and Planning C: Government and Policy*. https://doi.org/10.1068/c0961

Valide. (2020). Plogen.

van Hemert, P., & Nijkamp, P. (2010). Knowledge investments, business R&D and innovativeness of countries: A qualitative meta-analytic comparison. *Technological Forecasting and Social Change*. https://doi.org/10.1016/j.techfore.2009.08.007

Vass, T. E. (2008). Will More Venture Capital Spur Regional Innovation? *SSRN ELibrary*.

Visser, W. (2010). Schön : Design as a reflective practice. *Collection*.

Walker, D., & Myrick, F. (2006). Grounded theory: An exploration of process and procedure. *Qualitative Health Research*. https://doi.org/10.1177/1049732305285972

Wallsten, S. (2015). The Competitive Effects of the Sharing Economy: How is Uber Changing Taxis? *Technology Policy Institute*.

Wasserman, N. (2006). Rich Versus King: Strategic Choice and the Entrepreneur. *Business*.

Wasserman, N. (2008). The founder's Dilemma. *Harvard Business Review*.

Weldeghebriel, L. (2016). Huddlestock inngått partnerskap med Saxobank. *Shifter*.

Wicken, O. (2009a). Policies for Path Creation: The Rise and Fall of Norway's Research-Driven Strategy for Industrialization. In *Innovation, Path Dependency, and Policy: The Norwegian Case*. https://doi.org/10.1093/acprof:oso/9780199551552.003.0004

Wicken, O. (2009b). The Layers of National Innovation Systems: The Historical Evolution of a National Innovation System in Norway. In *Innovation, Path Dependency, and Policy: The Norwegian Case*. https://doi.org/10.1093/acprof:oso/9780199551552.003.0002

Wikipedia. (2020). Research Council of Norway. In *Wikipedia*.

Wood, B. (2017). Prince of Norway carries out first trade on crowdtrading platform. *Business Daily*.

Woolley, L. (2015). *Drop Tests RescuePod*. Retrieved from https://www.youtube.com/watch?v=piGcd1SIL0A&feature=emb_title

Wright, M., Robbie, K., Wright Robbie Ken, M., Wright, M., Robbie, K., Wright Robbie Ken, M., … Wright Robbie Ken, M. (1998). Venture Capital and Private Equity: A Review and Synthesis. *Journal of Business Finance & Accounting*. https://doi.org/10.1111/1468-5957.00201

Yin, R. K. (2006). Case Study Reserach - Design and Methods. *Clinical Research*. https://doi.org/10.1016/j.jada.2010.09.005

Yin, R. K. (2009). *Case Study Research: Design and Methods*. *Essential guide to qualitative methods in organizational research*. https://doi.org/10.1097/FCH.0b013e31822dda9e

Yoon, H., Yun, S., Lee, J., & Phillips, F. (2015). Entrepreneurship in East Asian Regional Innovation Systems: Role of social capital. *Technological Forecasting and Social Change*. https://doi.org/10.1016/j.techfore.2015.06.028

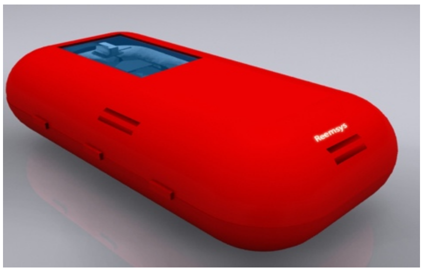
Yoon, I. J. (1995). The growth of Korean immigrant entrepreneurship in Chicago. *Ethnic and Racial Studies*. https://doi.org/10.1080/01419870.1995.9993865

10 Appendices

10.1 Appendix 1: RescuePod Product Development

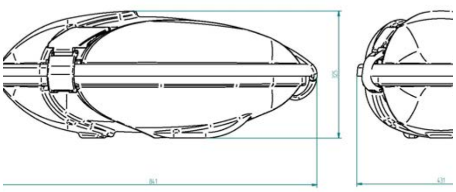
1) First design

The first Reemsys designs, developed by the entrepreneurs, were developed in-house in c1 by engineers at CTR, where RF1 worked.



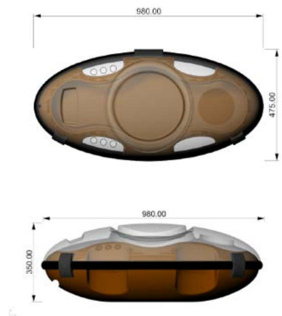
2) Second design

The second RS designs were developed as a hard-shell version by RPC, as described under Reemsys in Chapter 4.



3) Third design

The third designs, developed after initial discussions with Pivot Produktdesign, aimed to optimize the development by RPC in c1.



4) Fourth design

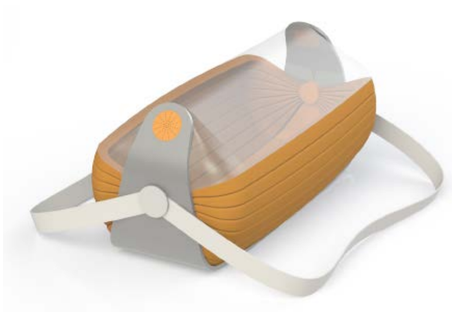
The fourth designs, which laid the foundation for the first prototype developed by Pivot Produktdesign, was based on the hard-shell version envisioned in c1.

5) First tangible product

The first tangible prototype developed by Pivot Produktdesign was primarily financed by IN. It was large, weighing almost 15 kg without an infant.

6) Fifth design

The entrepreneurs decided, after the first prototype, to change supplier and selected Inventas to develop a more light-weight, inflatable version of RescuePod. A patent was filed for this invention.



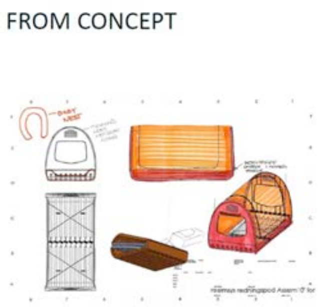
7) Second Prototype

A second prototype, which was based on Inventas' and Sub Sea Services' input, was developed and tested in the water. It worked well, the next step being certification and after that commercialization.




8) Third Prototype

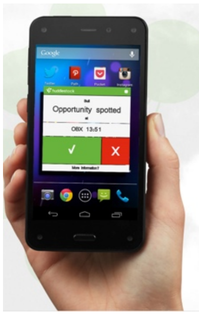
A lighter and more efficient product was developed, due to material sourcing challenges for the former prototype. The many changes implemented were also due to the many changes in Inventas project management. This was the last prototype developed for Reemsys.



10.2 Appendix 2: Huddlestock Product Development

1) First prototype

The first initial MVP (minimum viable product) was developed at the University of Stavanger using funding from the ‘Plogen’ programme from Validé.

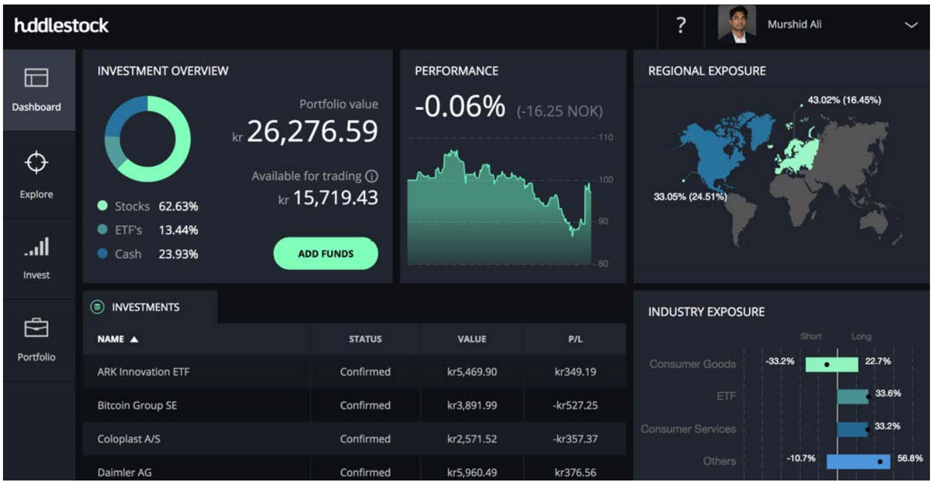


2) First product (beta-mode)

The first product, developed and launched as a closed beta in 2016, helped attract media attention and greater investor interest.

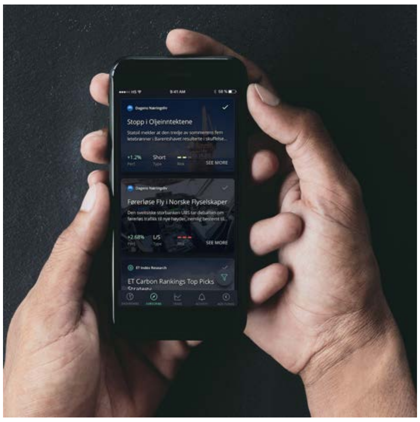
3) Second product (iteration and commercial launch)

A new and more modern design of the initial Huddlestock product was launched after attempts to increase the number of users failed.



4) Mobile application launch (iOS)

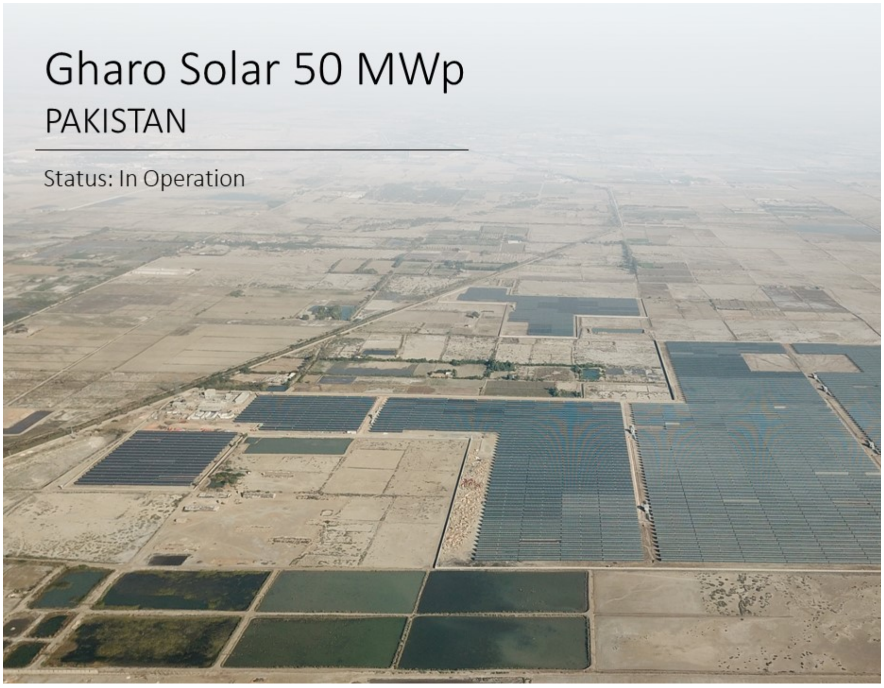
Mobile applications on both Android and iOS were developed and launched in 2017 and 2018, attracting thousands of investors.



10.3 Appendix 3: Pictures of Solar Power Plants

1) Gharo Solar

The first solar power plant Norsk Solar invested in and brought to a financial close, was Gharo Solar in 2018. The project was a major success for the company, providing above expected returns on investment. Gharo helped the company transition to c2.



2) Semypolky Solar

Semypolky Solar was a major milestone for Norsk Solar, the company for the first time leading, developing and financing a large-scale solar power project. This project played an important role in Norsk Solar transitioning to c3 and raising large amounts of capital. This ultimately led to a listing on the Norwegian Stock Exchange.

10.4 Appendix 4: Overview of Papers Written

Article Title	Data Collection Method	Authors and Publication Forums
Business Model Canvas as a tool for SME	Cross-sectional qualitative, case studies and in-depth interviews	Jan Frick and Murshid M. Ali, 20th Advances in Production Management Systems (APMS), Sep 2013, State College, PA, United States. pp.142-149
Norwegian Government Incentives for SME companies in The Local Oil and Gas Sector: A Case Study	Cross-sectional qualitative, case studies and in-depth interviews	Jan Frick and Murshid M. Ali, International Journal of Strategic Engineering Asset Management 3(1):55
Management of Technology Innovations During Export: How Government Incentives Affect Strategy	Cross-sectional qualitative, case studies and in-depth interviews	Jan Frick and Murshid M. Ali, EurOMA Conference Paper, Operations Management in an Innovation Economy, 2014, Palermo – Italy
A comparative study of entrepreneurial clusters and co-	Cross-sectional qualitative,	Jan Frick and Murshid M. Ali,

Article Title	**Data Collection Method**	**Authors and Publication Forums**
working spaces in Norway: The sudden boom of private initiatives from 2010 – 2015	secondary data and informal interviews	EurOMA Conference Paper, Operations Management for Sustainable Competitiveness, 2015, Neuchâtel, Switzerland
The importance of emerging markets for oil technology companies in Norway: Management and entry operation strategies.	Cross-sectional qualitative, case studies, secondary data and in-depth interviews	Jan Frick and Murshid M. Ali, IFIP International Conference on Advances in Production Management Systems (APMS), Sep 2014, Ajaccio, France. pp.481-488