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Measuring Incubation Performance in Bergen Teknologioverføring

A Quantitative Study on the Effects of Business Incubation

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Abstract

As the perceived value of innovative start-up environments has accumulated, the measurement of performance in business incubators have become a topic of increasing interest (M'Chirgui, 2012). Innovation is a key performance driver of the economy and supporting the growth and creation of new establishments is therefore becoming one of the priority policies in Norway (SIVA, 2013). Studies analysing the relation between being part of business incubator and enhanced value creation compared to non-incubated firms have shown various results.

The purpose of this thesis is to evaluate to which degree BTO's incubator Nyskapingsparken adds value to its associated firms and use our findings to propose how their performance measurement system can become more efficient and decision relevant information more available in the future. Our study will build on other empirical studies by Schwartz (2010) and Mian (1997) amongst others.

The study is an attempt to assess the performance of incubatees in Bergen Teknologioverføring with the aim of enhancing our understanding of the evolution of incubators in Norway and their impact on regional value creation. The analysis is two-fold: First, we describe how optimal performance measurement of the incubator should look like taking previous empirical studies into account. Secondly, using the optimal analysis as a starting point we evaluate past performance of incubatees in BTO based on collected data from multiple datasets. Drawing on the commonly used indicators of firm success, we evaluate the survival and growth rates of incubatees from BTO in the period from 2007 to 2017 comparing the results to a representative control group.

Our results cannot support nor deny previous research on the topic. We find indications suggesting that incubated firms in BTO develops a different growth path than similar firms that are not involved in an incubation process. However, the different key figures are not altogether consistent nor statistically significant.

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Contents

1. Introduction

There is wide consensus that innovation is a key performance driver of the economy and that start-ups and innovative businesses are of great importance in achieving economic growth (M'Chirgui, 2012). While traditionally being known as responsible for bringing new businesses to the markets, entrepreneurs are also increasingly recognised as an important mechanism to transfer new knowledge to markets. Business incubators are created as a supporting mechanism to leverage the business opportunities of these entrepreneurs and to assist young firms in their initial stages of development (Audretsch, 2007; M'Chirgui, 2012).

Being promoted as tools for economic development, business incubators have increasingly become a worldwide phenomenon (Rathino, 2011). The first known incubator was established in New York in 1959, and within a short amount of time the incubation model became popular and spread to other countries and continents (Sherman & Chappell, 1998). Today, there are 35 national incubators aiming to create regional value by commercialising ideas and transferring knowledge to the markets in Norway (SIVA, 2013).

Practitioners often praise incubators and their ability to support new venture creation (Tornatzky, Sherman, & Adkins, 2003). They claim that incubators impact the success rates of young firms by customising the support to each firm's needs. However, despite the rapid growth of publicly initiated business incubators and the public appraisal of their effect, it is still unclear whether firms supported by such incubators have increased chances to succeed compared to firms that have not received the same support (Rathino, 2011).

While previous research on incubated firms have conflicting results to show for, current research on incubation suggests that the heterogeneity of incubators affect the results of performance outcome (Rathino, 2011). Business incubators vary to a large extent and their objectives may differ across regions, sectors and economies. The fact that there is no prevailing industry standard regarding the measurement of incubator success, indicates that the individual incubators need to identify their own standards in order to achieve their desired results.

1.1 Research Question

Our Master's thesis is written in collaboration with Bergen Teknologioverføring (BTO) which is the regional centre of expertise for innovation and commercialisation of research results and ideas. Since their establishment in 2005 the office has grown substantially, and today they are one of the most prominent Technology Transfer Offices in Norway (BTO, 2018b). BTO offers a variety of services to potential entrepreneurs, start-ups and small businesses, but due to the limited time horizon and data sample the emphasis of the thesis will be on their business incubation programme managed by Nyskapingsparken Incubator (NPI).

While BTO monitors the start-ups and their endeavours both during their application period and the incubation period, they have no formal system for follow-up of the success or failure after incubation. Moreover, they have no formal definition of the term *success* in terms of incubation. Some start-ups go bankrupt and some dissolve, but there are also numerous examples of successful outcomes resulting in high growth, mergers and acquisitions.

Based on the introduction of business incubators and BTO, we present the research questions of the thesis:

To what extent can business incubation through BTO affect the success of innovative firms and how can our findings be applied to the incubator's future performance measurement system?

The purpose of our thesis is to evaluate the performance BTO's incubator, Nyskapingsparken. We assess this qualitatively by measuring financial growth indicators and survival rate. As a result of the lacking industry baseline and the absence of consistent reporting accordingly, we have recognized the need for a tailored performance measurement system for BTO. Consequently, the analysis of the thesis has become two-folded. We start by describing how performance measuring of BTO's incubator would be optimally designed taking empirical studies and available information on BTO's objectives into account. Using this optimal analysis, we assess a selection of firms that have participated in the incubation programme in NPI. In the performance measurement system, we concentrate on financial variables identifying value creation through growth parameters. Additionally, we assess the survival rates of the firms. Our study is primarily meant for the internal benefit of BTO's stakeholders but also as an update and a potential addition to previous empirical studies within the field of business incubation.

Defining and quantifying success in BTO's incubation programme is challenging, yet valuable. Quantitative measures are first of all important from a financial perspective. As a publicly owned company, BTO depends on funding and support from their owners and partners as well as from governmental institutions. Providing descriptive data regarding the success of incubated start-ups to the shareholders could increase the validity of BTO as an organization. Additionally, BTO can use the measures in benchmarking towards national standards, similar incubators or towards past internal performance to identify their strengths and weaknesses and to develop a strategy for future activities. Lastly, the quantified information can increase the internal knowledge and be explicitly presented using graphs and other tools. This would strengthen BTOs reliability and improve the effectiveness of internal and external communication. Consequently, BTO requests an evaluation of their incubated start-ups' success as of today.

1.2 Thesis structure

We start by introducing how business incubation is managed in Norway and by BTO in section 2.1 before providing a definition of the incubation phenomenon and its emergence. In section 2.3 we elaborate on performance measurement and present the relevant indicators of measuring performance in incubators. Section 4 presents the methodology used for our analysis including data collection and preparation. The first chapter of our analysis in section 5 propose what we believe to be an optimal and efficient frame of measuring incubation performance in Bergen Teknologioverføring, whereas the second chapter consists of an evaluation of past success in BTO by applying quantitative methods. Finally, we provide a summary of the thesis and briefly discuss its implications.

2. Background

The background creates the foundation of the thesis. We start by introducing how business incubation is administered in Norway and Bergen before we present the definition of business incubation as well as empirical literature explaining the emergence of incubators. Finally, we present the definition of performance measurement and explain its relevance for the success of business incubators.

2.1 Incubation in Norway and Bergen

2.1.1 SIVA

'Selskapet for Industrivekst SF' (hereby called SIVA) is the organisation overseeing the 35 incubation programmes in Norway. Since their establishment in 1968, SIVA have facilitated innovation by building, owning and developing infrastructure for industry, start-ups and research environments nationwide. Their vision is to create profitable business development in regional industries and environments (SIVA, 2018).

In 2012, SIVA introduced a national incubation programme aiming to "achieve an increase in national value creation by identifying and commercialising good ideas in order to create growth businesses and to revive established businesses" (SIVA, 2013, p. 3). The target group of the programme is strong innovation environments where business incubation is an important activity. It is expected that the incubators in the programme are closely connected to relevant industry and academic institutions, and the process is expected to be efficient and professional. Today, there are 35 incubators participating in the national incubation programme, including the incubator of our study (BTO, 2018b; SIVA, 2018).

As the programme operator, SIVA contributes with distribution of grants, knowledge and network to the incubators. The financing of the programme and thus the distributing of grants is provided by a selection of Norwegian Ministries[1]. In 2016, SIVA created an incubation program hierarchy describing the level of grants between 1.5 and 5 MNOK the incubators receive each year. The level of grants depends on the prerequisite, results, ambition and

[1] The Norwegian Ministries of Trade, Industry and Fisheries; Local Government and Modernisation and the Ministry of Agriculture and Food

potential of the incubator. However, the incubators are not fully financed by SIVA and therefore need to secure additional financing. As a result, both SIVA and various public and private institutions related to research and education are owners and financial providers for a majority of the Norwegian incubators (SIVA, 2013).

SIVA defines the incubation process in four different stages (SIVA, 2013): Preincubation, incubation, business innovation and postincubation. As a result of inconsistent reporting of the incubation periods we will consider the incubatees as active in the programme from the year of admission until the year the incubation agreement ended. The incubators have been required to report according to measures given by SIVA every six months since the incubation programme was introduced in 2013 (SIVA, 2013). The reporting system is integrated in all incubators using SharePoint. The system contains information about the start-ups regarding admission the incubation programme as well as publicly available information consisting of grants, operating costs and other financials. The collection of data from these reports create the foundation of our data analysis.

2.1.2 Bergen Teknologioverføring and Nyskapingsparken

Together with the Norwegian School of Economics (NHH) and Center for Service Innovation (CSI), Bergen Chamber has since 2017 branded Bergen as "The Innovation City Bergen", arguing that Bergen could become the leading city of innovation in Norway (Torvund, 2017). Tor W. Andreassen, researcher at CSI, explains how the basic idea behind the brand is that Bergen's strong academic environment attracts recognised researchers and excellent students. Furthermore, Bergen hosts headquarters of companies in important industries, several of which are internationally recognised (Andreassen, 2017). Adding the fact that Bergen is a coastal city, one could argue that the city has the same ingredients for innovation as Boston and San Francisco does, though in a significantly smaller scale.

As a mean of tying the resources Bergen possesses together to increase the value creation of business ideas, Bergen Teknologioverføring was established as a Technology Transfer Office in December 2004. A Technology Transfer Office exists to bridge the gap between research and innovation (Cullen, 2007). Consequently, BTO is the regional centre of expertise for innovation and commercialisation of research results and student ideas. Today, BTO is owned by the University of Bergen (33.43%), Haukeland University Hospital (33.43%), Institute of

Marine Research (14.52%), SIVA (13.56%), Western Norway University of Applied Sciences (3.82%) and the Norwegian School of Economics (1.23%) (BTO, 2018b).

BTO's statutory vision is: "to manage the commercialisation of company owners and other public appliances' intellectual property rights and ideas related to research results and processes" (Brønnøysundregistrene, 2018). Their core strength is business development within sectors such as oil and gas, aquaculture, marine technologies and health. With the help of professional business developers and analysts, BTO offer programmes and mentoring for business ideas with a growth potential and a high degree of innovation. They do not offer direct financial support to the businesses involved, but they contribute with applications and identifying external financial supporters by developing the businesses to attract venture capitalists and investors (BTO, 2018b).

Figure 1 illustrates the different nodes of BTOs services (Indresøvde, 2018). A short description of each node is provided in table 2 in the appendix.

Figure 1: Overview of BTO's entities (BTO, 2018)

The first node, Nyskapingsparken Inkubator (hereby called NPI), has been managed by BTO since 2015 and is today one of the most prominent incubators in SIVA's national incubation program (BTO, 2017; SIVA, 2013). NPI is also the focus of our thesis.

Nyskapingsparken facilitates possibilities for entrepreneurs and businesses to develop their ideas in a professional, safe and inspiring environment (Nyskapningsparken, 2018). Entrepreneurs and start-ups that wish to enter NPI must apply and get accepted into the incubator programme. To pass admission, an overall assessment of the potential of the idea and the team is carried out. Only the businesses that are considered benefiting from the incubation programme are admitted (Indresøvde, 2018). Figure 2 shows the increase in ideas submitted to BTO's incubator since 2013 and illustrates increasing interest in developing ideas in a professional environment. The evaluation criteria and assessment form used by business developers can be found in table 2 in the appendix.

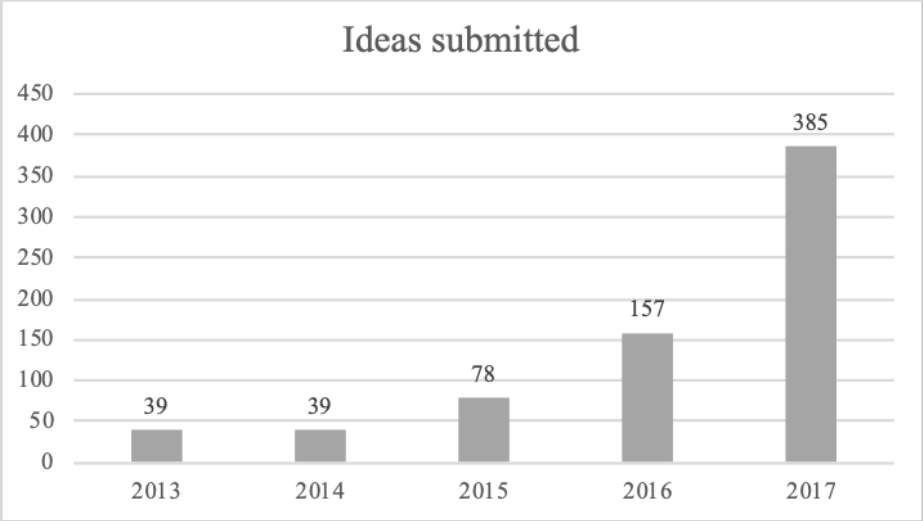

Figure 2: Development of ideas being assessed yearly in BTO Nyskapingsparken (BTO 2018)

In June 2018, BTO hoisted to the highest level on SIVAs incubation program hierarchy, now receiving a yearly grant of 5 MNOK. The act is considered an acknowledgement of the expertise and BTO's ability to take an active operative role in the innovation ecosystem of the region (BTO, 2018a).

Although NPI is the only cultivated incubator, all nodes are relevant for development of businesses in BTO. As an example, an idea may start to evolve during the Gründerhub or Accel program, before it enters the NPI programme and use Marineholmen Makerspace as a creative workplace to develop prototypes of its product. The businesses in our analysis have all received incubation support from NPI, but many have also participated in other programs either before or after incubation.

2.2 Incubation

Incubators can be understood as "policy-driven instruments to respond to the 'liability of newness'" (Schwartz, 2010). The liability of newness refers to the high failure risks of young firms in the first years after their market entry. The rationale behind the risk of failure is that young firms do not possess the necessary resource portfolio needed to survive (Freeman, Carroll, & Hannan, 1983). It is argued that these firms are faced with a substantial discrepancy between key resources crucial for their viability and their actual resource base, whereas more mature firms benefit from a broader pool of tangible and intangible resources. The lack of certain resources decreases the young firms' legitimacy in the market. According to Freeman,

Carroll and Hannan (1983), these firms are likely to be eliminated from the population. Consequently, incubators exist to address the market failure of ineffective resource allocation and contribute to the reduction of high start-up mortality (Colombo & Delmastro, 2012; Schwartz, 2010).

Generally, the term *incubation* refers to the service of providing low-cost, property-based facilities and shared networks to nurture the development of new businesses (OECD, 1997). By providing products, services and competence to young and innovative firms, an incubator aims to enhance local entrepreneurship and regional value creation in terms of growth and employment creation (Mas-Verdú, Ribeiro-Soriano, & Roig-Tierno, 2015). Through incubators, start-ups intend to gain access to relevant professional networks, sources of financing and an environment coloured by high achievers and a culture of sharing. According to SIVA (2013), the time spent in an incubator should be limited to a maximum of two years. However, Schwartz (2010) claims that there is no ideal incubation time, but that incubatees should not stay too long as they risk getting too dependent on the support from the incubator. Consequently, the firms may avoid investing in specific resource bases of their own.

In a study conducted by Albort-Morant and Ribeiro-Soriano (2016), with a primary target of identifying changes in the literature regarding business incubators over time, it is argued that the following might be the most relevant definition as of recent times:

> *"an incubator is an organization designed to accelerate the growth and success of entrepreneurial companies through an array of business support resources and services that could include physical space, capital, coaching, common services, and networking connections"* (Albort-Morant & Ribeiro-Soriano, 2016, p. 1776).

2.2.1 Market Failure

While different incubators exist for various purposes, there is an overriding objective of economic development (Udell, 1990). Supplementing this objective, several researchers claim that incubators can be seen as attempts to address market failures (Bøllingtoft & Ulhøi, 2005; Colombo & Delmastro, 2002). Market failure is the situation in which an unregulated economy does not result in an effective resource allocation (Jakobsen et al., 2017a). Economic literature on market failure explains how the market perceives start-ups' projects as too risky, hence preventing new businesses from attaining the resources vital in the start-up phase (Colombo & Delmastro, 2002).

In SNF's mid-term evaluation of SIVA's national incubation programme, they rationalise the public support for incubators with the explanation of market failure (Jakobsen et al., 2017b). They further claim that one of the varieties of market failure, external effects, are of particular relevance regarding incubation. Private firms will find it difficult to internalise the positive effects of an investment in entrepreneurial and innovative businesses. Instead the positive effects will affect other businesses that have not incurred the costs of an investment. The stronger the positive ripple effects for other businesses, the stronger are the arguments for increasing public support to innovation and R&D (Jakobsen et al., 2017a). Hence, it is argued that public support systems should initiate projects that can contribute with a focus on networking, interaction, learning and development. It becomes the government's responsibility to tie the actors together and facilitate the distribution of information and knowledge.

The idea of regional innovation systems results from the concept of market failure and governmental responsibility (Jakobsen et al., 2017a). Regional innovation systems are an institutional infrastructure supporting innovation within the production structure of a region (Asheim, 2007). This includes both formal and informal institutions such as norms, practices and attitudes. In SNF's mid-term evaluation of SIVA's incubation programme, they identify two types of regional innovation systems categorized as "*organizational thick*" and "*organizational thin*" systems (Jakobsen et al., 2017b). As organisational thick systems are often found in high-density regions with a large knowledge infrastructure, it can be argued that BTO belongs to this category and exist to tie regional resources together. Organisational thick systems can be further categorized in "*specialized*" and "*diversified*" systems where the specialized systems concentrate on just a few industries and the diversified systems concentrates on a versatile business ecosystem. Based on the information from the managers of BTO, their incubator is a combination of the two. The challenge for specialized systems is not to get stuck in deteriorating or stagnating sectors. To avoid this, BTO stimulates a new way of thinking to increase the creativity in the closely connected network (BTO, 2018b). For diversified systems, it is important to encourage a flow of knowledge across actors within the different sectors in the region. Boschma and Frenken (2017b), cited in Jakobsen et al. (2017a), also emphasize the importance of connecting businesses within sectors that are related in terms of knowledge.

The theory of regional innovation systems exists in order to understand the governmental involvement in innovation on a more local level (Boschma and Frenken, 2017). It is also based

on an understanding that public funding must be specifically customized to fit the different characteristics of the region it is operating in (Jakobsen et al., 2017b). If incubators contribute in creating regional value, such public funding is appropriate and even decisive for regional innovation.

2.2.2 Types of Incubators

Incubators come in various forms and variations depending on factors such as primary target, demography and sector (OECD, 1997). Some incubators are focused on making financing more available for the entrepreneur while others might solely exist to commercialize academic research. While the most common services provided in the early years primarily involves offering cheap work space and administrative services, most modern incubators now also provide their customers with sector specific competence and measures needed to quickly add value and develop start-up businesses.

Zedtwitz (2003) distinguishes between five different types of incubators. This distinction is widely recognized as relevant for the modern incubator environment and also recognisable in the Norwegian market. The first type of incubator is the *university incubator* which has its origin from the need of taking academically developed ideas to the market. *Independent commercial incubators* are often spin offs from venture capitalists and tend to be specialised within specific sectors. While *company internal incubators* are used to purse business ideas developed within an existing company, *virtual incubators* offer an online platform with a network of investors, entrepreneurs and advisors available to the customers by outreach. Finally, *regional business incubators* describe incubators established by local government or private companies with mutual interest in creating work places and adding value to a community. Hence, these incubators mostly depend on governmental funding. The incubator in BTO most closely resemble the regional incubator as it is governmentally owned and the main purpose is to boost local entrepreneurship and develop the regional innovation scene in Hordaland county (Bøllingtoft & Ulhøi, 2005; Zedtwitz, 2003).

2.2.3 Resource-Based View

A number of researchers view incubators from a resource-based view (Ahmad, 2014; Dalmarco, Maehler, Trevisan, & Schiavini, 2017; McAdam & McAdam, 2008). The main argument for the resource-based view (RBV) is that firms can benefit a superior financial performance when they have access to resources that are valuable, rare, inimitable and non-

substitutable (Barney, 1991). It is therefore expected that the resources provided in incubators contribute to the incubatees' competitive advantage over non-incubated firms in terms of growth and survival (Schwartz, 2010). Hackett and Dilts (2004) further argue that sustainable competitive advantage can be achieved more easily by exploiting internal rather than external factors. Hence, the RBV can help explain how incubators function as specialised units that hatch new businesses by exploiting the internal resources of the incubators (Gassmann & Becker, 2006).

Researchers applying the resource-based view look at incubation as a mechanism of awarding a stock of tangible and intangible resources to their start-ups that result in growth and other benefits (Gassmann & Becker, 2006). Tangible resources in incubation processes are visible and relatively easy to measure. These tangible resources can include financial, physical, human and organizational resources in addition to explicit knowledge flows (Ahmad, 2014; McAdam & McAdam, 2008). On the other hand, intangible resources, such as proximity to markets, sources of knowledge and clustering effects, are harder to detect and identify (Ahmad, 2014; Gassmann & Becker, 2006). The impact of these resources results in access to new knowledge, expertise and networks, which in the end results in growth for the incubatees (Ahmad, 2014).

Carayannisa & von Zedtwitz (2003) found that there are five essential tangible services that should be provided in order for the company to identify as an incubator: access to physical resources; office support; access to financial resources; access to relevant networks as well as entrepreneurial start-up support. The incubator in BTO provide all five resources although they only facilitate for access to financial resources by helping incubatees with applications to relevant financiers. Schwartz (2010) supplies the five mentioned services with the importance of the intangible resources provided by incubators, the first being the incubators' ability to increase incubatees' image and reputation. Naturally, new firms do not have a strong foothold in their target markets, which might have a negative impact on interactions with potential investors, suppliers or customers. By entering an incubator, these firms might benefit from the image associated with the incubator's achievements, location and general reputation. Moreover, the network synergies identified in incubators are decisive for a successful incubation process (Schwartz, 2010). By having several companies of similar character in the incubator, all players can benefit from each other's network and key skills. It is also argued that the opposite might even prove beneficial for the firms in the incubators: having a portfolio like BTO, consisting of diverse businesses in terms of sector, age, team and other dimensions,

can stimulate creative thinking and collaborations amongst unforeseen players (BTO, 2018b; Indresøvde, 2018).

Ahmad (2014) argues that the resource-based view, although contributing with meaningful insights to our understanding of business incubation, are not fully concerned with the process-oriented nature of incubation. When applying RBV-based theory on incubation, he questions the incubators' ability to fully comprehend the internal environment of an incubator in order to understand the client start-ups' capacity and willingness to absorb the resources offered. Furthermore, the exploitation of internal resources varies to a large extent among the incubatees. This makes the quantifying of resource exploitation challenging without conducting a large amount of qualitative in-depth interviews.

The intention of our thesis is to study whether incubation has had an impact on the survival and growth of incubatees compared to similar firms that have not received the same treatment. It would be desirable to study the respective tangible and intangible resources in detail. However, taking the limited time and scope of our thesis into account, we need to study the incubator as a bundle of resources and services of which we assume all incubatees take advantage of in the same manner.

2.3 Performance Measurement

Lohman et al. (2004) describe Performance Measurement Systems (PMSs) as frameworks that integrate performance information in a dynamic and accessible way in order to achieve consistent and complete performance measurements. Consequently, a PMS is a tool for internal learning and improvement. It is often used to strengthen and grow businesses, promoting job creation, wealth generation and regional development (Wolk, Dholakia, & Kreitz, 2009). Ultimately, a PMS establishes a culture of learning that leads to increased value creation and social impact that investors and stakeholders appreciate (Wolk et al., 2009).

Tangible resources in incubation processes, such as financial and human resources, are usually easy to measure (McAdam & McAdam, 2008). Thus, the value creation from tangible resources is direct, contrary to the value creation from intangible resources. Intangible resources are indirect and considerable more difficult to measure (Kaplan & Norton, 2001). Resources such as knowledge and cluster effects rarely have a direct impact on financial measures. Rather, the improvements in intangible assets affect financial outcomes through

chains of cause-and-effect relationships involving intermediate stages (Huselid, 1995). As an example, Heskett et al. (1994) describe the stages in a service management profit chain:

Figure 3: Stages in a standardised service management chain

Such complex linkages make it difficult, if not impossible, to place a financial value on a resource such as employee capabilities or knowledge (Heskett et al., 1994). Furthermore, the value of an intangible resource depends critically on the context in which the intangible resource is deployed. Thus, the value created from investing in intangible resources is neither linear nor additive compared to the value creation from tangible resources, complicating the creation of a PMS.

A key weakness of a PMS' is that it is, in fact, a simple framework. The organizations using PMS' have traditionally adopted a narrow focus, and although such frameworks are undoubtedly valuable, their adoption is often constrained by the fact that they need to be understood as well as incorporated in the management of the business (Neely et al., 2000). Furthermore, it is argued that the PMSs does no longer meet the competitive environment. Minahan and Vigoroso (2002) claim that as much as 60 percent of the businesses in their study were not satisfied with their ability to measure and manage performance. Clearly, performance measuring must be tailored towards the specific business to be useful as a tool for learning and improvement.

2.3.1 The Goal Approach

There is a vast amount of previous empirical studies conducted on performance measurement frameworks, however the literature on performance measurement in incubators specifically is quite limited. According to Voisey, Jones, Gornall, and Thomas (2006), incubators are often structured as traditional companies although the majority is in fact non-profit entities. Consequently, incubator outputs do not always appear in traditional statistical outputs. Where traditional PMSs have focused on financial measures such as sales, profits or return on investment, Kaplan and Norton (2001) stress that measuring performance using a multidimensional set of indicators that are primarily based on non-financial measures is essential for incubators.

Despite the lack of literature on incubator performance measurement, criticism towards solely using financial performance measures has led to the development of different approaches for measuring the effectiveness of incubators. Daft (2009), cited in Vanderstraeten & Matthyssens (2010), suggests four approaches that take various aspects of incubation effectiveness into account. For the sake of BTO, we find it most convenient to elaborate on the goal approach.

Autio and Klofsten (1998, p. 32) refers to success as "the degree to which the support arrangement is able to meet the objectives set for it". Although incubators differ in their objective, several studies indicate that their ultimate goals should be incubate growth and survival (European Commission, 2002; Mian, 1997). In other words, the incubator should be organized in such a way that firm survival and growth are enhanced.

Measuring whether or not an incubator contributes to growth and survival is difficult given that it is complicated to identify success factors for growth across different sectors. Some companies might lose money the first five years but are nevertheless considered a success because of revenue growth and an increase in employment rate. In a reversed case, a company might make money already after the second year and onwards but are deemed unsuccessful in year 5 because companies operating in the same sector have a significantly higher profit margin.

Vanderstraeten and Matthyssens (2010) argue that the best developed goal-related measurement scale is summed up in figure 4 as introduced by Hackett and Dilts (2008). They measure incubation performance in terms of both survival and growth at the time of incubatee exit. According to Hackett and Dilts (2008), the first two categories, in addition to the fourth, were historically considered successful, while category three and five were considered failures. However, after several analyses, they concluded that category three should be considered a success story whereas the fourth would be considered a failure. Consequently, our definitions of success and failure of incubatees are based on the categories introduced by Hackett and Dilts (2008) in table 1.

Category	Success/failure	Incubatee outcome state
1	Success	The incubatee has survived and is growing profitably
2	Success	The incubatee has survived, is growing and is on a path toward profitability
3	Success	Incubatee operations were terminated while still in the incubator, but losses were minimized
4	Failure	The incubatee has survived but is not growing and is not profitable or is only marginally profitable
5	Failure	Incubatee operations were terminated while still in the incubator, and the losses were large

Table 1: Outcome states as presented by Hackett and Dilts (2008)

In the following sections we will outline the two measures of incubatee outcome states and present a small sample of studies related to measure incubation success. By doing this, we intend to provide a brief overview of previous results on the subjects before embarking on our own study of success in BTO.

2.3.2 Firm Growth

The first important measure of incubation success, as introduced in the goal approach, is the measure of firm growth. Most common indicators of firm growth have been the measures of sales, job creation and profit growth (Mian, 1997). In our study of BTO, we consider growth in terms of the following measures of scale: *sales revenue, personnel expenses, profits* and *value creation*.

A study conducted using data from 2 100 business incubators in the US, Amezcua (2010) measured success by looking at firm failure, sales growth and employment growth. The study found that the companies that were part of an incubation program employed more people after entering incubation and this tendency continued after the incubation contract ended. According to the study this could imply that modern incubators prepare start-ups for growth not only when in incubation but also in an external environment post-incubation (Amezcua, 2010).

In a study measuring employment growth amongst a sample of 134 start-up tech firms situated in 10 different incubators in Sweden, Löfsten and Lindelöf (2002) found indications suggesting firms located in an incubator create more jobs compared to a group of similar companies. On the other hand, both Westhead & Cowling and Campbell & Allen (1987) found that incubator leaders were overestimating their contribution to value creation in their area.

In our research, we consider growth in general as an indication of the exploitation of resources offered by Nyskapingsparken Incubator. As recommended in the incubation literature, we consider growth in *sales revenue* as the first financial measure of firm performance. Growth in sales is an indication of the market's acceptance of a commercialised technology and is therefore an appropriate measure of incubation success (Löfsten & Lindelöf, 2002; Walter, Auer, & Ritter, 2006). Furthermore, we use *net profits* as a second financial measure to capture the efficiency of firm's operations and *personnel expenses* to indicate growth in terms of employment. To confirm the added value of an incubator, the innovativeness of the incubatee is considered by measuring its *value creation.* In our research, value creation is defined by adding the operating profit and employment costs as in line with SIVAs definition (Jakobsen et al., 2017b). Both sales and net profits are considered central elements in a successful innovation process (Walter et al., 2006), whereas personnel expenses and value creation is included as it is an indication of the relative performance of the incubatee (Löfsten & Lindelöf, 2002).

Literature regarding start-ups in the years after establishment often refer to "the valley of death" (Frank, Sink, Mynatt, Rogers, & Rappazzo, 1996; Hudson & Khazragui, 2013; Markham, Ward, Aiman-Smith, & Kingon, 2010; Nemet, Zipperer, & Kraus, 2018). The valley of death describes the situation in which a technology fails to reach the market because it is unable to obtain financing and resources for the commercialisation process (Frank et al., 1996). The metaphor is a tool for identifying and understanding a critical area of development (Markham et al., 2010). Incubators are usually in possession of the resources necessary for a successful commercialisation of the technology. However, it is expected that start-ups and new ventures experience a period of decline in capital before they potentially manage to break out of the death valley curve and experience growth. Consequently, growth metrics should be measured over one-, three- and five-year intervals (Kelly and Hankook, 2013).

2.3.3 Firm Survival

A firm's survival rate is another trusted measure of incubation success(European Commission, 2002; H. Sherman, 1999). The definition of firm survival can be divided into two groups: *direct survival* describes the situation of which an incubatee in year t has survived in year $t + n(n \leq 1)$ if it has been active in terms of turnover or employment in $t + n$. *Survival in terms of M&As* is the situation in which an incubatee is subject to mergers and acquisitions to other established firms in year t or $t + n$ (European Commission, 2002).

As incubators compensate for fundamental early-stage resource deficits of young firms, it is expected that the incubator support will increase the long-term survival chances of incubatees. Previous research on the impact of incubation on firm survival is increasing, however the research is conflicting in their evidence of firm survival as an effective instrument in measuring the success of incubators (Schwartz, 2010).

Sherman (1999) conducted a study in which 126 firms from 80 randomly selected incubation programs were used to look for trustworthy measures of added value. The quantitative study found that companies either currently or previously part of an incubation program had a significantly greater survival rate compared to average survival for all start-ups. However, this study looked specifically at very young firms and the oldest companies had only been operational for five years which makes it hard to speculate in regard to long term survival. Furthermore, the firms and incubators provided all of the data themselves leaving the study with an element of possible error due to different means of reporting.

Michael Schwartz conducted a study which effectively eliminated the challenge Sherman experienced. Schwartz (2010) wanted to measure the effect on survival on start-ups in incubation over the course of ten years and compare that to a representative group of similar firms. The group of firms consisted of 371 firms who all finished the incubation period at five different incubators in Germany. The time span of the study was 10 years. Surprisingly, there was not identified any higher probability for incubated firms to survive relative to the comparison group. On the contrary, the study showed a statistically significant negative correlation between being part of three of the incubators and the possibility of survival.

This negative relation was also the outcome of a bigger study conducted by Amezcua (2010) where a dataset analysing 19 000 start-ups was compared with a representative group of 30 000 non-incubated companies. However, the substantial size of the sample can be criticised for the difficulties in validating the end state of all the firms. For instance, it might look like some firms have gone bankrupt when they no longer exist one year while there is a high probability of a name change, merger or similar.

In 2002 an EU-commission released a report suggesting that firms involved with a business incubator had a much better chance of survival compared to other small and midsized companies (European Commission, 2002). In their evaluation of the national incubator programme, SIVA also found that incubators are of immense importance for the incubatees

ability to survive (Jakobsen et al., 2017b). SIVAs result might be altered by the fact that they are responsible for the programme. However, the outcome of the programme will in the end depend on the specific performance of the incubators and incubatees which is difficult for SIVA to influence.

2.3.4 Critisism of Indicators for Incubation Success

Measuring incubation success is hardly a generic exercise. Depending on the purpose of the incubator the performance measures will differ and there are biases that are hard to neglect. There have been several attempts to measure success quantitatively in order to establish a reasonable benchmark for comparison. However, the results gathered from the studies on firm survival and growth for assessing success in an incubator are scattered and have little consistency. One could therefore assume that there are differences between incubators that provide the data with a various degree of inaccuracy. Similar to what Phan, Siegel, and Wright (2005) found, we summarize this section with that there is a vast spread in results amongst previous empirical studies.

3. Hypotheses and Research Model

Based the empirical background on performance measurement in incubators, our research question as well as our mandate from BTO, we present the following hypotheses:

H1: Incubated firms in BTO perform better than non-incubated firms in terms of growth

H2: The incubator in BTO increase the survival rates of the incubated firms in comparison to non-incubated firms

The research model illustrates the logical structure of our analysis. The hypotheses are reflected in the second section of our thesis as this part represents the conduction of analysis based on the data collected.

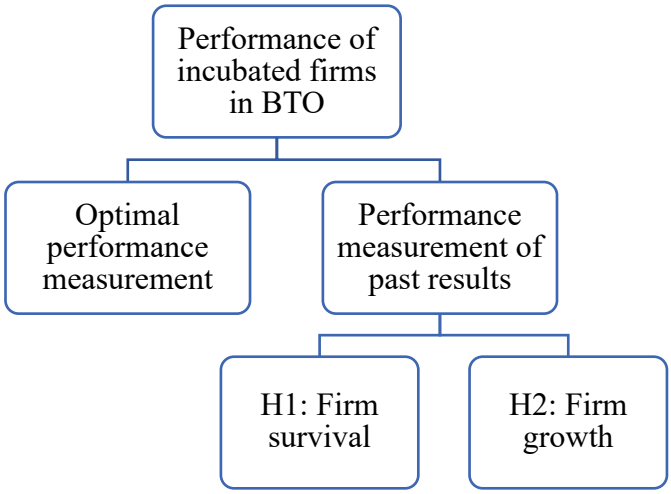

Figure 4: Stages describing our research model

4. Methodology

4.1 Research Design

Our study aims to evaluate and improve the performance measurement system in Bergen Teknologioverføring for future use. In the research strategy we look at the steps of our study.

Our thesis is based on a quantitative research design. The main set of data is the dataset collected from BTO via SIVA consisting of all data gathered on incubated firms since the establishment of Nyskapingsparken. To compliment and compare, our research benefits from several additional secondary sources: financial statements of firms in Norway operating between 1992 and 2015 obtained through Samfunns- og Næringslivsforskning AS (SNF): dataset consisting of all grants distributed by Innovation Norway from 2010 until 2017 as well as frequent meetings and interviews with representatives from BTO. However, some of the sources lack consistent data which made pulling data manually from public records online of a necessity in order to increase sample size to a minimum.

The data assessed in the evaluation of past incubator performance is longitudinal as we look for developments over time. The nature of our research is descriptive. We address the impact of an incubation treatment and not necessarily what caused it. Furthermore, our thesis is descriptive in its inherent aim to explain the effect of incubation, a situation of which ideas are developed in a professional environment.

Upon gathering and cleaning the BTO-data, we construct a comparison group of firms from the dataset obtained from Innovation Norway through propensity score matching. By comparing variances, we look for tendencies and indications of the development of a different growth path for firms affiliated with the business incubator. We are especially interested in means of value creation identified through previous empirical studies related to growth and firm survival.

When assessing the survival rate of the incubated firms we conduct our analysis on a different dataset than for growth. We chose to do this due to the lack of consistent observations over time in the BTO-data. Additionally, a bigger sample of control firms was desirable in order to work with a more representative population.

After conducting the evaluation, we used our findings and method to propose a set of important elements for BTO to consider for future implementation of our procedure.

In the methodology chapter, we start by describing how we collected and prepared the data of our analysis in section 4.3 before describing how we prepared the data in section 4.4. In section 4.5 we describe how we pulled out the final sample of incubated firms and how we used propensity score matching to identify the sample in the control group. Finally, we describe the most prominent limitations of our analysis and data in section 4.6.

4.2 Sample

Due to satisfactory reporting in BTO starting as late as in 2013, cleaning and structuring our datasets have been by far the most time-consuming parts of our thesis. Furthermore, it is acknowledged in previous studies that explaining the difference in variances entirely with a treatment effect is not feasible (Löfsten & Lindelöf, 2002; Schwartz, 2010). The selection bias, previous experience of the entrepreneurs, available capital and many other factors might also play a part in potential success of the firm. Hence, a comparison group consisting of firms in a similar life phase and economic situation was needed. To ensure this, we contacted Innovation Norway.

Both of our samples are gathered using a non-randomised sampling method. Ideally, we would have wanted our samples to represent all firms in incubation, however we consider trying to answer our research question to be more critical. By operating the non-randomised sampling method our findings cannot be applied in generalisation of all firms.

We have been able to construct a sample of 100 firms that can provide us with some indications of BTO incubatees' growth path compared to a group of similar firms obtained through Innovation Norway. To construct the comparison group, we used propensity score matching which is a mean of homogeneous sampling.

When assessing firm survival, we used a different sample and pulled the organisation numbers of all firms within the incubation programme in BTO in 2013. For comparison we looked at firms who received their first grant from Innovation Norway the same year. We chose to do this in order to increase the population size and normality of our findings.

4.3 Data Collection

All business developers mentoring the incubatees in BTO are required to report to SIVA semi-annually, as are the rest of the business incubators that operate under SIVA. This practice was implemented in 2010 and the amount of information demanded has been increasing and becoming more intricate over the years due to increasingly stringent demands of reporting within the governmental performance management system (Indresøvde, 2018; Jakobsen et al., 2017b). However, the reported data is not initially intended to be used for performance measuring purposes, and the frequent changes of the reporting standards has resulted in incomplete datasets lacking considerable information.

Report year	Observations	Percent	Cumulative
2013	44	7 %	7 %
2014	71	11 %	17 %
2015	83	13 %	30 %
2016	128	19 %	50 %
2017	215	33 %	82 %
2018 YTD	117	18 %	100 %
Total	658	100 %	

Table 1: Amount of observations registered per year in Nyskapingsparken

The level of consistency in the data gathered in BTO made a drastic enhancement in 2013 (Indresøvde, 2018). Before this, the reporting routine was not standardised, and the accuracy varied with the business developer who was responsible of the respective firm. Through several sessions with both business developers and the CEO, Anders Haugland, we pulled a dataset consisting of internal reporting on all incubated companies from 2013 to 2018. Through collaboration with BTO we have been able to improve the quality of this dataset substantially in terms of both consistency and human error.

In order to measure incubation performance quantitively we needed a representative comparison group in which none of the firms have been part of an incubator process. After initiating correspondence with Innovation Norway, we were provided with a dataset consisting of all firms who have received financial support from Innovation Norway, on which grounds they were given, sector code, when the application was approved and where the company was based. Reporting was standardised in 2010 and thereby we were provided with data for the past 7 years.

To complement both the BTO and IN datasets, we were granted access to SNF's accounting database holding financial records of companies in Norway between 1992 and 2015[2] (Mjøs, 2016). The datasets have been delivered annually by Brønnøysundsregisteret via Bisnode D&B Norway AS and Menon Business Economics. Thus, the dataset consists of secondary data of high quality which is altered and used in research at the Norwegian School of Economics (NHH) frequently. The SNF dataset includes income statements, balance sheets as well as detailed information regarding sector and industry codes.

4.3.1 Ethical Reflections of the Data Collection

A best practice when handling secondary data is to always consider that the data was not created for the purpose of our study. This could have several implications, one being it can cause discontent amongst the subjects of the data. Therefore, we will not publish any names or other identity revealing variables but rather aggregate our results. Furthermore, our thesis is written in close cooperation with BTO. They are the only providers of sensitive datasets, whereas the information gathered by SNF and Innovation Norway is public record and is therefore not considered sensitive.

[2] Figures from 2016 made available 13th of December 2018

4.4 Preparation of the Data

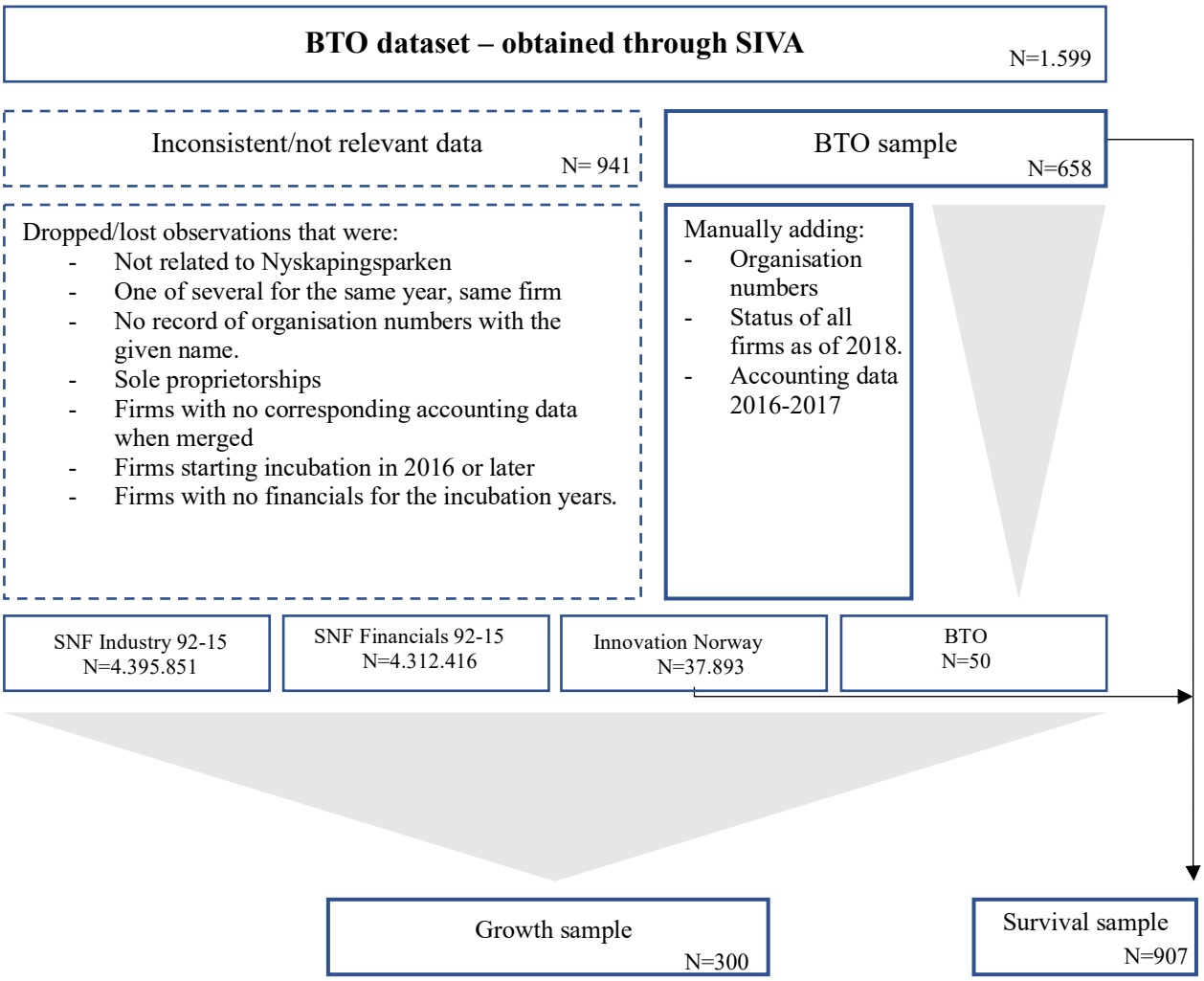

Figure 5: Data preparation resulting in the two samples used in our analysis

Because our population obtained from BTO is small and most firms are in a very early stage of establishment we have prioritized looking for differences in growth paths over firm survival rate. Thus, this section will primarily explain the gathering of the dataset needed for growth assessment before more briefly account for the sample used to measure firm survival.

Preparing the Dataset Obtained from BTO

The dataset was constructed in order to evaluate past performance of Nyskapingsparken Incubator looking at relevant growth variables. When assessing growth, we compared our findings with a matched group of similar firms.

In order to look for answers to our hypotheses, we needed to restructure and clean our dataset substantially. Figure 6 provides an overview of this process. We eliminated all companies

registered being in the phase “Idea” after consulting with business developers in BTO. Some of these companies just appeared once which often meant they were only assessed but never actually entered incubation. Others had severe shortcomings and lacks in data, both of which making them unfit for analysis.

The minimum requirement of data needed from BTO in order to be able to compare financials to a comparison group were the incubated companies’ organization numbers, at what point they entered the incubation programme and when their contract ended. Some companies in the incubator were registered with several dates as the start of their incubation process which was often a result of a spin-off idea occurring during the incubation period. A new idea would result in a new contract with BTO and a new line of data. For these companies we have only used the first date registered creating a starting point of incubation. Where the organizational numbers were missing, yet relevant, we used public records to manually insert this information. We also confirmed the companies’ status as of September 2018. This became the basis of the sample used to measure firm survival, whereas the growth sample required some further adjustments.

The Growth Sample

For our analysis of the growth indicators, we relied on a more consistent and longer time frame. As the consistent reporting was first initiated in 2013, the only relevant observations from BTO is data from the five previous years. However, due to the delay caused by quality assurance in the SNF-dataset, we could only collect data up until 2015. After excluding all companies with no corresponding financials in the SNF-dataset for the first incubation year and the two subsequent years we had 28 firms left in the data provided by BTO. With an initial database of 217 BTO-firms we considered the sample size and years represented too narrow and decided to enter the variables needed from year 2016 and 2017 manually. We pulled the data from public records online. Consequently, the final dataset consisted of 50 firms with financial records of their time in incubation and the two following years.

In our analysis we have removed one firm and its correspondent match in the comparison group. This company was not only a significant outlier but also in a very different phase and growth state when they were in contact with BTO which is not relatable to the rest of the sample. Furthermore, the company was not part of a traditional incubation process and the removal of these observations was therefore supported by BTO’s business developers.

After merging the three complimentary datasets we had a dataset that added information about funding, financials and sector from SNF and Innovation Norway to the companies affiliated with BTO Nyskapingsparken.

In order to identify the best matches for each of the 49 incubated firms we used propensity score matching. According to Rosenbaum and Rubin (1983), this approach is applicable for the purpose of analysing potential effects of a treatment. In our research, the treatment is the incubation process.

The comparison group was extracted from the data received from Innovation Norway. Initially, the dataset consisted of 19 490 distinct firms who received funding between 2010 and 2017. We excluded all years except the first year of grant approval, thereby constructing an equivalent to year 0 in the BTO-sample.

A propensity score was predicted for each of the firms in the IN dataset. Propensity scores were estimated using a logistic probit regression with the binary treatment 'incubation' as the outcome and measured covariates as the predictors (R. Rosenbaum & Rubin, 1983; Sainani, 2012). The propensity score for each firm in the comparison group was estimated to identify matching firms who are the most comparable to the BTO-sample. The approach can be seen as a data reduction tool that reduces a large number of variables about firms into a single probability value (Sainani, 2012).

We sorted each BTO-firm to their closest matches in the comparison sample and randomly matched the firms with the closest propensity score. Due to a large number of comparable companies some of the propensity scores were exactly the same in some cases. For instance, the p-score was equal to 0 for 81 firms in the dataset from Innovation Norway. After conducting t-tests on the randomly selected groups it was therefore deemed necessary to assign one consistent match to each BTO firm. Thus, reducing the spread in results that appeared every time the function was conducted in Stata indicating that different firms were chosen each time. Moreover, the firms that had been part of any BTO process *and* received funding from Innovation Norway were excluded.

The covariates used were *sales revenue, personnel expenses, profits* and *sector*. These financial variables is based on the *parallel path assumption,* assuming that firms performing similarly in year 0 have the same initial probability of growing and surviving. We included the sector variable as an attempt to correct for the sector-wise differences in firm performance.

Furthermore, we could have excluded all other counties than Hordaland to keep the analysis within the Hordaland region. However, when excluding firms affiliated with both of the arguably biggest contributors to start-up innovation in Bergen, the pool of remaining firms with similar traits would not have been sufficient matches to the incubatees.

As an indication of the accuracy of using propensity scores, we found that the 49 control firms had primarily received grants from IN characterized as *establishment grants* or *R&D*[3]. Innovation Norway categorize their grants in more than 60 different groups where only a fraction of the groups is directly related to establishment and entrepreneurship. The fact that the 49 comparable firms are all characterized as start-ups or young innovative firms marks an important assumption for our analysis.

The sample from Innovation Norway closely resembles our master data mainly because the companies are young, have a high degree of innovation and have actively been seeking support to help them grow and commercialise their idea. Furthermore, they are in the same target group of governmental support in the attempt to correct for market failure and the uncertainty associated with investing in young and entrepreneurial firms.

The difference between the two groups are the assets provided: while incubated firms receive both tangible and intangible resources, the IN firms only receive tangible financial support once per year. Moreover, we cannot say if these firms have applied to BTO or other Norwegian incubators and got rejected, which would have increased the selection bias.

The Survival Sample

When analysing firm survival, we used the initial BTO-sample and isolated the first year of consistent reporting, 2013, to look at the longest interval available. Thereafter, we compared the rate of survival with the recipients of the establishment grant from Innovation Norway in the corresponding year.

We could not use the Growth Sample to assess survival because the only demand when putting together the sample of BTO-firms, was the 3 periods of financials and thereby survival.

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[3] «Etableringstilskudd» and «industrielle forsknings- og utviklingskontrakter»

The cleaning and add-on process of the BTO-sample was the same for this dataset. We merged the organisational numbers with the SNF financials and sector sets to look at which firms appeared in the subsequent years following 2013.

4.4.1 Final samples

Our main objective has been to construct samples which enables us to answer our research question. Due to the substantial lack of consistent observations over time in the data obtained through BTO we deemed it necessary to look at growth and survivability through two different datasets.

Growth Sample

The final sample consists of 98 firms of which 49 is from the treatment group and 49 from the control group as depicted in table 2.

The comparison group consisting of 49 non-incubated firms represents what would have happened to the incubator sample in the absence of the incubator – given that the two samples are a perfect match in year 0 (Cheng & Schaeffer, 2011).

	BTO	**IN**
Firms	49	49
Average years since establishment, t=0	1,755	2,040
Oldest incubatee/grant receiver, t=0	16	17
Median age at t=0	1	1
Credit score average	A	A

Table 2

Sector	***BTO***	***IN***	***Total***
Agriculture	0	1	1
Manufacturing	2	1	3
Telecom/IT/Tech	20	19	39
Construction	1	3	4
Wholesale/retail	3	1	4
Other services	23	24	47

Survival Sample

The sample consists of two different sized subsamples of 36 and 225 firms. We observe that the average age of the companies is lower than the growth sample which partially could be

	BTO	**IN**
Firms	36	225
Average years since establishment, t=0	1,29	1,323
Oldest incubatee/grant receiver, t=0	4	6
Median age at t=0	1	1
Credit score average	A	A

Table 3

Sector	***BTO (N=36)***	***IN (N=225)***
Agriculture	0 %	3 %
Manufacturing	3 %	10 %
Telecom/IT/Tech	33 %	23 %
Construction	6 %	5 %
Wholesale/retail	5 %	10 %
Other services	53 %	49 %

explained by a more specific focus on young firms within BTO latter years. Furthermore, the subsample from Innovation Norway only consists of companies that received establishment grants in 2013, which again supports our lower average age in year 0.

Table 4: Most important variables in the growth sample

Name	Definition	Source
Fiscal Year	Fiscal year	SNF
Year	Years after incubation/first granted funding	-
Organisation Number	Firm ID	BTO, IN
Comparison Group	Binary indicating BTO or comparison group	-
Sales	Value of goods and services sold in the period	SNF*
Personnel Expenses	Cost of labour	SNF*
Operating Income	Gross income - operating expenses	SNF*
Value Creation	Operating income + personnel expenses	SNF*
Net Profits	Profitability of a venture after accounting for all costs and taxes	SNF*
Net Debt	Short and long term debt	SNF*
County	The county where the company has its address	SNF
Source Idea	Where the idea originated	BTO
Sector	Widest sector differentiator, extension of NACE-codes	SNF
Credit Rating	Credit rating	SNF
Municipality	Municipality where the firm has its address	BTO, IN
Matched To	Showing correspondent match assigned using propensity scores	-

**All financial variables in thousands, NOK*

4.4.2 Time frame

In order to compare the impact on an incubated firm's performance over time we want as many years of observations as possible. Our dataset measuring growth consists of information on 49 incubated firms in the years 2007-2017 who were all active in the incubation year and the two

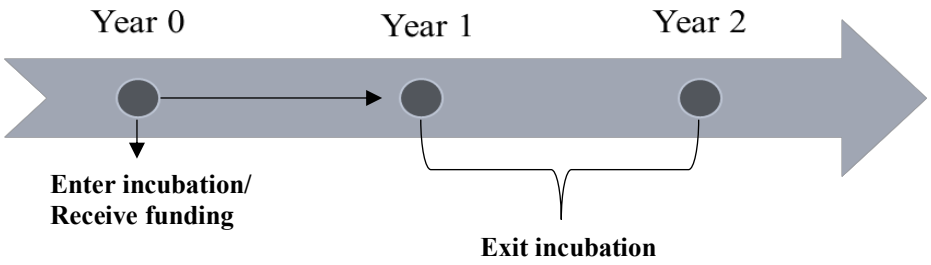

Figure 6: Time frame in the growth sample

following years. Thus, the three active years are measured relatively within these ten years as presented in figure 7. In the BTO sample, t=0 is defined as the year an incubatee entered BTO. In the control group sample, t=0 defines the year that a company first received funding from Innovation Norway.

The sample used to measure firm survival in BTO looks at firms who entered incubation in 2013 compared to firms granted their first funds from Innovation Norway in the same year. We matched the firms to the financials from SNF. Thus, our survival sample consists of all available financials for the firms defined in year 0 between 2013 and 2016.

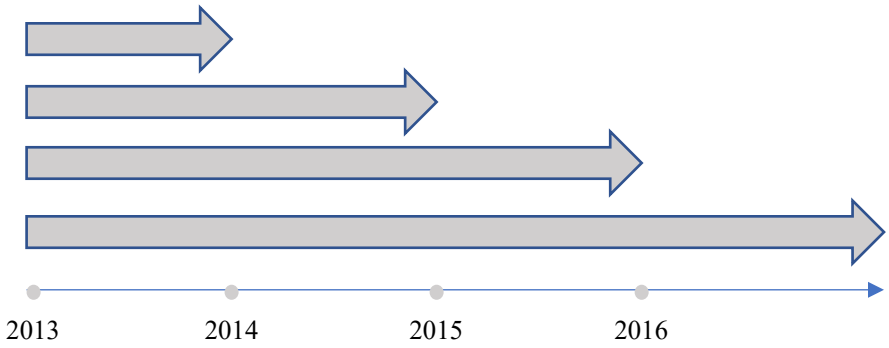

Figure 7: Time frame in the survival sample

4.5 Limitations

There are several limitations of our research and we intend to address these limitations in the chapters of their relevance. However, in this section we will elaborate on the four essential limitations that challenges the reliability and validity of our results.

Selection Bias

The incubatees in BTO have been through a stringent application process and has been carefully screened before the admission to the incubator (table 2 in the appendix). This

screening process accounts for several shortcomings of our study, referred to as selection biases.

First of all, an administrative selection bias is created as a result of the subjective screening process prior to incubation. Applicants with poorly prepared business plans, unrealistic visions and inadequate degree of innovation and the like will be filtered out. As a result, the final sample of incubatees is not directly representative of the populations to which it is compared, thereby damaging the validity of the study. Cheng and Schaeffer (2011) further argue that using a control group when measuring the performance of incubatees complicates the issue of selection bias. In addition to the administrative selection bias, they argue that these young firms are subject to a self-selection bias (Saunders, Lewis, & Thornhill, 2016). This bias suggests that the entrepreneurs of the incubatee firms may be more motivated and are higher educated than an average entrepreneur in the control group. This could clearly create a misguidance in the results. Both biases suggest that the incubated firms have an inherent advantage over the firms in the control group, thus overestimating the efficiency of incubators.

Reliability

Udell (1990) argues that even under the best possible conditions, studies of incubation effects are difficult and much of the data is frequently unreliable. As an example, the data from BTO consisted of several companies that was not covered by the SNF-data as a result of mergers or sole proprietorships. Another reason for the difficulty in obtaining reliable data from entrepreneurs may be that they are reluctant to share information as they are afraid of it falling into the wrong hands, or they may simply do not keep record of the accurate information. Others perceive themselves as too busy to keep records of the necessary data or do not find it as an important activity. Consequently, much data is based on best guesses or even fabricated truths. In our experience, the lack of data was not necessarily a result of the entrepreneurs' holding back information, but rather the lack of stringent reporting demands from SIVA and the management of BTO. As a result, we had to manually extract important information to complete the datasets. This causes another reliability limitation of the data as the chances of extraction errors increases. Our study may be replicated, but the chances of achieving dissimilar results are high.

Validity

External validity concerns the generalisability of our study (Saunders et al., 2016). First of all, the sample of our study is small, but it is also quite specific and chosen on the basis of their sufficient reporting. Hence, it is difficult to say whether the sample is representative to the population of incubated firms. We conclude that we cannot generalise our results to other incubated firms in similar incubators. The internal validity of our study refers to whether we can deduce valid conclusions from our results. Taking the inconsistency of the data provided into consideration, the internal validity is weak. As all the samples used in our study consists of young firms in the early stages of their development, the validity of data is inherently limited (Freeman & Engel, 2007). The proximity to the actors of our study strengthens our internal validity to some extent as the opportunity to request information and acquire data from BTO throughout the study has been vital. Nevertheless, the study cannot be characterized as neither valid nor generalisable.

Limitations Using Propensity Score Matching

Propensity score matching is commonly used in research (Jakobsen et al., 2017b) but recent research have criticized important limitations to the approach. King and Nielsen (King & Nielsen, 2018) detected weaknesses in the parts of the algorithms that connects the probabilities of being in the treatment groups within the control group sample. Sainani (2012) pointed out the most prominent limitation of the propensity score matching which is the lack of generalizability of the results and the reduced statistical significance because of the reduced sample size. Furthermore, the variables chosen to calculate the p-score in our study could have included other factors accounting for other means than the chosen financial figures.

5. Analysis

The aim of our analysis is twofold: Consider to what extent incubation affects the performance of incubatees in BTO compared similar non-incubated firms as well as propose important considerations for future use of our approach. We repeat our research question:

To what extent can business incubation through BTO affect the success of innovative firms and how can our findings be applied to the incubator's future performance measurement system?

In the first section of our analysis we argue what would be an optimal approach for measuring incubator performance in BTO. We describe the procedure and the variables needed in order for BTO to implement this system. In the second section we assess incubation performance on BTO's Nyskapingsparken from 2007 until 2017 based on the available data provided to us.

5.1 Optimal Performance Measurement System

In the following chapter we will present both the procedure and measures we propose in order for BTO to optimize their performance measurement system. The suggestions presented are based on our analysis on past performance as well as empirical studies. In the literature there is a lack of consensus partly as a result of the overarching heterogeneity of incubators, suggesting that a PMS for one incubator might not be suitable for another (Phan et al., 2005). Using the literature presented, we will in the following section explain how performance measurement would be optimal for BTO in order to obtain results that can be used for financing- and strategy purposes and increase BTO's validity towards stakeholders.

An important starting point of constructing the optimal system is for the management to define and agree upon the most important objectives of the performance assessment. A baseline of existing results and a target for desired results should also be determined, as well as a suitable control group to be used for the different measures. An applicable control group for benchmarking of results in BTO is a sample of the firms that were rejected to the incubator in BTO, although the selection bias is hard to neglect.

Optimally, the incubatees should be measured from the point of their exit from the incubator in BTO. This point of exit typically marks the incubatees market entry and is the most critical point of time for the future of the firm. Therefore, performance measurement in year three and

five post-exit can provide valuable information about the effect of incubation (CSES, 2002; Kaplan & Norton, 2001).

As of now, reporting is done according to SIVAs guidelines and framework which is a considerable source of incomplete data. BTO should have their own reporting system that is not dependent on the demands from SIVA but rather holds a limited number of variables of which the incubatees or the responsible business developers are obliged to report. The reporting should be done consistently at a given point of time each year. Although former incubatees have no obligation to report directly to BTO or SIVA, there is a great amount of firm information that can easily be extracted from official records such as Brønnøysundregisteret. Alternatively, financials can be requested from SNF. As they are co-owners of BTO via NHH they are expected to have an interest in incubation performance results. In order to secure consistent performance measurement, it is important to assign responsibilities to competent employees. We propose to use student interns to create a system for collecting data and develop routines in analysing the data.

The goal approach by Hackett and Dilts (2008) is a suitable framework to categorize firms as successes or failures in BTO. The performance indicators used in the goal approach is firm growth and survival. Optimally, several indicators of both quantitative and qualitative characters should be evaluated in order to create a holistic PMS. However, choosing too many performance measures may result in information overflow and ignorance of important data (Tangen, 2004).

Preferably, already existing measurement practices should be audited and streamlined towards the new system. In a long-term perspective, it is reasonable to assume that BTO has been able to collect more and increasingly consistent data as a result of a larger accumulated base of incubatees and a larger focus on performance measurement. Thus, for each round of reporting, the results will become more reliable.

5.1.1 Optimal Growth Analysis

BTO's regional business incubator, Nyskapingsparken is constantly evolving in order to meet the expectations and demands required of an institution facilitating innovation – so should the reporting and performance measurement system. Being able to grow at a higher pace than average is according to BTO one of the most important factors when screening and selecting new incubation participants (Indresøvde, 2018). Consequently, making it all the more relevant

to measure whether or not the incubator is able to create an environment where this potential is maximized.

The parameters of growth we intend to measure are *sales revenue, personnel expenses, value creation* and *net profits.* Keeping track of these variables can provide valuable insights to decision making (Jakobsen et al., 2017b; Löfsten & Lindelöf, 2002; Walter et al., 2006). They are easily comprehendible and intuitive which should make them interpretable for all stakeholders. As illustrated in figure 9, we are interested in looking at the potentially different growth paths of in the mentioned for the two groups of firms over a longer time span. The spread, here especially visible in the medians are expected to disperse to a greater degree over time as proposed in the first hypothesis of the thesis.

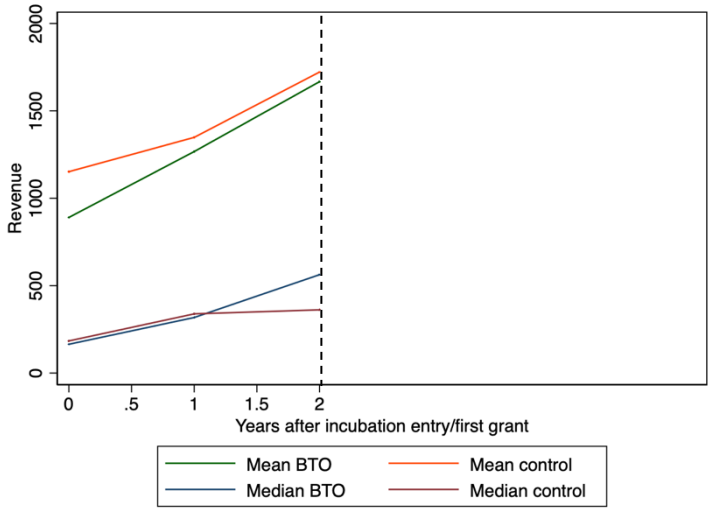

Figure 8: Visual example of future PMS

We would ideally want to assess performance through measures like the number of employees relative to revenues and/or net profits to be able to compare rates of value creation. As this is not public record, value creation is primarily a rate for internal use and reporting.

We propose to construct a comparison group either by doing propensity score matching with data on similar firms made available through Innovation Norway or by constructing a comparison sample out of the firms that got their application to Nyskapingsparken rejected. In the latter case, a Difference-in-Difference analysis can be used to correct for the different base points of the companies in the sample as SNF has done in their midterm evaluation of the incubation programme (Jakobsen et al., 2017b). If BTO is contributing to increased value creation or even if just the selection biased proposed earlier is substantial enough, we should

be able to observe stronger correlation or even statistically significant differences between the two groups of firms over a longer time span.

According to our research on previous studies within the field it is recommended to measure these key figures as long as possible after incubation, while the third and fifth year after exiting the incubator are being used as the most common benchmarks.

In addition to these factors we would recommend keeping track of *debt*, external *funding*, *ownership* and the number of *employees* in the firm.

The *debt-equity ratio* compares the total amount of liabilities in the firm with shareholder equity while the *debt ratio* is calculated by dividing total liabilities by total assets. Reporting these figures could help BTO assess the accumulated amount of risk being taken within their portfolio. It could also make it easier to understand the optimal level of debt-equity mix in an industry which could help guide future participants in the incubator increase their profitability (Corporate Finance Institute, 2018).

A variable of outmost interest which we would have wanted to look deeper into is *external funding*. Being characterized as one of the most vital features of a growth intensive firm and one of the most common advantages to be exposed to within a business incubator, we believe this should be a part of the performance measurement system (Indresøvde, 2018; Löfsten & Lindelöf, 2002). Both BTO and SIVA but also one of the most important creditors of the incubatees, Innovation Norway, is governmentally funded to maximize idea potential in Norway. In our opinion the amount of external funding and especially what comes from government sources should be compared to other measures such as the rate of employment. This is not only relevant decision-making information for SIVA and BTO but also something that could be considered a responsibility being a public institution. Furthermore, analysis on return on investment for the different commonly used creditors in Nyskapingsparken could be applied on the entire portfolio of incubated firms which could make it easier to get funding to initiate future projects.

Where deemed possible it would be interesting to analyse the effect different *ownership* models have on the value creation in the incubated firms. We are interested in this first and foremost in order to assess whether or not different ownership models affect company performance. This would not necessarily be as easy to compare with a comparison group, but it generates value for internal use. This measure is especially interesting because BTO

conducts M&A activities in order to compliment governmental funding and thereby financing its operation. Are BTO choosing to buy shares where it is optimal or is there a tendency of imperfect information leading to suboptimal decision making?

After gathering these indicators of growth, BTO could not only compare its own performance with outside innovative start-ups but also look at differentiating factors within their own operation. It is for instance not unlikely that some sectors have a predisposition of higher growth than others in the Hordaland area. Furthermore, they might be able find correlation between where the idea of the incubated firm originated[4] and how this affects growth potential.

Building an optimal measurement system accounting for the accumulated growth in the business incubator is perhaps the most important and easiest way of assessing success in BTO's Nyskapingsparken. We propose to further build on our approach for the future.

5.1.2 Optimal Survival Analysis

In this chapter we outline how the second most effective indicator of firm success could be optimally measured in BTO, namely firm survival (Hackett & Dilts, 2008; Schwartz, 2010). The second hypothesis of the thesis predict that incubated firms have higher survival rates than non-incubated firms. In our analysis of past performance in section 5.2 we use a comparison group to evaluate the differences in survival between two slightly different populations. In this section we will rather concentrate on internal measurement of firm survival as a mean for future predictions.

In section 2.3.3 we defined survival by adding together *direct survival* and *M&As*. A challenge with the reporting as of today concerns the uncertainty of the end state of the incubated firms. While some firms are reported as operating, acquired, terminated or bankrupt, most firms do not have any description of their outcome for each year. Optimally, the end state should be an obligatory variable when reporting which should be followed up for all incubated firms post-incubation. Only then would a valid analysis of incubatee firm survival be possible to conduct. In table 5 we illustrate how such an analysis could be summarized assuming that the different

[4] «origin of the idea» in the SIVA-framework

outcomes of firms' end state could be categorised as either surviving or non-surviving. Market exit refers to the number of firms that exited incubation in the relevant year t.

n=XXX, t=0	t+1	t+2	t+3	t+4
Survivors	n-market exit			
Market exit total	xx			
M&A	xx			
Bankrupcy	xx			
Survival rate	XX%			
M&A rate	XX%			
Bankrupcy rate	XX%			

Table 5

Thus, with some adjustments to the reporting of the end state of incubatees exiting BTO each year, it will be possible to acquire reliable results in terms of firm survival in a couple of years. The survival rates alone will not explain the impact of BTO but can provide valuable insights into the incubators' ability to extend the lifetime of newly established firms.

In a long-term perspective, BTO can easily illustrate the development in survival rates of incubatees over the years by developing a table as table 6.

Year of exit	**+1 year**	**+2 years**	**+3 years**	**+4 years**	**+5 years**
2013	XX%	XX%	XX%	XX%	XX%
2014	XX%	XX%	XX%	XX%	
2015	XX%	XX%	XX%		
2016	XX%	XX%			
2017	XX%				

Table 6

One of the objectives of BTO is to create regional value which can be done by for instance creating more jobs (Mian, 1996). This objective might conflict with the objective of bringing new ideas into market that may be tedious and cause a higher risk of failure. For these reasons it would be valuable for BTO to have a better understanding of the initial firms and entrepreneurs in terms of their survival. It would be interesting to identify characteristics of the firms that survive in a three- or five-year perspective in order to enhance the most value creating admissions to the programme.

Such information could contribute to predictions of future survival of the firms. For instance, measuring the differences in survival rates between firms established prior to incubation and

during incubation may be of value. A logic assumption in this matter lies in the older firms' preliminary experience of managing their business. Another interesting characteristic of measurement is whether firms within specific sectors might outlive incubated firms operating in other, perhaps less prominent sectors in the Bergen region.

5.2 Evaluating Past Performance in BTO

In this section we will present our results, their implications and limitations based on our evaluation of performance in BTO from 2007 to 2017. Due to the inconsistencies in the dataset provided by SIVA and lack of observations over time, the analysis is sub-optimal. We have chosen to set t=0 to the point of admission to the incubator as opposed to at the point of exit These kinds of actions have been necessary in order to demonstrate how past performance can be interpreted and future performance can be measured. Nevertheless, the final dataset consists of a sufficient sample of BTO-incubated firms and the analysis of past performance is carried out as closely to the optimal analysis as possible.

Our analysis aims to answer the two hypotheses proposed in section 3 and is manifolded providing performance measurement indicators in terms of both growth and survival variables respectively. By the end of the analysis we categorize the incubated firms as successes or failures using to the goal approach (Hackett & Dilts, 2008).

In section 5, we proposed to keep track of *debt*, external *funding*, *ownership* and the number of *employees* in the firm in terms of growth. We also suggested to keep track of preliminary experiences of the entrepreneurs as well as the sectors of firm operations in terms of survival. However, these variables will not be addressed in the following section. Both samples consist of firms with financials and information for the year of incubation entry and the two subsequent years. Thus, the firms are at a very early stage and commonly do not report financials like debt, external funds and ownership at this stage (Freeman & Engel, 2007). Characteristics of firms and entrepreneurs also lacks in the reporting as of today.

5.2.1 Firm Growth

Table 7: Descriptive Statistics and differences in BTO and its matched firms

$N_{BTO}=N_{Control}=49$	BTO				Comparison Group				
	Mean	*Median*	*Mean growth*	*Median growth*	*Mean*	*Median*	*Mean growth*	*Median growth*	*Mean difference*
Sales Revenue									
Year 0	890,46	165,00			1152,18	184,00			
p=0,7288	(1785,416)				(2407,224)				
Year 1	1267,31	318,00	42,3 %	92,7 %	1348,55	339,00	17,0 %	84,2 %	**25,3 %**
p=0,5702	(2295,049)				(2239,642)				
Year 2	1667,14	563,00	31,5 %	77,0 %	1722,30	362,00	27,7 %	6,8 %	**3,8 %**
p=0,5413	(2408,129)				(2824,746)				
PeronnelExpenses									
Year 0	561,75	239,00			571,67	88,00			
p=0,5405	(838,822)				(898,278)				
Year 1	839,20	369,00	49,4 %	54,4 %	729,38	224,00	27,6 %	154,5 %	**21,8 %**
p=0,3028	(1105,194)				(990,344)				
Year 2	882,69	374,00	5,2 %	1,4 %	943,34	304,00	29,3 %	35,7 %	**-24,2 %**
p=0,5934	(1216,326)				(1315,303)				
Net Profits									
Year 0	-288,06	-24,00			-534,38	-9,00			
p=0,2377	(1120,671)				(2129,342)				
Year 1	-480,18	-185,00	66,7 %	-670,8 %	-924,63	-83,00	73,0 %	-822,2 %	**-6,3 %**
p=0,2316	(1482,664)				(3954,999)				
Year 2	-601,53	-242,00	25,3 %	-30,8 %	-1062,51	-12,00	14,9 %	85,5 %	**10,4 %**
p=0,2737	(1429,812)				(5148,853)				
Value Creation									
Year 0	243,91	10,00			51,71	28,00			
p=0,2938	(1243,632)				(2137,689)				
Year 1	332,67	31,00	36,4 %	210,0 %	-166,48	30,00	-421,9 %	7,1 %	**458,3 %**
p=0,1872	(1567,97)				(3588,562)				
Year 2	261,42	79,00	-21,4 %	154,8 %	-106,34	5,00	-36,1 %	-83,3 %	**14,7 %**
p=0,2890	(1372,764)				(4402,734)				

Standard deviations in brackets

P-values: one-sided, diff>0

All figures are presented in thousands

Table 7 shows descriptive statistics and differences between the two subsamples containing 98 firms in total – 49 incubatees and 49 comparison firms. The table provides an overview of

the four most common variables used to measure performance quantitively: *Sales Revenue, Peronnel Expenses, Net Profits* and *Value Creation.* Year 0 represents the year of entering incubation (BTO) or the first year of granted funding (Innovation Norway). *Difference* is mean growth in BTO subtracted by mean growth in the comparison group and is thereby positive when the incubated companies have performed better than the control group in terms of relative growth. Because the sample of companies is small, we have chosen to include the median.

As stated earlier we have chosen to exclude one observation of the BTO sample and its respective match due to substantial outlier characteristics. When we include these two firms all of the incubated companies are affected greatly making the comparison unreliable.

Table 7 also show the t-tests for all of the relevant financial variables in year 2. When matching the incubatees with the comparison group through propensity score matching, we wanted to minimize the difference between the two samples in year 0. Thus, making it easier to determine whether or not incubation at BTO is facilitating a different growth path given the parallel path assumption. The median values of all the financial variables shows that the two groups were very similar at t=0.

We can reject the null hypothesis that the samples are equal when we observe high p-values between the two groups. Thus, we accept the alternative hypothesis stating there are no significant difference between the groups of the analysis.

All assumptions in order to apply a reliable t-test are fulfilled: Ordinality of scale, simple random sample, approximately normality distributed means, no significant outliers and homogeneity of variances (Maverick, 2018). Some of the variables are a bit skewed and logging them betters the normality but due to negative figures and several observations amounting to zero we do not use log. The transformation would also have altered the means making the spread smaller which would have negative consequences in a sample of this size.

For the future, it is reasonable to assume that the data will become normally distributed while the sample size increases. We observe that the incubated companies originating in BTO seem to have a higher relative growth rate in Sales Revenue even though the means are higher for the comparison group. This is consistent with the findings in SNF's evaluation of SIVA's incubation programme (Jakobsen et al., 2017b) where it is argued that incubated firms take longer to develop the company and its strategy before entering the market (H. Sherman, 1999). Furthermore, we observe that the small sample size and some big firms are affecting the mean heavily leaving the median as a more suitable measure.

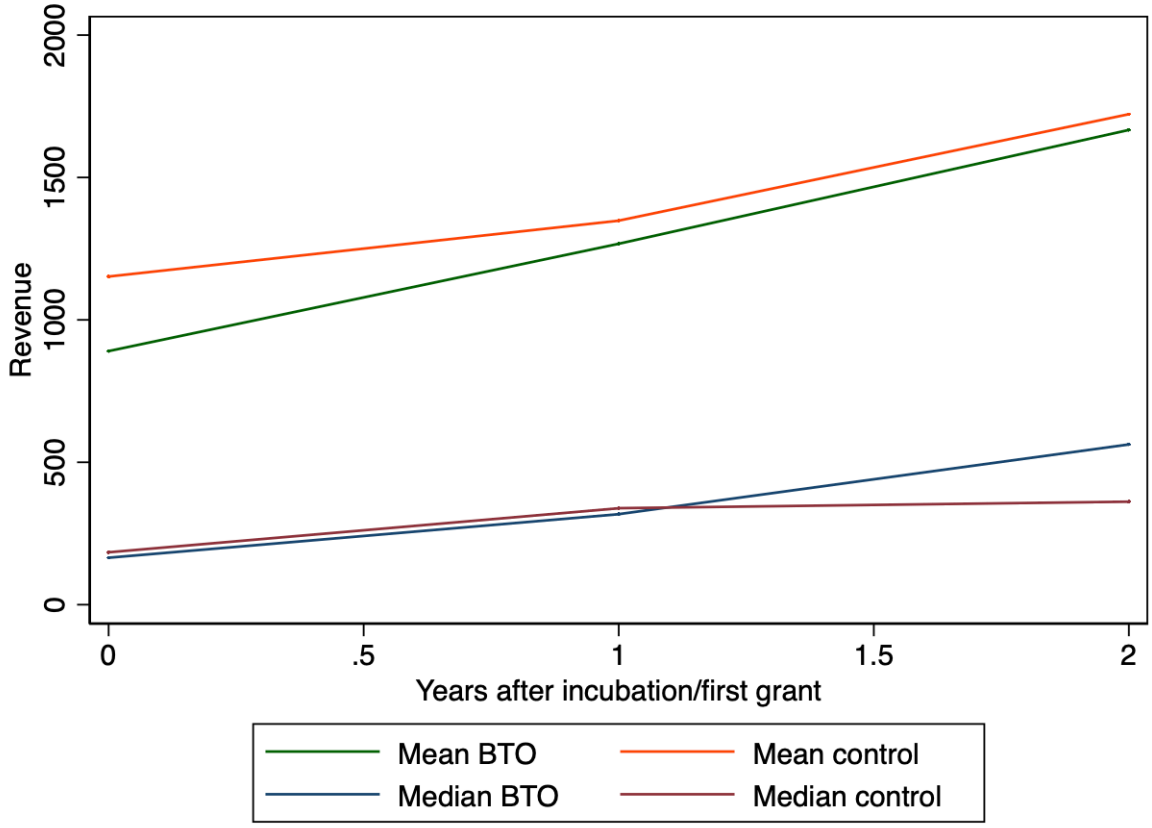

Figure 9: Graph showing the development in mean and median revenue for both samples

We also observe that there is a small spread in the means for year 0 in favour of the comparison group. This could be a result of the higher average age before the time of analysis for this sample and might also explain some of the difference in means in year 2.

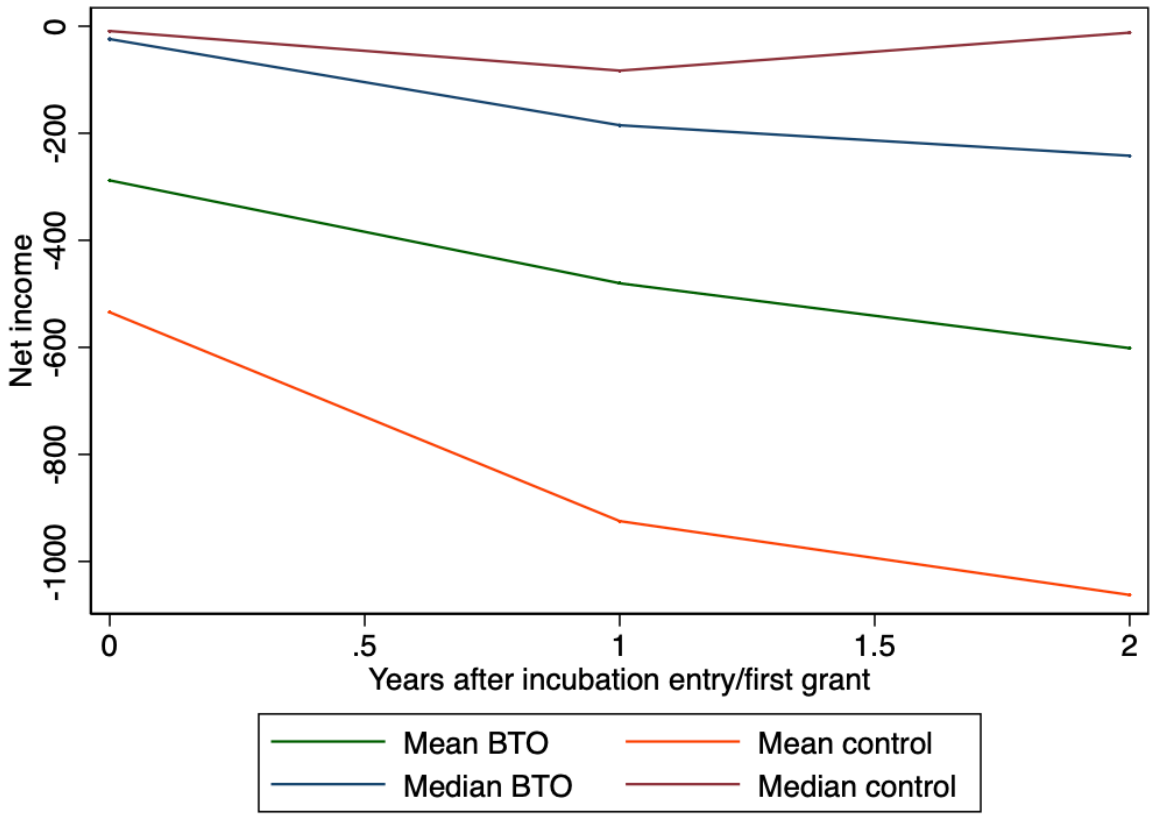

Figure 10: Graph showing the development in Net Income for both samples

It is important to keep in mind that the companies in the sample are not matched with age at t=0 as an independent variable and that the comparison group consequently contains companies with slightly more mature firms. It is feasible to assume that another year of operation would imply an increase in sales at such an early growth stage and this could explain the higher means for the comparison group at t=0.

Both groups present negative numbers in profits for all periods. The median and means are pointing different directions for the control group indicating one or more outlier taking bigger losses than average relatively. The spread is smaller between median and mean for the incubated firms which could imply that the level of risk-taking the first years is lower for companies under mentoring from BTO than for firms without the same amount of available coaching. However, the numbers shortly after establishment are very low making relative measures look more influential than what might actually be the case.

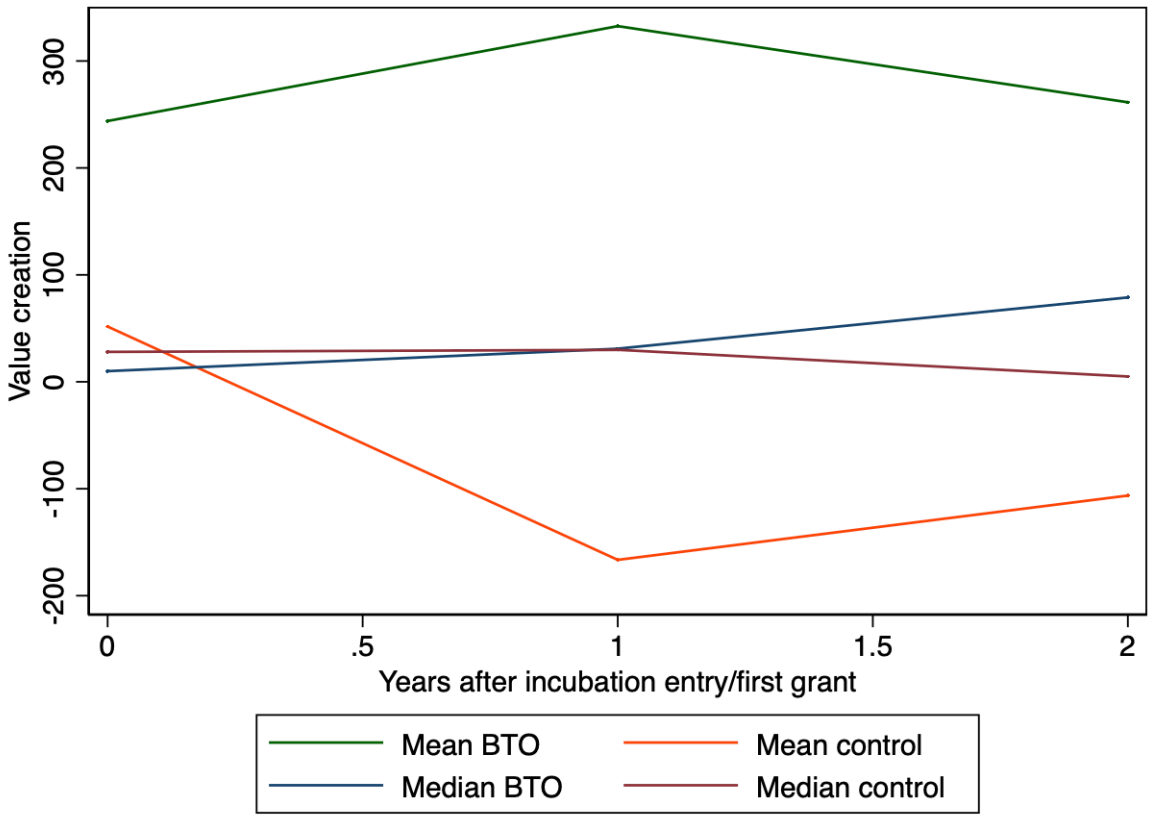

Figure 11: Graph showing the development in Value Creation for both samples

Value creation is a trusted figure measuring performance quantitatively in business incubators (Mian, 1996). By adding cost of employment to the operating profit we specifically examine the actual activity in the firm. The operating profit gives an indication as to how profitable the company has been the last year. We observe that both the value creation mean and the relative growth over the periods is higher for the incubates than for the comparison group. This result is not in line with SNF's findings as their study showed that SIVA's incubated companies overall had lower figures of value creation than the correspondent matches in the first periods after starting incubation. However, in a slightly more long term perspective, looking at firms after they exited incubation, SNF concluded that firms with previous experience from a business incubator had a higher probability of returning high rates of value creation (Jakobsen et al., 2017b). It is viable to claim that BTO, being one of SIVA's biggest entities might experience a similar development.

The spread between the two groups is quite low which is expected due to low revenue and the fact that there are often few if any paid employees in small and often immature firms. These factors would contribute to low figures of value creation.

Measuring value creation by adding personnel expenses to operating income is fine but not optimal. As already stated, the ideal measure of value creation would be the number of employees relative to revenues or net profits. However, as it is not required to report the number of employees with your public financial statements, we are unable to obtain this information for past incubatees.

Graph 13 shows the development of personnel expenses in the defined time frame. We use

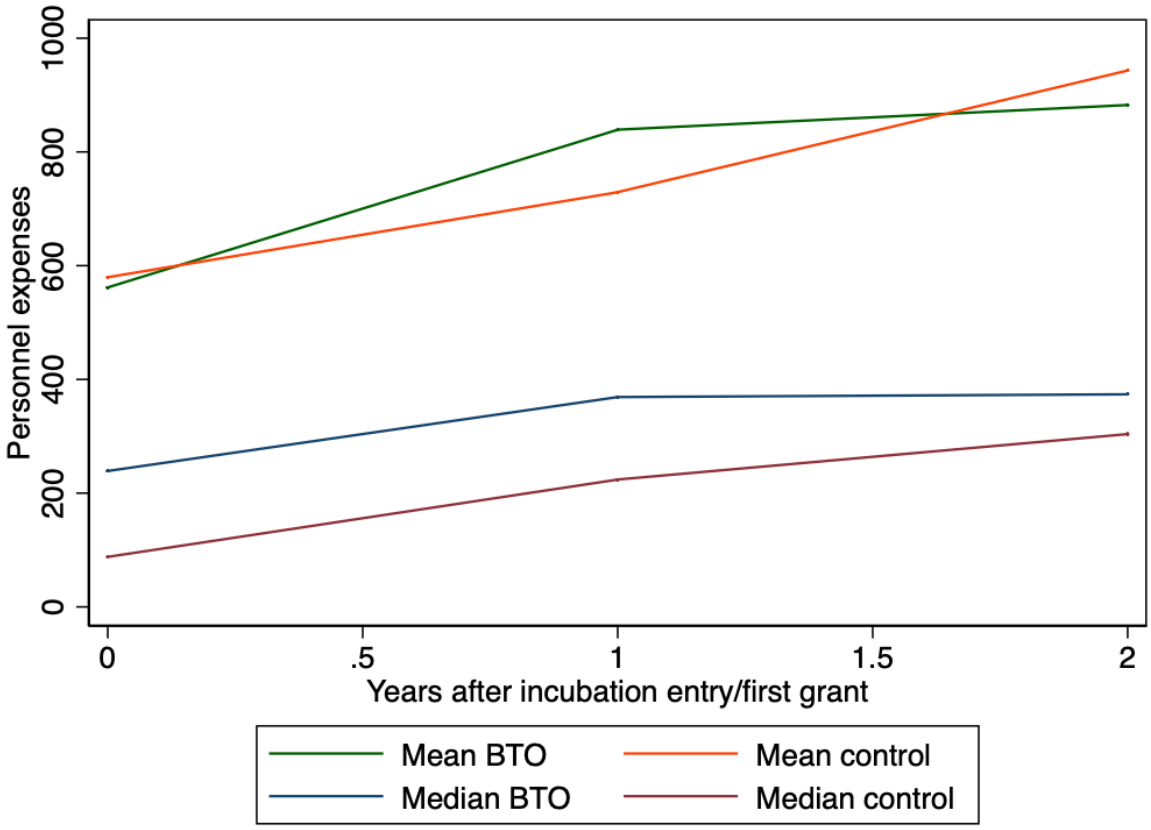

Figure 12: Graph showing the development in mean and median personnel expenses for both samples

this accounting item as a performance measure because it implicitly regards one of the most important goals of a regional business incubator – increasing the rate of employment in a given geographical area through innovation (Zedtwitz, 2003).

From the t-test comparing the variance of the means for personnel expenses we observe a slightly higher cost for the comparison group in year 2 amounting to 943,3. Furthermore, the growth from year 1 to 2 among the comparison group is bigger. As for all of the other variables the absolute difference between the two groups is small and expected to disperse on a longer term. However, while the companies obtained from Innovation Norway reports an increase in

cost related to employment over the two periods, the firms in the BTO sample are experiencing a stagnation possibly indicating a more conservative attitude towards increasing wages and/or expanding the work force even though revenues are increasing.

Our results from the evaluation of the relative performance within a group of incubatees from BTO cannot provide any conclusive answers but rather give an indication as to which degree an incubation process can affect an innovative firm's operation. By applying our method when the sample size has been allowed to grow through more consistent reporting in BTO, it is more likely that we could observe significant differences between the incubatees and a control group of similar non-incubated firms.

5.2.2 Firm Survival

The second hypothesis of our thesis proposed that incubation increase firms' chances of survival. In our analysis of past performance in terms of firm growth, the sample of 49 BTO-firms were selected with the prerequisite that they have survived three years from the admission of the incubator. For this reason, the same sample is not applicable when measuring firm survival. Thus, we will in this section use a slightly different sample and rather assess the survival rate of the firms entering incubation in 2013 in a three-year perspective. The sample will be compared to a similar group of companies from the Innovation Norway dataset.

The firms in the BTO sample have been screened according to several success criteria to assess their future chances of succeeding and contribute to an increase in regional value creation (the admission criteria are attached in table 2 in the appendix). In other words, the firms are selected with their chance of survival as one of the criteria for admission to NPI. Thus, assuming the screening process helps filtering out the best candidates, the incubatees should have a considerable higher chance of surviving than firms developed without the help of BTO.

In our analysis we study the 44 firms that entered incubation in 2013 and their development up until 2016. Using the SNF financials we determined whether or not the firm is still operating. We have created two different comparison groups from the Innovation Norway dataset, one being the total of all firms receiving a grant in 2013 whereas the other only consists of firms who have gotten a specific type of grant closely related to start up activity.

		2013	2014	2015	2016
BTO Sample	*BTO, N=*	44			
	SNF, N=	36	33	28	25
	Survival rate	82 %	75 %	64 %	57 %
	Relative		92 %	85 %	89 %
All grants given 2013 Innovation Norway	*IN, N=*	3762			
	SNF, N=	2111	2075	2008	1922
	Survival rate	56 %	55 %	53 %	51 %
	Relative		98 %	97 %	96 %
Establishment grant Innovation Norway	*IN, N=*	321			
	SNF, N=	225	219	209	200
	Survival rate	70 %	68 %	65 %	62 %
	Relative		97 %	93 %	88 %

Table 8: Statistics showing the level of survival of firms in three different samples

Our findings in table 8 shows how many distinct firms there are in each of the datasets before and after merging with SNF's database of financial records for the years 2013-2016. Out of the 44 registered firms in the BTO sample only 36 or 82% show up in SNF financials for the same year. There could be many reasons as to why these firms do not turn up: some of the incubatees are sole proprietorships and do not report financials to Brønnøysundsregisteret while others might not survive the first year or they sell their idea or patent to another firm dissolving the other. The same could be the case for the sample for all companies that received a grant from Innovation Norway, showing that 44% of the registered firms do not appear when merged with the financial statements. Assuming the reasons for not appearing and the probability of them occurring are the same for both the sample obtained from BTO and Innovation Norway, we can observe that BTO's incubatees have a lower rate of survival than firms receiving establishment grants from Innovation Norway in 2013.

On recommendation from Innovation Norway we also did the analysis on a subsample within the Innovation Norway database of firms who have gotten an *establishment grant*[5]. This group of firms are also in an early phase and are required to deliver business plans and progress

[5] Etableringstilskudd

reports to Innovation Norway as they receive funding split over time. We observe that the survival rates are slightly more alike the BTO sample although somewhat higher.

The BTO sample is smaller than the two others which makes one firm's termination affect the ratio more than in the samples from Innovation Norway. However, in the sample consisting of firms on the establishment grant from Innovation Norway, 5% more of the companies have survived by the end of 2016 compared to the dataset from BTO. This supports the findings of Sherman (1999) and Schwartz (2010) where the firms affiliated with the incubator had a lower rate of survival than the control group.

Table 8 is dissimilar to the tables proposed in the description of an optimal measurement of survival rates. The reason is the use of a comparison group in the analysis of past performance. However, using a comparison can be misguiding as the end states of its firms are only speculative. Such information is non-available from official records. Hence, the optimal analysis of firm survival should enhance internal characteristics and be cautious when comparing such figures with comparable groups or national standards.

Our results are based on a sample of incubatees covering a maximum period of three years after the start of incubation which means that the post-incubation period covers a maximum of two years. Assuming that the majority of incubatees stay in the incubator over the recommended period of two years, the sample only covers the first year after exit. According to Schwartz (2010) it is therefore reasonable to assume that the dissolvement rates in BTO would increase if we had covered at least two more years of the same sample. His studies concluded that incubatees are more likely to dissolve within three years after their exit from the incubator compared to a group of similar firms. Thus, in line with Schwartz' (2010) findings we might argue that BTO at best postpone their incubatees' liability of newness and delay their inevitable future. However, this would only be speculative as our findings cannot confirm nor deny this claim.

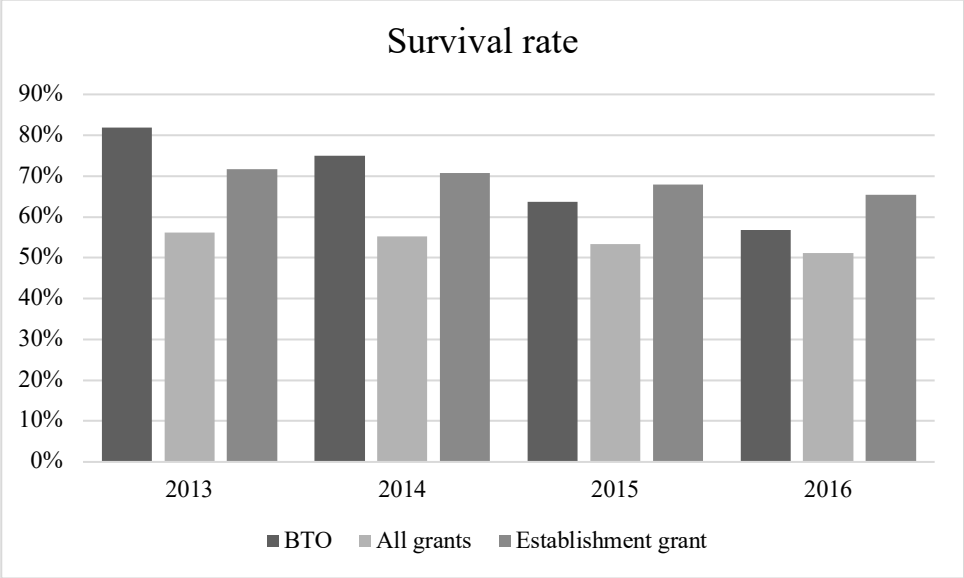

Figure 13: Graph showing the rate of survival of firms in the three samples, 2013-2016

5.2.3 The Goal Approach Framework

After looking into the different aspects of success criteria for BTO's incubates we assess them using the goal approach (Hackett & Dilts, 2008). We look at the sample meant for measurement of growth because of the consistent time span for all companies makes for the best comparison we have available. Furthermore, the use of this sample best represents future use of the framework in BTO for categorising their incubatees relative to performance.

State 3 and 5 describes a situation in which a company has been terminated whilst being in the incubator and taking small and big losses respectively. Because one of the assumptions in the creation of the BTO dataset was financial reportings of year 0 to 2 we do not have any firms that were terminated while being a part of BTO Nyskapingsparken.

State 1 accounts for companies that have survived and are growing profitably. We have further defined profitable growth as substantial growth in revenue over all years as well as an expanding positive operating profit (Young, 2016). There are 13 BTO-incubatees and 13 firms from the Innovation Norway sample in this state.

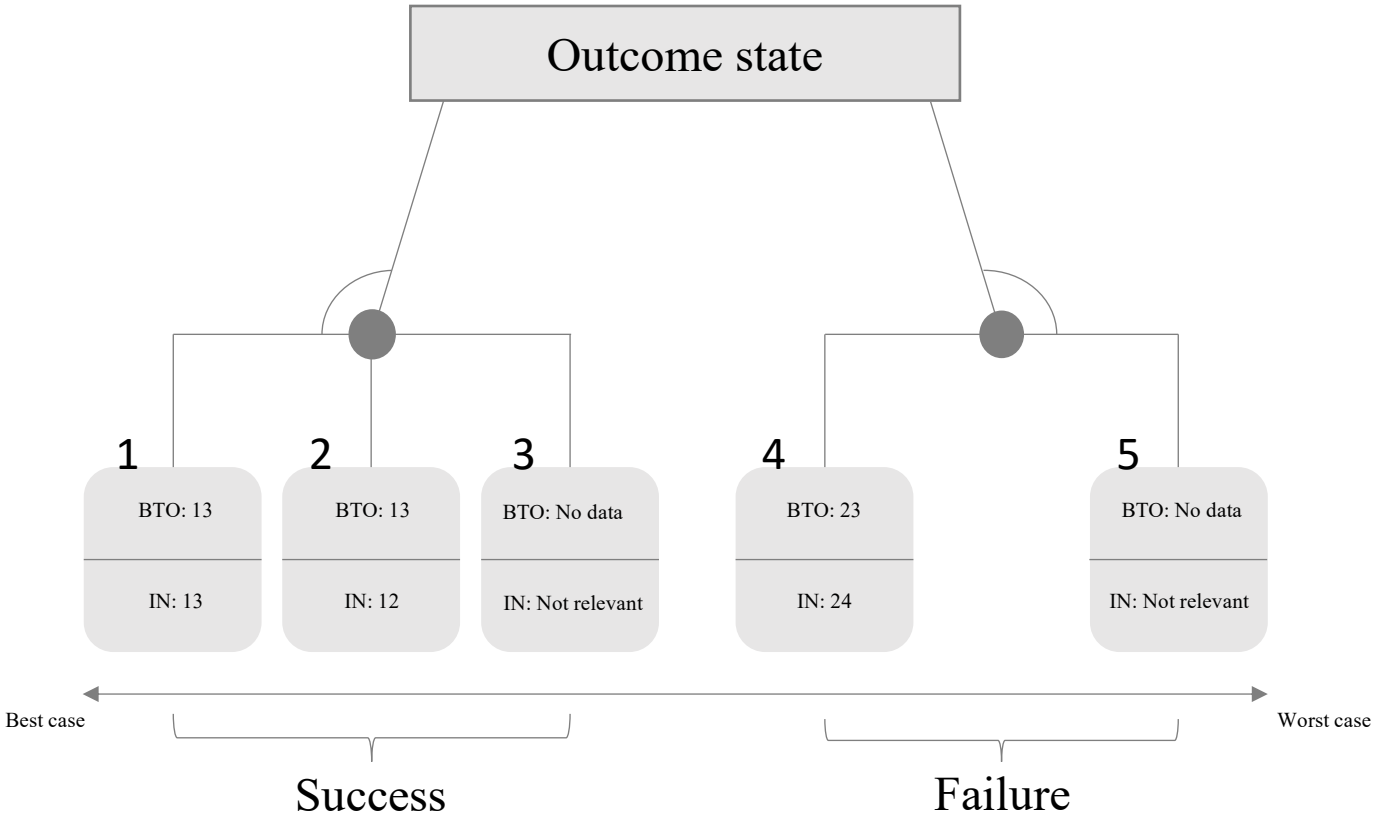

Figure 14: Illustration of firms in our growth sample placed in Hackett and Dilts (2008) framework of outcome states

State 2 describes firms that have survived, experience growth and are showing a pattern leading towards profitability. We have chosen firms with a significant sales revenue growth and increasing but still negative operating profits as representative for this group. The results from our sample are more or less the same for this state as well: 13 incubatees and 12 from the comparison group. This state describes an early stage of innovative start-up firms in which companies' part of an incubation process are expected to pass through faster than those who are not, reaching profitable growth more efficiently (Löfsten & Lindelöf, 2002).

State 4 gathers companies that have survived but is not growing and are not or only marginally profitable. Most of the companies in our combined sample belongs at this stage which was expected considering that the sample from BTO consists of companies established less than two years before incubation on average and just over two years for the comparison group.

6. Discussion

In this thesis we wanted to assess whether being part of an incubation process in Bergen Teknologioverføring influence performance and if so: to which degree. Our first hypothesis concerns the growth of the firms in the incubator and proposes that these firms perform better than non-incubated firms along four financial dimensions. Although the results are inconclusive, it is possible to observe patterns indicating future developments.

Due to the matching methods applied to the sample, the companies are approximately equal in year 0. During the next two periods we found that the spread between the two groups is expanding and consequently it seems the two groups develop different growth paths. We are especially interested in the results after two years because our time frame is short and these measures are expected to develop differently over time. Our findings after two years (t=2) are in favour of BTO for relative measures of mean sales revenue, profits and value creation, although sales revenue is higher on average in the control group. Moreover, we observe several severe gaps between the median and mean values suggesting that we have some outliers. In a sample this size, just one outlier could have a big influence on the results in these kinds of restricted analysis. Personnel expenses seem to be stagnating for BTO between year 1 and 2 while continuing to grow for the control group. This could simply be caused by an outlier but the medians are relatively in line with the means. Therefore, it may suggest that growth in terms of employment may be deferred for incubated companies compared to others.

In our second hypothesis we propose that the incubator in BTO increase the survival rate of start-ups compared to non-incubated firms. Our results are based on a dataset of low validity and we cannot make conclusive remarks. The findings indicate that the rate of survival is lower for the firms with BTO-history than for the comparison group. This supports the findings of Schwartz (2010) and Amezcua (2010), in which both of whom concluded that there is no positive relationship between incubation and increased chances of survival. Schwartz thereby suggests the efficiency of incubators tends to be overestimated as result of the selection bias. Looking at firm survival as an absolute positive success criterion might be misleading according to the Center for Strategy and Evaluation Services (2002). Even though a company does not turn up in the financial reports one year, it does not mean it necessarily went bankrupt. On the contrary it might have been merged with another entity and delivering high profitability. Because this information is not available in our datasets, the findings might provide us with misleading insights.

The objectives of BTO is to create regional value by commercialising ideas and establish viable growth businesses. Out of the 49 incubatees studied in our thesis, 26 of them, or 53%, can be considered a success even in a three-year perspective according to Hackett and Dilts (2008). In the comparison group, successful firms accounted for 51%. These figures seem to be more aligned and normalised than our findings compared to the survival or growth rates alone, indicating that several performance indicators might provide results that are more reliable. When analysing effects based on small samples over a short time frame this becomes particularly relevant. Through the use of this framework we also consider the failure or discontinuity of a firm may as well be regarded as a necessary step in achieving success in the future.

According to SIVA, many young Norwegian firms dissolve before they have had a chance to enter the market (Jakobsen et al., 2017b). Their findings indicate that Norwegian incubators evoke positive effects for such young firms and help them overcome the liability of newness. Whether or not BTO contributes to the market failure correction in Norway is inconclusive according to our results. From the data provided it is apparent that increasingly more firms are applying for and connects with the incubator in some way. Although the following reasoning is simplified, we might infer from this that the incubator could have a positive effect on the local innovation environment due to the increased possibilities of commercialising great ideas. However, this practice binds resources within BTO and might imply less time for follow-up and business development for the actual incubatees.

Overall, our results can only give an indication of the value added in incubators and their future patterns of performance. The uncertainty related to the impact of incubation can best be described by the words of Udell (1990): "*input does not equal impact*". Some companies affiliated with BTO's Nyskapingsparken may experience high growth and carry on operating profitably for decades while others might end up bankrupt after the first months of operations. For some, that outcome depends a lot on incubation treatment while others would have done just as well without it. This implication in addition to the lack of consistency and validity in our dataset makes conclusive arguments for or against incubation practically impossible to draw.

7. Conclusion

7.1 Summary

Business incubation through BTO is intended to enhance value creation in the Bergen region. The results from our analysis of past performance of incubated firms in BTO does not reveal any statistically significant difference in the performance of these firms compared to a group of non-incubated firms with similar capabilities. The findings are inconclusive, but reveal some tendencies suggesting that incubated firms grow faster and have a lower rate of survival than the control group.

Combining the two performance indicators of our hypotheses, we can evaluate the overall success of the sample using the goal approach by Hackett and Dilts (2008). Success in incubators was defined as "the degree to which the support arrangement is able to meet the objectives set for it" (Autio & Klofsten, 1998). The objectives of BTO is to create regional value by commercialising ideas and establish viable growth businesses. From our analysis we found that the success of the incubated firms is similar to the success of the control group. Hence, we cannot conclude that incubation in BTO affects the survival rate as of now.

In order to answer our research question, we collected secondary data from several sources. Using these datasets, we constructed samples consisting of previously incubated firms and a control group that is considered similar to the incubated firms in year 0 of our analysis. However, data with high validity is hard to acquire when looking at newly established firms and innovative environments (Freeman & Engel, 2007). Furthermore, we detected significant shortcomings in the datasets provided and manually added essential data to our samples. Hence, the results are affected by limited validity of the data and cannot be considered acceptable.

Performance measurement in incubators is a conflicted theme in incubation literature, and it is suggested that generalizing the performance measurement systems is challenging due to the differences in the various incubators' objectives and missions (Mian, 1997; Minahan & Vigoroso, 2002). Combining this fact with the constrained data we were able to obtain resulted in the analysis of an optimal performance measurement system for the incubator in BTO. We briefly described how the procedure of reporting and collection of data should be done in order to analyse performance that in the future can be crucial for decision making in the incubator.

Building on the analysis of past performance we added suggestions for more efficient assessment of firm growth and survival.

7.2 Implications

Throughout our research we have identified several shortcomings in BTOs reporting and performance measuring routines. The most prominent shortcomings have been addressed in thesis as the lack of consistency in the admission process and arbitrary performance reporting which has resulted in selection biases and inconsistent data. Reducing biases and increasing the consistency in data is therefore of immense importance in order to achieve valid results when measuring performance. However, through our conversations with the management of BTO, it has become evident that better routines are initiated - our thesis being one of the initiatives. As a concluding remark, our thesis is likely to impact BTOs performance measuring strategy by identifying the shortcomings in their existing routines and suggesting a procedure and indicators for future performance measuring.

7.3 Suggestions for Further Research

There is a great potential in the performance measurement system currently used in BTO as well as in other Norwegian incubators managed by SIVA. After spending five months studying the subject of business incubation in Norway we have not found any other specific research on Norwegian incubators than the evaluation of SIVA's incubation programme by Jakobsen et al. (2017b) conducted via SNF. There is a general lack of reporting and thereby datasets with a satisfactory level of validity in innovative environments. The public spending on these new initiatives is increasing without there being conducted studies on the actual influence they have on value creation in Norway. Therefore, we encourage researchers to elaborate on the subject of performance in Norwegian incubators in order to understand their actual impact on regional value creation.

We were not able to identify significant differences between the BTO-incubatees and other firms with similar capabilities. For the future, we would assume these differences to occur given that our results were caused by a lack of data, limitations of matching method rather than actually not showing significant variation in performance. First and foremost, we therefore propose conducting another descriptive study measuring incubation success in BTO.

This study could build on our findings and we assume a substantial improvement in the incubator's reporting standards and data gathering.

Following these descriptive studies assessing whether or not incubation actually influences the performance in start-ups, it would be interesting to conduct an explanatory study looking at how BTO adds value to their affiliated firms. We propose the following research question:

"How can the different resources provided in BTO's incubator explain the performance of the incubatees?"

It would also be interesting to conduct studies looking at predispositions for success in an incubator as well as look for factors that affect survival rate on a more in-depth level.

References

Ahmad, A. J. (2014). A Mechanisms-Driven Theory of Business Incubation. University of Warwick, Coventry. *International Journal of Entrepreneurial Behaviour & Research 20*, 375-405. doi:10.1108/IJEBR-11-2012-0133

Albort-Morant, G., & Ribeiro-Soriano, D. (2016). A Bibliometric Analysis of International Impact of Business Incubators. *Journal of Business Research, 69*, 1775-1779.

Amezcua, A. S. (2010). Performance Analysis of Entrepreneurship Policy: Which Business Incubators Generate the Highest Levels of Economic Performance? *Frontiers of Entrepreneurship Research, 30* (18).

Andreassen, T. (2017, 08.05.2017). *Innovasjonsbyen Bergen*. Retrieved from http://twa-marketing.blogspot.com/2017/05/innovasjonsbyen-bergen.html

Asheim, B. (2007). Differentiated Knowledge Bases and Varieties of Regional Innovation System. T*he European Journal of Social Science Research, 20, 223-241*. doi:10.1080/13511610701722846

Audretsch, D. (2007). *The Entrepreneurial Society*. Oxford University: Oxford University Press, Inc. Retrieved from: http://utrechtce.nl/wp-content/uploads/2015/08/Entrepreneurial-University1.pdf

Autio, E., & Klofsten, M. (1998). A Comparative Study of Two European Business Incubators. *Journal of Small Business Management, 36*, 30-43

Barbero, J. L., Casillas, J. C., Wright, M., & Garcia, A. R. (2014). Do Different Types of Incubators Produce Different types of Innovations? *Springer Science Business Media, 39*, 151-168.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management, 17,* 99-120.

Brønnøysundregistrene. (2018). *Nøkkelopplysninger fra Enhetsregisteret: Bergen Teknologioverføring.* Retrieved from https://w2.brreg.no/enhet/sok/detalj.jsp?orgnr=987753153

BTO. (2017). *Årsmelding 2016, Bergen Teknologioverføring AS*. Retrieved from https://issuu.com/limedrop/docs/bto_aarsrapport_2016

BTO. (2018a). 01.10.2018. *Growth in Siva-funding Strengthens Innovation in Hordaland*. Retrieved from https://bergento.no/2018/10/growth-in-siva-funding-strengthens-innovation-in-hordaland/

BTO. (2018b). *Årsmelding 2017, Bergen Teknologioverføring AS*. Retrieved from https://issuu.com/limedrop/docs/bergen_teknologioverf_ring_as_-_a_r

Bøllingtoft, A., & Ulhøi, J. P. (2005). The Networked Business Incubator—Leveraging Entrepreneurial Agency? *Journal of Business Venturing, 20*(2), 265-290. https://doi.org/10.1016/j.jbusvent.2003.12.005

Campbell, C., & Allen, D. N. (1987). The Small Business Incubator Industry: Micro-Level Economic Development. *Economic Development Quarterly, 1*(2), 178–191. https://doi.org/10.1177/089124248700100209

Cheng, S., & Schaeffer, P. (2011). Evaluation Without Bias: a Methodological Perspective on Performance Measures for Business Incubators. *Region et Developpement, 33*, 211-225

Colombo, M., & Delmastro, M. (2002). How Effective are Technology Incubators? Evidence from Italy. *Research Policy, 31(7),* 1103-1122. https://doi.org/10.1016/S0048-7333(01)00178-0

Corporate Finance Institute (2018, 16.12.18). What is the debt to equity ratio? *How much leverage does a company have?* Retrieved from https://corporatefinanceinstitute.com/resources/knowledge/finance/debt-to-equity-ratio-formula/

CSES (2002). Benchmarking of Business Incubators. *Centre for Strategy & Evaluation Services*. Retrieved from: https://ec.europa.eu/

Cullen, K. (2007). Knowledge Transfer: The Role of the University in Economic Development. *Technology Transfer and Economic Development, 10-25.*

Dalmarco, G., Maehler, A. E., Trevisan, M., & Schiavini, J. M. (2017). The use of knowledge management practices by Brazilian startup companies. *RAI Revista de Administração e Inovação, 14*(3), 226-234. https://doi.org/10.1016/j.rai.2017.05.005

Frank, C., Sink, C., Mynatt, L., Rogers, R., & Rappazzo, A. (1996). Surviving the "Valley of Death": A comparative Analysis. *Technology Transfer, Spring-Summer,* 61-69. doi: 10.1007/BF02220308

Freeman, J., Carroll, G. R., & Hannan, M. T. (1983). The Liability of Newness: Age Dependence in Organizational Death Rates. *American Sociological Review, 48*(5), 692-710. doi:10.2307/2094928

Freeman, J., Engel, J. S. (2007). Models of Innovation: Startups and Mature Corporations. *California Management Review, 50(*1), 94-119.

Fritsch, M., & Mueller, P. (2004). The Effects of New Business Formation on Regional Development Over Time. *Regional Studies, 38,* 961-975. doi:10.1080/0034340042000280965

Gassmann, O., & Becker, B. (2006). Towards a Resource-based View on Corporate Incubators. *International Journal of Innovation Management*, *10,* 19-45. doi:10.1142/S1363919606001387

Hackett, S., & Dilts, D. (2004). A Real Options-Driven Theory of Business Incubation. *The Journal of Technology Transfer, 29,* 41-54. doi:10.1023/B:JOTT.0000011180.19370.36

Hackett, S., & Dilts, D. (2008). Inside The Black Box of Business Incubation: Study B - Scale Assessment, Model Refinement, and Incubation Outcomes. *The Journal of Technology Transfer, 33,* 439-471. doi:10.1007/s10961-007-9056-9

Heskett, J., Jones, T., Loveman, G., Sasser, E., & Schlesinger, L. (1994). Putting the Service-Profit Chain to Work. *Harvard Business Review, 72*(2), 164–174. Retrieved from: https://hbr.org/2008/07/putting-the-service-profit-chain-to-work.

Horn, B. (2018), «Gode eksempler fra Norge og erfaringer fra inkubatordrift i Bergen». Presentation. Retrieved from: https://bergento.no/wp-content/uploads/2018/03/Horn_Bjarte_1510.pdf.

Hudson, J., & Khazragui, H. F. (2013). Into the Valley of Death: Research to Innovation. *Drug Discovery Today, 18*(13), 610-613. doi:https://doi.org/10.1016/j.drudis.2013.01.012

Huselid, M. (1995). The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance. *Academy of Management Journal, 38*(3), 635-872. Retrieved from: http://www.markhuselid.com/pdfs/articles/1995_AMJ_HPWS_Paper.pdf

Indresøvde, H. (2018, 25.10.18) *Interview regarding the admission to NPI and the incubation programme/Interviewer: J. Styve., P. Stubberud*.

Jakobsen, S.-E., Engesæter, P., Kvitastein, O., Mæhle, N., Nesheim, T., & Aarstad, J. (2017). Midtveisevaluering av Sivas Inkubatorprogram og Næringshageprogram. *Samfunns- og næringslivsforskning (SNF).* Retrieved from https://siva.no/midtveisevaluering-nh-inkprogram/

Kaplan, R., & Norton, D. (2001). Transforming the Balanced Scorecard from Performance Measurement to Strategic Management: Part 1. *American Accounting Association, 15*(1), 87-104.

King, G., & Nielsen, R. (2018). Why Propensity Scores Should Not Be Used for Matching. *Department of Political Science, Harvard University.* Retrieved from: https://gking.harvard.edu/publications/why-propensity-scores-should-not-be-used-formatching

Lohman, C., Fortuin, L., & Wouters, M. (2004). Designing a Performance Measurement System: A Case Study. *European Journal of Operational Research, 156*, 267-286. doi:10.1016/S0377-2217(02)00918-9

Löfsten, H., & Lindelöf, P. (2002). Science Parks and the Growth of new Technology-Based Firms—Academic-Industry Links, Innovation and Markets. *Research Policy, 31*(6), 859-876. doi:https://doi.org/10.1016/S0048-7333(01)00153-6

M'Chirgui, Z. (2012). Assessing the Performance of Business Incubators: Recent France Evidence. *Sciedu Press, 1*(1). doi:https://doi.org/10.5430/bmr.v1n1p62

Markham, S., Ward, S., Aiman-Smith, L., & Kingon, A. (2010). The Valley of Death as Context for Role Theory in Product Innovation. *Journal of Product Innovation Management, 27*(3). doi:https://doi.org/10.1111/j.1540-5885.2010.00724.x

Mas-Verdú, F., Ribeiro-Soriano, D., & Roig-Tierno, N. (2015). Firm survival: The role of incubators and business characteristics. *Journal of Business Research, 68*, 793-796.

Maverick, J. B. (2018, 14th of february). What Assumptions are Made When Conducting a t-test? Retrieved from: https://www.investopedia.com/ask/answers/073115/what-assumptions-are-made-when-conducting-ttest.asp

McAdam, M., & McAdam, R. (2008). High Tech Start-ups in University Science Park Incubators: The Relationship between the Start-up's Lifecycle Progression and Use of the Incubator's Resources. *Technovation, 28*(5), 277-290. doi:https://doi.org/10.1016/j.technovation.2007.07.012

Mian, S. (1996). Assessing value-added contributions of university technology business incubators to tenant firms. *Research Policy, 25*(3), 325-335. doi:https://doi.org/10.1016/0048-7333(95)00828-4

Mian, S. (1997). Assessing and Managing the University Technology Business Incubator: An integrative Framework. *Journal of Business Venturing, 12*, 251-285.

Minahan, & Vigoroso. (2002). The Supplier Performance Measurement Benchmarking Report. *Aberdeen Group.* Retrieved from: http://www.lyonsinfo.com/_resources/aberdeen_spms_report.pdf

Mjøs, A. (2016, 11.09.18). SNF Arbeidsnotat 10/2016. *Samfunns- og næringslivsforskning AS (SNF)*. Retrieved from: http://www.snf.no/Default.aspx?ID=143&year=2016&cat=1&mode=detail&RowId=PubID%3d21714&ViewPID=130&PubID=21714

Neely, A., Mills, J., Platts, K., Richards, H., Gregory, M., & Bourne, M. (2000). Performance Measurement System Design: Developing and testing a process-based approach. *International Journal of Operations and Production Management, 20*(10), 1119-1145.

Nemet, G. F., Zipperer, V., & Kraus, M. (2018). The Valley of Death, the Technology Pork Barrel, and Public Support for Large Demonstration Projects. *Energy Policy, 119*, 154-167. https://doi.org/10.1016/j.enpol.2018.04.008

Nyskapingsparken. (2018, 18.10.18). Home: Nyskapingsparken. Retrieved from www.nyskapingsparken.no

OECD. (1997). Technology Incubators: Nurturing Small Firms. *OECD/GD, 97*(202). Retrieved from: http://www.oecd.org/science/inno/2101121.pdf.

Phan, P., Siegel, D., & Wright, M. (2005). Science Parks and Incubators: Observations, Synthesis and Future Research. *Journal of Business Venturing, 20,* 165-182. doi:10.1016/j.jbusvent.2003.12.001

R. Rosenbaum, P., & Rubin, D. (1983). The Central Role of the Propensity Score in Observational Studies For Causal Effects. *Biometrika, 70, 41-55.* doi:10.1093/biomet/70.1.41

Rathino, T. (2011). *Are They Helping? An Examination of Business Incubators' Impact on Tenant Firms* (PhD thesis). University of Twente. Retrieved from: https://www.utwente.nl/en/bms/nikos/research/dissertations/Tiagoratinho.pdf

Sainani, K. (2012). Propensity scores: Uses and Limitations. *American Academy of Physical Medicine and Rehabilitation, 4*, 693-697.

Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research Methods for Business Students* (Seventh edition). Pearson Educated Ltd.

Schwartz, M. (2010). A Control Groups Study of Incubators' Impact to Promote Firm Survival. *IWH Discussion Papers,* Halle Institute for Economic Research (IWH) *No. 11/2010*. Retrieved from: http://hdl.handle.net/10419/37055

Sherman, H., & S. Chappell, D. (1998). Methodological Challenges in Evaluating Business Incubator Outcomes. *Economic Development Quarterly - ECON DEV Q,* 12, 313-321. doi:10.1177/089124249801200403

Sherman, H. D. (1999). Assessing the intervention effectiveness of business incubation programs on new business start-ups. *Journal of Developmental Entrepreneurship, 4*(2), 117-133. Retrieved from: https://search.proquest.com/docview/208432977?accountid=37265

SIVA. (2013, 24.10.13). *Ny nasjonal inkubasjonssatsing 2012-2022*. Programbeskrivelse. Retrieved from: https://siva.no/ny-nasjonal-inkubasjonssatsing_utlysning-2014/

SIVA. (2018, 24.10.18). *Om oss*. Retrieved from: https://siva.no/om-oss/

Tornatzky, L., Sherman, H., & Adkins, D. (2003). Incubating Technology Businesses: A National Benchmarking Study. *National Business Incubation Association*. ISBN: 1887183604

Torvund, Ø. (2017, 27.04.2017). Innovasjonsbyen Bergen. Retrieved from https://www.nhh.no/nhh-bulletin/artikkelarkiv/2017/april/vil-skape-innovasjonsbyen-bergen/

Udell, G. G. (1990). Are business incubators really creating new jobs by creating new business and new products. *Journal of Product Innovation Management, 7*(2), 108-122. doi:https://doi.org/10.1016/0737-6782(90)90053-H

Ulhøi, A. B. J. P. (2005). The Networked Business Incubator—Leveraging Entrepreneurial Agency? *Journal of Business Venturing, 20*, 265 – 290.

Vanderstraeten, J., & Matthyssens, P. (2010). *Measuring the Performance of Business Incubators: A Critical Analysis of Effectiveness Approaches and Performance Measurement Systems*. University of Antwerp, Belgium.

Voisey, P., Jones, P., Gornall, L., & Thomas, B. (2006). The Measurement of Success in a Business Incubation Project. *Journal of Small Business and Enterprise Development, 13*(3), 454-468. doi:10.1108/14626000610680307

Walter, A., Auer, M., & Ritter, T. (2006). The Impact of Network Capabilities and Entrepreneurial Orientation on University Spin-Off Performance. *Journal of Business Venturing, 21*(4), 541-567. doi:https://doi.org/10.1016/j.jbusvent.2005.02.005

Wolk, A., Dholakia, A., & Kreitz, K. (2009). *Building a Performance Measurement System: Using Data to Accelerate Social Impact*: Root Cause. Retrieved from: http://www.rootcause.org/

Young, P. (2016, 30.08.16). Your Investors Need to Know What Profitable Growth Means. *Dialogue Review*. Retrieved from: https://issuu.com/revistabibliodiversidad/docs/dialogue_q4_2016_print_proof__crop p/51

Zedtwitz, M. v. (2003). Classification and Management of Incubators: Aligning Strategic Objectives and Competitive Scope for New Business Facilitation. *International Journey of Entrepreneurship and Innovation Management, 3*, 176-196.

Appendix

Concepts for entrepreneurs and small businesses in incubation

Concept	Content
Nyskapningsparken	Program over two years aiming to ensure a faster and safer way from establishment to growth. Application rounds three times per year. Collaboration with Bergen kommune, HVL, UiB, NHH, SIVA and partners.
Finance Innovation Incubator	Providing access to offices, workshops, mentors, training, investors and finance industry experts
Marineholmen Makerspace	Workshop space for building and prototyping products. Open for members and others with a private agreement. Arranging workshops, courses and open days.
Mediekuben	Program over two years aiming to ensure a faster and safer way from establishment to growth. Application rounds four times per year. Collaboration with Bergen kommune, partners, NCE Media.
Oceans Industry Accelerator	Innovation environment created for entrepreneurs and businesses within the ocean industry, in particular R&D, spin-offs, post incubation businesses. OIA is a place for exchanging knowledge and experience in an exciting and professional environment.
Hatch	International growth program within aquaculture. Mentoring businesses from the whole world. Collaboration with NCE Seafood and Hatch Blue
Accel	National accelerator program for entrepreneurs, start-ups and established businesses. Sector specific: Seafood, Energy, Media, Crossover, Explore, Student. Collaboration with Innovation Norway, clusters, HFK and BK.
Gründerhub	Program over four months, held three times per year for early stage businesses. Facilitating for mentoring, network, competence and financing opportunities.

Table 1 (Horn, 2018)

Assessment criteria for admission to Nyskapningparken

Evaluation criteria	**Explanation**	**Score and comment**
Growth potential	The business should have national market potential at the minimum. o Is the business model scalable? o Is there a defined market? o Is there a demand in the market for the product or service? o Is the market willing to pay?	
Degree of innovation	The business' product/service/organization should to a certain degree be innovative. o Is the technology patented? o Is it patentable? o If not, what is unique about the idea?	
Complementing the innovation ecosystem	o Does the business fit well in the incubator? o Does it complement the existing businesses? o Can the business benefit from sharing knowledge with other businesses?	
Team composition	o Is the entrepreneurs' dedication and ability to control the development of the business present? o Is the team composition a good match? o Does the team have the ability to implement their idea? o Does the team have the ability to attract resourceful people? o Are any of the entrepreneurs planning on working full-time on their idea? o Does the project have a 'driver'?	
Need for incubation	o Is the business in the need ofan incubation programme? o Is it in the need for subsidized office rental? o Does the team have a need for consultancy and mentoring? o Are they coachable?	

Table 2 (Indresøvde, 2018)