



Universitetet
i Stavanger

UIS BUSINESS SCHOOL

MASTER'S THESIS

STUDY PROGRAM:

MSc Business Administration – Business
Innovation

THESIS IS WRITTEN IN THE FOLLOWING
SPECIALIZATION/SUBJECT:

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TITLE:

Navigating a crisis: The case of Norwegian early-stage firms and the impact of the coronavirus

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Acknowledgements

I would like to show my greatest appreciation to Jason Deegan, my supervisor, who was encouraging and always enthusiastic, guiding me throughout this work. I am grateful for his keen interest and professional contribution. I learned a lot while working on this project, and I am happy to have this experience.

I would also like to express my gratitude to the entrepreneurs and firms' representatives who agreed to participate in this research and treated this work with empathy and concern. Without their honest and in-depth answers, suggestions, and heartfelt wishes for success, this work would not be so valuable.

Navigating a crisis: The case of Norwegian early-stage firms and the impact of the coronavirus

Abstract

The purpose of this research is to explore the nature of a start-up organization during a period of crisis and provide great contextual value on the impact of the COVID-19 crisis in understanding how it impacts newly established technological firms. Through a thorough literature review, a theoretical frame was developed which focused on the structure of firms and the ways in which they behave and respond during ongoing public, health, and economic crises such as the current COVID-19 crisis in which many firms find themselves.

The outcome of this mixed-method research of 54 innovative start-ups across Norway serves to provide some interesting insights and may indicate the potential motivation for further research exploring how firms respond during an asymmetric shock such as COVID-19. The first-hand feedback from entrepreneurs provides a few unexpected insights, which further enhances the value of the research.

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1 Introduction

How are firms responding to the COVID-19 crisis? How will the economic environment caused by COVID-19 influence the direction of the Norwegian economy in the future? Similarly, how will this climate impact the survival rates of new firms? More directly, what lessons can be learned from the approach taken towards new firms amid the COVID-19 crisis? These questions serve as key motivating considerations for this thesis and seek to provide greater clarity on how new firm survival rates are affected during an exogenous crisis such as the current lockdown.

At the beginning of the COVID-19 shock, the Norwegian government has responded rapidly and with an unprecedented financial support program. That sought to support the number of firms, especially in wage protection schemes, to ensure job losses were minimized, and human capital formations were not disrupted (Lee-Wright, 2020). However, despite these efforts, a number of firms struggled to maintain stability during the initial stages of the crisis, with over 45,000 employees being directly supported through wage protection schemes (Nina Berglund, 2020). This support was crucial and allowed many companies to avoid bankruptcies. However, a significant proportion of employees was temporary laid-off, so that there was a sharp shift from 65 000 to 290 000 unemployed within a few days and companies. The unemployment rate reached 10,2% (Sentralbyrå, 2020a). It was in this context that Statistisk sentralbyrå (SSB) recorded the deepest ever decline in GDP (Øyvind Kragh Kjos, 2020). However, while this shock has been far-reaching, given its recency, there is a lack of specific data on how in particular various business sectors were forced to respond to the imposition of the lockdown and resultant slowdown in economic activity. It is not clear if Norwegian companies have managed to operate efficiently despite the crisis. Indeed, given the ongoing nature of the crisis, there are still no predictions when the pandemic ends, so this research is very much based on recent experiences of the crisis. Though some Norwegian companies started taking laid-off employees back to work, NAV extended the unemployment benefit scheme for two additional months. This signals the unusualness of this particular crisis and the fact that far from being solely limited to a slowdown in economic activity, the public health guidelines have significantly impacted working patterns.

In August 2020, the forecasting on economic recovery looks more positive than predicted at the beginning of the pandemic-induced lockdown. The government has provided guarantees that they will continue the record fiscal spending (Klesty, 2020) to support the economy. This may prove increasingly relevant for one of the most unpredictable sectors of many national economies and yet the one that is often considered quite crucial for future growth – innovative, high-technology start-ups.

This thesis has a purpose of exploring and contributing to a better understanding of the start-up organizations in Norway and their response to the COVID-19 crisis. Following that idea, this paper

begins with a chapter devoted to covering the theoretical aspects relevant for start-ups, providing the frame for both a useful definition of a start-up firm alongside with how newly-established firms have previously behaved during an economic crisis. The methodology chapter describes the research approach and the method of analysis conducted among the sample of 54 Norwegian firms to incorporate the considered theoretical concepts. The findings section provides the output of the conducted analysis. It is followed by the discussion part that includes the conclusion, limitations, and recommendations.

1.1 Problem statement

The precise definition of a start-up varies significantly within the academic literature. One can understand a start-up as a newly established firm that is likely at an immature stage of organizational development with a high probability of failure (Wang et al., 2016), which is still recognized as a vital element of healthy economic development (Dishman, 2015). In recent years, many countries have turned increased attention onto policies that can support the development of start-ups, as they have come to be seen as an increasingly necessary component in spurring economic development and growth. Based on these insights, incorporating the theoretical implications discussed within would serve as a helpful addition to registering Norwegian start-ups' first-hand insights during a global pandemic.

As such, and flowing from the discussion above, the problem statement which motivates this thesis is: How do Norwegian high-technology early-stage firms respond to the economic downturns?

This problem statement will be operationalized by applying of a mixed-method research structure of the response of Norwegian high-technological start-ups to the COVID-19 crisis. The problem statement is expanded through the development of three core questions of focus:

1. What are the characteristics of start-up behaviour during a period of economic slowdown?
2. How did innovative Norwegian start-ups respond to the economic shut down due to COVID-19?
3. What are the lessons that could be taken from the economic crises of 2020?

1.3 Characteristics of start-up behaviour in crisis.

As a phenomenon, a start-up stands aside from other organizational forms when it comes to behaviour in an economic crisis; there is a twofold estimation of why this is the case. On the one hand, start-ups demonstrate their vulnerability at the early stage, and technological start-ups are more likely to prefer to exit in response to a crisis, as they intend to save organizational assets (Davidsson & Gordon, 2016). At the same time, newly established firms are characterized in a series of previous

research as resilient (Bullough et al., 2014) and persistent (Hoang & Gimeno, 2010); this serves to benefit these firms in surviving uncertainty and economic downturn. There is also research that states that most nascent organizations experience less stress in economic shutdown (Davidsson & Gordon, 2016) than it is believed. The point is that these young firms are yet not fully integrated into the economy. They are more likely to be connected to the local economy than to global national-level processes (Julien, 2007) As such, they are largely insulated from broader macro-economic trends, and their small size allows them to be much more agile. Unlike firms with higher fixed costs, they have options to minimize their operations in response to an economic crisis. In this regard, this research seeks to build on earlier discussions on how start-ups respond to the economic crisis, and indeed whether they are more vulnerable or less to poor economic conditions. These challenges serve to support the first problem statement outlined earlier.

1.4 Norwegian start-ups respond to crisis

When focusing on the Norwegian context, few issues need to be acknowledged. Firstly, Norway was better prepared for the COVID distress due to the recent crisis and favourable economic conditions post-2016 oil crisis, which Norway had experienced. A slew of stabilizing measures was incorporated to better support the economy and was developed in advance and could be utilized ("*Norwegian financial crisis package*", 2020). This prompt response to the developing situation illustrates that the national government was fully aware of the gravity of the circumstances and moved quickly to stem the negative consequences that the crisis could unleash on many firms, both large and small. The impact of the economic slowdown and the public health conditions that forced many to alter working patterns was felt immediately. The consequences were spread to all the sectors of the economy. One indicator that can give a sense of the national economy's negative effect is the significant increase in the unemployment rate, even though many of these layoffs are temporary. Within the first four weeks of the shutdown, 2/3 of the layoffs belonged to the business sectors that were not directly targeted by the government restrictions (Annette Alstadsæter, Bernt Bratsberg, Gaute Eielsen, Wojciech Kopczuk, Simen Markussen, Oddbjorn Raaum, 2020). Meanwhile, the nature of the current crisis, consisting of a lockdown due to transmission of the virus, together with local municipalities' desire to support safe standards of living raised the relevance of digital technologies ("*Smart cities companies*", 2020). COVID-19 provided some firms with market opportunities to develop digital and IoT products which were only increasingly relevant given many were forced to work from home. In response, some innovative firms adapted their product offering and managed to propose new solutions, which further enhanced their security and viability. The exploration of Norwegian firms' specific responses, representing the IT and IoT sector to COVID lockdown in addition to the first research question is a matter of concern for the current paper. The choice is also motivated by the intention to give an

overview of the innovative business sector that may become a change agent (Infante, D., Rancer, A. & Womack, 1997).

1.5 Lessons taken from the crisis 2020

While we are in the midst of the COVID-19 crisis, Norwegian authorities continue to hold a coordinating role and are fully supported by citizens. By taking responsibility for fundamental actions, the government operated in collaboration with not only experts and professionals but with the support of the local business (Christensen & Læg Reid, 2020). Consequently, several actors' actions will determine the effect of a crisis on the Norwegian economy, including start-up firms and governmental capacities (Brandsen & Honingh, 2016). This research will build on the first-hand feedback from firms, their assessment of the current situation, and proposals for the future that these firms believe would benefit their industry/sector and further explore these firms' behaviour in response to the COVID-19 crisis.

This research is intended to be descriptive (Mark Saunders, Philip Lewis, 2012) in order to outline the response of innovative firms to economic turndown, discover the connections between the firm characteristics and crisis behaviour, and more particularly, understand the key differences in responses between high-tech start-ups. These outcomes, which support the theoretical framework, should provide prerequisites for further research and development of relevant actions to adequately respond to a crisis, be that a future public-health crisis or, indeed, future economic shocks.

1.6 Disposition of thesis

The next chapter deals with the review of the theoretical basis in which this research rests, further expanding on the concept of a start-up and how we can understand the particularities of a start-up. This part provides the core value for the first research question connecting existing approaches to a newly established firm and its reaction to the economic crisis. The theoretical review outputs allowed to develop a framework with essential organizational characteristics later applied to firms at the empirical research.

The third chapter is devoted to the research process organization. Starting with clarification of the research design and method, depicting the empirical data collection, it also includes the online survey platform's description and collected data processing. The issues of validity and reliability of data are also covered.

Further empirical research in the fourth chapter is based on the observation of Norwegian start-ups from the perspective of theoretical framework features. It focuses on the description and

interpretation of primary data obtained during the study and consists of the predictions regarding the behaviour based on the firm's characteristics, description of regression models that were used to illustrate the theoretical framework, and feedback from the firms on their assessment of the current situation. By mapping together, the theoretical findings and observational output followed the intention to answer the second research question.

Finally, the fifth chapter is dedicated to summarizing the research result and discussion analysis of qualitative and quantitative parts that help answer the third research question.

The sixth chapter brings the conclusion based on the research findings with recommendations for further development of the topic and possible application.

2 The frame of reference

This section of the thesis is focused on a theoretical overview of the start-up phenomenon, aspects of the development of young organizations, and their operation in times of economic crisis. It was essential for the study to develop the theoretical framework to support the problem statement, design the empirical part, and contribute to the discussion.

2.1 Definition of start-up

The rapid increase in digital technology and innovations development is followed by developing organizational forms that produce it, the start-ups. Scholars claim that start-ups accelerate the economic development of a state by fostering innovation, bringing competition and growth to the business community, and creating jobs (Joseph A. Schumpeter, n.d.; Kirchhoff & Phillips, 1988; Reynolds, 1994). Together with the fascinating success of technological «unicorns», these factors make start-ups an increasingly important subject both for further research (Walsh & Cunningham, 2016) and to better predict and design the nature and direction of economic development within regions.

Despite the high stir around the IT start-ups distributed in mass media, the academic world still did not come to its standard definition. One may meet diversified variations of it. For the purpose of this paper, We incorporate the approach by (Luger & Koo, 2005) partly supported and specified by other scholars wherein the authors describe the notion through the characteristics of a newly established firm as being those firms which are considered: “new”, “active”, “independent”.

The current theoretical frame uses a definition of a start-up as a newly established firm. (Bellerby, 2017) particularly specifying that it should be entering the market for the first time with a new product or service idea. Further building on this, it appears that there are no strict age limitations for a start-up

firm. The average age that is mentioned by (Grimpe et al., 2018) is 3.87 years. However, one can meet a reference to a start-up up to 10 years old. That depends a lot on the characteristics of the product and specifics of its development.

The second criterion, “active”, is used by (Luger & Koo, 2005) to highlight that the newly established firm should have operating activities, not just existing on the paper. In other words, the firm should at least have one person employed with a salary. Though the average size of a firm in a start-up stage is 4,89 staff members (Grimpe et al., 2018), a team's size may reach up to 20 employees (Bellerby, 2017).

The last criterion, “independent” (Luger & Koo, 2005), is close to the first one. The firm's novelty should also be represented by the absence of finance, legal, functional connections to any other parent company. Through this understanding, the term "start-up" is understood in the context of this research. While there are many other valuable and essential distinctions amongst the myriad of available definitions, this research will not seek to expand on these definitions but instead incorporate the above understanding into this research.

2.2 Economic downturn

While some scholars discuss the reasons and prerequisites for economic downturns, it is understood that for this research, it is important to consider external reasons, those that are not under the control of the firm and which can be considered exogenous shocks absent a firm's individual performance.

Across much of the academic literature, many approaches differentiate the factors that influence an economic downturn. Some scholars distinguish between endogenous and exogenous factors, where cyclical economic downturns belong to (Fredland & Morris, 1976). Other approaches rank categories of risk on an economy-based, industry-based, firm-based influence on economic performance (Everett & Watson, 1998). At any rate, an economic downturn is among one of the many reasons for why a firm may, in-fact, fail. This can be specifically with regards to younger firms, it happens with high probability, up to 50% (Everett & Watson, 1998), they will not stand the crisis (Fredland & Morris, 1976).

Globalization and technology spread also impact the degree and scale of economic crises and shift them to a more significant level and increase their frequency (Carmen M. Reinhart and Kenneth S. Rogoff, 2010). While they may be classified into many types, it becomes tricky to distinguish them, as they escalate from one to another (Racickas & Asta, 2012). Still, the research papers propose to classify them at the base level according to the origin and extent. In the context of current research, we estimate firms' behaviour in the economic shutdown that was forced by the implementation of safety

measures in response to global pandemic crises. It can be considered a dual public health crisis, as well as an economic one, leading to both a slowdown in economic activity alongside significant changes in working patterns.

Alternatively, firms that survive the crisis have a chance to benefit from renewed economic recovery (Hinz, 2000), new market shares that may become available, and the internal upgrades that were implemented to adapt to a new context with new, often limited resources (Doern, 2019). The redesigned firms that are already operating within new economic circumstances are more competitive than those who will just start their journey.

2.3 Survival rate

When speaking about a start-up, we should also include one additional characteristic, which is vital to understand the dynamics at the play of innovative start-ups – young firms typically have a lower survival rate. This rate continues to fall (Headd, 2003). On average, only 60 percent of firms survive after the first year. Just about thirty percent reaches its mature stage (Dahl & Reichstein, 2007; Phillips & Kirchhoff, 1989; Taylor, 1999). When it comes to Norway, the official statistics state that 29,8% newly established firms survive five years (Statistisk Sentralbyrå, 2020b). This is an important dimension one must keep in mind when evaluating the impact of the COVID-19 crisis. Like that, some firms, typically younger firms, are often unlikely to survive regardless of the broader environmental conditions in which a firm finds itself.

Some scholars state that the first two years of life determine the future of a firm's success (Jovanovic, 1982). Positive performance during this period lays long-term groundwork. Again, after these first years and experiences gained during this time, it would be clear if the firm will succeed.

2.4 Firm behaviour in crises

When working on a survival strategy, a firm turns to a short-term solution in rearranging the financial flows. In most cases it would be the reduction of employment, selling the assets, cutting costs (Asquith et al., 1994). While the tangible assets of a firm that could be sold easily, make a firm more secure in the period of economic crisis (Denis & Denis, 1994). At the same time, downsizing and reduction of personnel are controversial tools. It is essential to keep the balance of an organization's appropriate size, supporting the necessary operational activity without a negative effect on performance (Luan et al., 2013). It may be inefficient to apply to it due to risks of product quality decrease or severe delays in deliveries.

One of the surviving strategies would be the exit of a firm from the market. Previous literature state that only about 33 percent of start-ups are closing due to their low performance (Headd, 2003). In

fact, bankruptcy becomes the only decision that an owner can take, apart from going with the flow and spending the assets on problem-solving (Hopenhayn, 1992). It becomes an option when it is possible to escape the current problem and save assets for other business opportunities.

2.5 New firm recovery

When looking at the notion of survival rates as an indicator, it not only signals the firm-specific characteristics; it also refers to the economy of the region (Audretsch, 1991). Therefore the recovery of the industry and business in the region would also be dependent on pre-crisis characteristics (Doern, 2016). Taking into consideration that the economic crisis has a cyclic nature, the awareness of the government, business sustainability, and implementation of prevention tools on the municipality and/or the state level will likely play a large part in determining the success of economic rehabilitation within a market.

2.5.1 Age and size

Scholars also explore a bunch of characteristics on the firm level that may predict the surviving chances of the start-up. Age and size are usually tied-up in these discussions, and they may reveal the likelihood of failure (Audretsch, 1991; Bruderl et al., 1992; Dahl & Reichstein, 2007; David B . Audretsch and Talat Mahmood, 1995; Evans & Leighton, 1989; Hall, 1987; Headd, 2003; Phillips & Kirchhoff, 1989). The bigger and more mature the firm is, the higher chances to overcome challenging times. The four-year firms are less likely to fail, but the probability increases when it comes to innovative industries (Audretsch, 1994). Interesting was the fact that the smallest companies are more resilient to risks than medium-sized companies (Dunne & Hughes, 1994).

2.5.2 Environment of the establishment year

The next in a row of characteristics comes the year of establishment, more precisely the characteristics of the local market in that period. The foundation of a firm in economically prosperous years with wealthy environmental conditions serves as a benefit to the stability of business in crisis times (Dahl & Reichstein, 2007; Hinz, 2000; Romanelli, 1989). The firms that enter the market in the period of the economic downturn may demonstrate weakness in surviving capacity and their future growth prospects, remaining at a smaller size even after the recovery of the economy (Sedláček & Sterk, 2017). Environmental conditions also include the accessibility of financial support integrated into local policies. That may include not only direct subsidies but also bank loans with lower risk rates or governmental pledge guarantee support (Thomas Åstebro, 2003).

2.5.3 The market of the firm

Among other characteristics, the affiliation to the market also predicts the likelihood of success in crisis times. Firms that operate in the national market have a higher probability of handling an

economic slowdown (Bruderl et al., 1992). Meanwhile, the industry where the firm operates has no significant influence on surviving rates (Dahl & Reichstein, 2007).

It was several times stated about the vulnerability of young established firms. However, it comes to innovative ones, which are the core of the focus of current research. It would be interesting to note that technology-based firms tend to be more sensitive to economic downturns and show a higher rate of failure only in the short-run. But in the case of surviving, these firms show better results in recovery and future growth (Almus & Nerlinger, 1999; Audretsch, 1994; Opler & Titman, 1994).

2.5.4 The stage of a firm development

The organizational growth models also contribute when predicting the possibilities of a firm's failure. The very first stage of organization development has different names: the existence (Churchill, Neil C ; Lewis, 1983), entrepreneurial stage (Quinn & Cameron, 1983). This stage is considered to be the most crucial for the further development of an organization. (Cader & Leatherman, 2011; Churchill, Neil C ; Lewis, 1983) state that firms are most exposed to failure in this phase. As well it is important to keep a proactive position at the next stage, as it is sales that provide a solid foundation for further growth and development of newly established firms (Hill et al., 2002). The further stages of development are characterized by higher resistance capabilities.

2.6 Summary of previous literature

The objective of this section was to explore the theoretical environment in which this research exists and to answer the first research question: *What are the characteristics of start-ups' behaviour.* This section provided an overview of definitions of a start-up and economic crisis, specified how the economic distress manifests itself, and influences newly established firms. The key findings were the connections between firms' characteristics and predictions on their behaviour in economic distress.

The other focus is on the connections between the characteristics of a firm, and a start-up specifically, and predictions on how they deal with the period of economic distress. Scholars made the observations revealing several features of a firm that may point to its unsustainability within economic crisis.

In the next section, the paper explores if the following characteristics of Norwegian technological start-ups may predict the behaviour in crisis in application to Norwegian economy situation during the pandemic. The categories of the age and size, the quality of year when a firm was established, market of the product or a service, stage of organizational development are included in the observation of the empirical part are used to answer the second question of the research, namely; *How did Norwegian innovative start-ups respond to the economic shut down due to COVID-19?*

3 Methodology

3.1 Research design

When working on the stated problem of current research, the most essential was to utilize proper tools and being consistent in their implementation. The formalized approach established a solid foundation for this work (Salkind, 2010). The objective of the research was to develop sufficient answers to the research questions supporting the initial topic. Once the questions were formulated, the further steps were to address the appropriate analysis method, shaping the corresponding methods of data collections, and obtaining the outputs for analysis and discussion. The initial frames of the research were determined by the location and time scale. Digital tools made it possible to expand the region from Rogaland to the whole of Norway and still meet the timeline of 6 months. When choosing the subject of the research, it was considered that it would not be time-consuming to create the list of participants by searching in open online sources as they tend to be accessible. Though one had only predictions on the response rate, it was expected that it would be necessary to construct a dataset containing roughly 50 or so respondents from across a wide variety of potential respondents. The core criterion in choosing the method of data collection was the limitations caused by the pandemic situation that prevented conducting personal one-on-one interviews. It was also understood that most of the firms were under huge pressure due to the abovementioned situation. Creating an online questionnaire, simple in its structure, with minimal requirements on time investments seemed to be a reasonable solution, which effectively addressed the concerns of the research, while still remaining cognizant of the pressures placed on these firms under study.

3.2 Method

The research is devoted to the observation of behaviour of Norwegian innovative start-up firms influenced by the economic lockdown of 2020. In order to gain statistical data with more profound contextual insights, a mixed-method was chosen (Schoonenboom & Johnson, 2017). The “mixing” and both integrating qualitative and quantitative methods in data collection, processing and analysing should compensate weaknesses and benefit the strength of each approach (Ivankova et al., 2006). Its application enabled to reveal the relationships between firm characteristics and its behaviour in a crisis period, support the theoretical framework, and acquire more insights on the immediate reflection of firms’ leaders. To integrate both approaches, sequential explanatory design was utilized by collecting and analysing quantitative data first for the outcomes and insights, and then qualitative data deepened this understanding (Tashakkori, A., 1998). Specifically, the quantitative analysis by focusing on theory confirmation and statistical analysis, aims to answer the second research question, with qualitative research being explorative – to provide input for the third research question (Johnson & Onwuegbuzie,

2004). The utilization of multiple data types evolved into complementary research (Johnson, R. B., & Turner, 2003) with a broader perspective for further development.

3.3 Source of data

The output for the research question should be based the up-to-date information on how start-ups feel and respond to this current economic downturn. While the mass media can provide some numbers, they are relatively shallow and do not provide sufficient insight necessary to aide in this research. SSB can also provide such data as it collects and provides an analysis of key Norwegian economic figures regularly. However, the way it arranges surveys has some limitations that did not make it possible to reveal the required data on organizations with specific characteristics of age and industry field. Appealing to start-ups directly enabled us to collect the data tailored to the empirical model. It was essential to keep control over the sample group, as the main focus was, specifically on innovative firms (Boeije, 2005).

For the research, an online semi-formal questionnaire was developed (Myers, 2009). It was composed of closed-end and open-end questions with an additional form for information that a respondent felt relevant to provide (Mark Saunders, Philip Lewis, 2012). To deliver the survey to the respondents, there was created a list of technological firms with their contacts. It was formed from the online references of Norwegian start-ups in media, including the free-of-charge platform that provides the overview of Nordic start-up community, (*The Hub*, n.d.)

3.4 Data collection

The substantial issue for conducting this research was to create a proper sample of firms. The optimal solution was to follow the probability sampling approach, taking into consideration that the responses of random sampling would be equal to all the cases (Riley, M., Wood, R.C., Clark, M.A., Wilkie, E. and Szivas, 2007). The long list includes 300 firms fulfilling the characteristics that follow the logic of theoretical reference: Norwegian based, declared that they belong to IT or IoT sector of business, not more than ten years old, the corporate web site is active (working). That was essential for the current research to verify that the outputs from worldwide academic papers may be relevant for Norway and can be implemented here in a broader perspective.

Recently people became familiar with online communication, especially when it comes to business communication. One needs to keep in mind that online surveys became well-spread nowadays, and tolerance to them decreases (Beullens et al., 2018). Some additional efforts had to be undertaken to improve the response rate. The letter with the survey link was sent not only to corporate

mails at the companies' websites but also via corporate pages in social media. Second, the university account was used to send the letters with a survey link to clarify that the request is reliable, not spam. Third, a cover letter was written in a non-formal manner with detailed information about the purpose of the survey also in order to gain trust. (Bartholomew & Smith, 2006). That was encouraging to meet positive feedback and willingness to contribute to the study from the founders of firms. The mailing was carried out manually during the summer months of 2020. The response rate for the survey reached 18 %, which can be considered to be satisfactory in line with what we find in the literature (Paul McDonald, Matt Mohebbi & Inc., n.d.). Still, the size of the obtained sample, 54 responses, requires being discreet with the predictions and speak rather about possible probabilities and directions of further research.

3.5 Survey design

The data for the analysis was collected via an online and pilot-tested survey. The questionnaire consists of 10 questions and one optional field with possibility to share further personal opinion or feedback. The word choice was designed in various ways. Close-ended questions with fixed options to choose were used to collect data for numerical interpretations. Open-ended questions were implemented in order to get personal feedback on how do the entrepreneurs really feel in this challenging times, giving a possibility for sharing the first-hand impression. Also, questions were designed to verify that the respondent belongs to the sample characteristics and can be considered as categorisation questions.

The frame of the research dictated the criteria for the participants' characteristics. They included the ten-year limit for age, affiliation to the innovative field – IT or IoT sector, Norwegian based, having people employed, independent brand.

The purpose of the questions' logic has three vectors (see Appendix A). The first one - to collect information about the company, following the research frame - the age, the number of employees, the market, the stage of development, year of establishment. The second vector questions aim to reveal the response on COVID-19 shut down. This data is supposed to provide input for the second question of the research. The open-ended questions ask how the firm was affected and personal feedback on the current situation. Here the entrepreneurs could share any additional ideas and opinions on what could be done differently. That is the most valuable part of the research that created a feedback loop with firms, giving them an opportunity to share how do Norwegian entrepreneurs feel about the current situation and what is the best way to support start-up business in challenging times.

The respondents also have an option to leave a request to get the outcomes of this research by mail for their information.

When working on the web page to collect the primary data, the focus was on carefully elaborating the questionnaire protocol to increase the response rate and add value to the research (Don A. Dillman, Jolene D. Smyth, 2014). It was essential to take into consideration how the request will look like from the respondent's perspective?

The first point was to shape the question stem in a direct and explicit way with additional hints, making the questions easy to understand and respond. (Don A. Dillman, Jolene D. Smyth, 2014) The answers did not assume to provide complex or detailed data or information under NDA. Second, there are just ten questions to answer plus an optional field for additional information that the respondent felt relevant to provide. Overall, it took about 15 min to complete the form. The logic of questions was tested to be transparent and consistent.

3.6 Validity and Reliability

One of the challenges of mixed-method research is validity, which refers to the accuracy of utilized measurement tools that are applied (Keith F. Punch, 2005). For the purpose of this research, there was a strong focus on the validity ensured and reviewed the precision of the concept of the study, and indeed whether this is relevant to the theoretical framework (Roberts & Priest, 2006). The objective at this stage was to develop clear characteristics for a firm that would be corresponding to the research question and concept and arrange a sample of firms with a good match. To evaluate the quality of the study, the precision of data output obtained by statistical analysis also had to be verified.

The other difficulty when working with descriptive research is research bias, which may come from inaccurate collection, processing, and interpretation of data based on a personal perspective (Johnson, 1997). To prevent threats to reliability during data collection, several actions were taken. The survey was tested on misunderstanding, proper order, and number of questions, clear instructions, simple measurement (Ihantola & Kihn, 2011). The questions of the survey were following the logic of the theoretical frame and direct in wording. That was tested with random respondents in advance. The language was developed in accordance with the expected value of the answer so that it could give the numerical value or value given by the frame. There was no space left for double meanings. The write-in box included the hint appealing to the expected format for the answer. The expected answers were either in unequivocal form or suspected to choose from the given options. Besides, two questions in an open format without the guiding were included where respondents could share their opinion if they wanted. Those answers were not included to support the theoretical frame but were used to collect the personal feedback from firms to gain additional insights for current research.

3.7 Limitations and further research

The critical limitation of the current study refers to the pandemic situation and public health restrictions that followed. In fact, there was no big choice of options for conducting the survey. The online solution was selected due to limitations in time, anticipated difficulties with conducting a face-to-face interview, and the prediction that most of the firms were under the pressure of uncertainty at the moment and are less responsive. As a result, the sample size did not allow to show better quality outcomes. Future research would benefit from arranging similar analytics to a broader population.

3.8 Data processing

The next step for the research was processing and analysis of the data that was collected via the Tilda platform. The online platform was chosen for several reasons, including a friendly interface and a secure personal data protection policy. The Tilda-based page does not collect data except the one that is required for the system to operate. There also is an option utilized in the current solution to disable data storage completely.

Besides, the confirmation of the survey method with the Norwegian Center for Research Data (NSD) was required. The representative of NSD ensured that the used method of data collection and processing did not violate the personal data protection rules of Norway.

The dataset was based on 54 responses that were collected within June-August 2020. The provided responses were converted into excel format. At this stage, the obtained information had to be checked for duplicates and quality answers; words were coded into numbers and transformed into variables.

Following the logic of qualitative research, the dataset included two types of data. The first one belongs to the numerical characteristics of a firm – the age and number of employees. Other features were coded into binary figures corresponding with one of the characteristics or actions.

The goal of the linear regression analysis was to explore the interdependence between the fact of being affected by crises, characteristics of a firm, and actions that were taken in response to lockdown. Still, due to the explorational nature of the research, multiple models and approaches were tested (Appendix B), though not all of them were relevant for the research questions.

4 Data analysis

The mixed-method study's initial purpose was to reveal the characteristics of a firm that may describe the behaviour of start-ups in an economic crisis. It was done by collecting the data and verifying theories, having obtained results from the survey of 54 representatives of early-stage firms at a time of COVID-19 lockdown, and exploring the results. Both qualitative and quantitative input was obtained simultaneously, as suggests by the convergent parallel design (John W. Creswell & Clark, 2011). Following the approach, there was no priority for one of the methods so that the analysis could be done separately and then combine both outcomes. In the current research, the datasets were interpreted independently. While the sample size and significance of qualitative analysis inclines to minimize the importance of findings, the chosen approach admits consideration of all the data. It rather enables one to make assumptions for the directions of further research.

The *quantitative part* was aimed to review whether the features of a firm, identified in the theoretical frame, may predict the effect of distress on the organization. The data was obtained from the answers from close-ended questions and coded into a numerical binary value. To process the figures, a statistical software tool, STATA, was chosen. Though there were no high expectations on potential predictive power, it was used to run a linear regression.

The *qualitative part* had its purpose of getting the contextual knowledge of the phenomenon (Byrne, 2001; Sharma, 2010) and studied in depth how the firms had been affected and what was their first-hand reflection on the situation. The data was obtained by collecting responses to only one open-ended question and optional comments by respondents, that wanted to share their insights regarding the topic anonymously. A six-step technique of recursive abstraction was used for further analysis of the obtained information (Polkinghorne, M. and Arnold, 2014) that by collecting, highlighting the core, combining ideas. Finally, paraphrasing and coding made it possible to come to valuable research outcomes. In doing so, additional efforts were utilized to keep a sense of the original context. The outcomes were evaluated with an open-ended approach with respect to the research question and the theoretical framework alongside with insights that occurred therein while proceeding (Cohen, L., Manion, L., 2000).

4.1 Descriptive analysis of quantitative data

The dataset for the quantitative analysis was constructed based on 54 observations. The primary variables used in this exploratory analysis are based on the theoretical frame that reviewed the aspects of a firm's growth and immunity to economic crises. Based on this, this research's particular interest was to verify if revealed by the scholars interdependences, which can be traced in the current case study of COVID-19 crisis. More specifically, the quantitative analysis explores if the characteristics of

being established in a recession year, younger age and smaller size of the firm, affiliation to the international market, and an earlier stage of organizational development increase the probability of being affected in distress. The use of the abovementioned variables allows us to check the predictive value of the theoretical frame. Being affected by corona (AffectedbyCorona) is the core dependent variable of the model. In the analysis process, some of the core variables were omitted due to being not significant for the model and are further covered in the appendices (Appendix B).

The survey also provided some additional variables that represent the response of firms to shut down. Among them are the decisions to lay-off employees, apply for support by a government loan, cut costs, downsize a firm, and attract new investments.

The initial survey already included the variables that were analysed afterward. However, the additional feedback of respondents in open format brought some better understanding of the context along with variables that were also used in the analysis: desire to keep employees, taking the strategic decision for improvements and adjustments, and increases in sales. These secondary variables were added to improve the quality and predicting power of the model.

```
. reg AffectedbyCorona Age BY3 Size Mrkt_nat Scaling Sales_incr, robust
```

```
Linear regression                               Number of obs =      54
                                                F( 6, 47) = 17.88
                                                Prob > F      = 0.0000
                                                R-squared     = 0.4873
                                                Root MSE     = .37417
```

Affectedby~a	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
Age	.0058886	.0107987	0.55	0.588	-.0158357	.0276128
BY3	-.2408794	.1162253	-2.07	0.044	-.4746945	-.0070643
Size	.011487	.0034522	3.33	0.002	.004542	.018432
Mrkt_nat	-.1666421	.100138	-1.66	0.103	-.3680938	.0348096
Scaling	-.4143658	.1177771	-3.52	0.001	-.6513027	-.1774289
Sales_incr	-.7247998	.1171971	-6.18	0.000	-.9605701	-.4890296
_cons	.9274312	.0811243	11.43	0.000	.7642302	1.090632

Figure 1 – Linear regression of responses

Figure 1 represents the most meaningful model of the paper. There were models with less explanatory power that still may inspire further research (Appendix B). The current model is significant at all significance levels with $F=0.0000$ and explains 48 % of the population.

The variables that have explanatory power are size (Size), establishment in recession period (BY3) and scaling phase (Scaling). Size is a continuous variable that refers to the number of employees in the firm. Its coefficient reflects that every additional employee in a firm increases the probability of being affected by COVID-19 by 0.01%. Scaling and establishment in the recession period are dummy variables. The first one indicates that when a firm moves the scaling phase of its organizational development, it becomes more resilient to the crisis by 0.41%. The second variable shows that firms that were established in bad for the economy years are 0.24% less resilient to the next distress than others. P-value and t-test figures of these variables confirm their significance of influence on the dependent variable.

The last variable, also dummy, that have significant influence, is sales increase (Sales_incr). It supports the model by indicating that if a firm has increased in sales, it will be less affected by distress by 0.72%.

The other variables that were extracted from the theoretical concept did not show any significance and explanatory power.

4.2 Descriptive analysis of qualitative part

The section includes the description of the sample data along with interpretations and graphs in order to provide the context and better understanding of a very specific situation. All the data is presented in percentage, illustrating the responses of 54 firms that took part in the survey. These outcomes provide the evidence for findings, answering the second research question of the paper.

4.3 Basic characteristics of the sample

The answers were received from start-ups that were established between 2005 and 2020. Almost half of the sample, 48,1%, are very early-stage firms, up to 3 years old (Figure 2). Moreover, there is even one start-up established in 2020 with three employees that stays quite positive, stating that though they are affected by corona, it does not affect their future development and growth. Four firms exceeding the age limitations were added to the sample in order to check the proof of concept regarding the basic characteristics and stage of organizational development. This small group demonstrated that a firm can still stay in the R&D stage with a small number of employees when it comes to highly technologically complicated products. The size of a firm is ranging between 1 and 80 employees. The average size is 11.9. All the firms belong to the IT or IoT field, utilizing product innovation with few exceptions. 61,1% of firms, based in Norway, are operating on the international market. (Figure 3).

Almost half of firms are also reaching the mature stage of development, being in a scaling phase. (Figure 4) Though 18,6% of firms represent the R&D stage firms.

Age of the start-ups

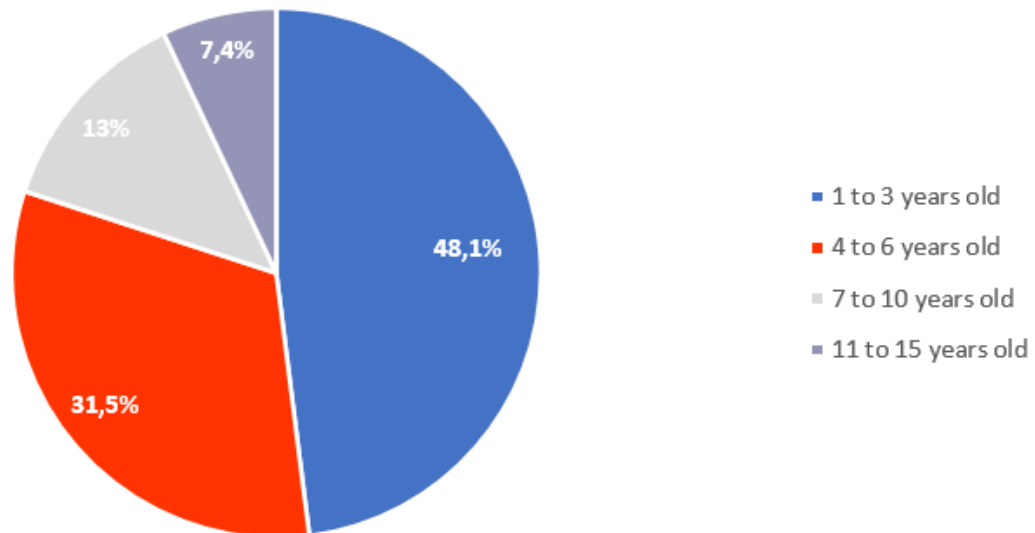


Figure 2 – Age of the start-ups

Market of the product

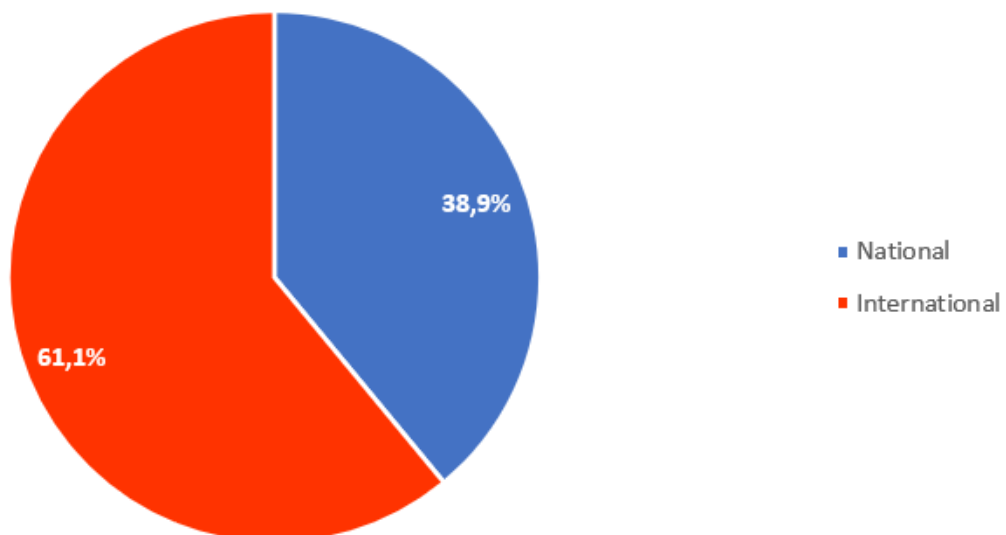


Figure 3 – Market of the product

Stage of organizational development

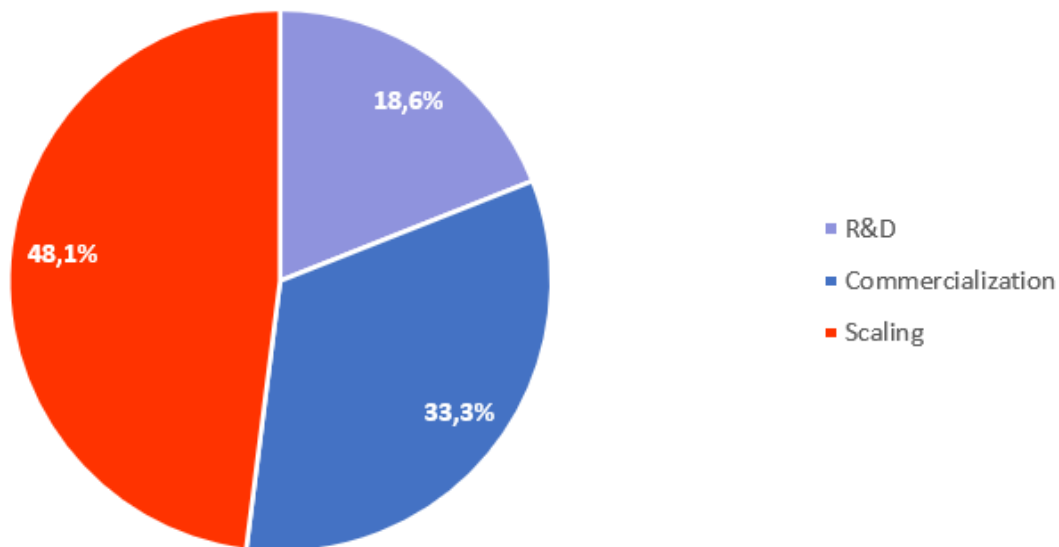


Figure 4 – Stage of organizational development

4.4 The effect of COVID-19 crises on firms

The more significant part of the sample, 61,1% (Figure 5), stated that they were negatively affected by COVID-19 crises. Interestingly, 21% of them did not respond with any measures and stated that no profound changes had taken place. The respondents mentioned a severe decrease in sales among the causes, up to 80%, cancelation of events, postponed projects. This group also includes the R&D stage of development firms that should be supposedly less connected to revenue and sales. Still, their damage is reflected in the loss of pilot customers, difficulties in raising funds, and a decrease of interest from private investors.

The company negatively affected by COVID-19 lockdown

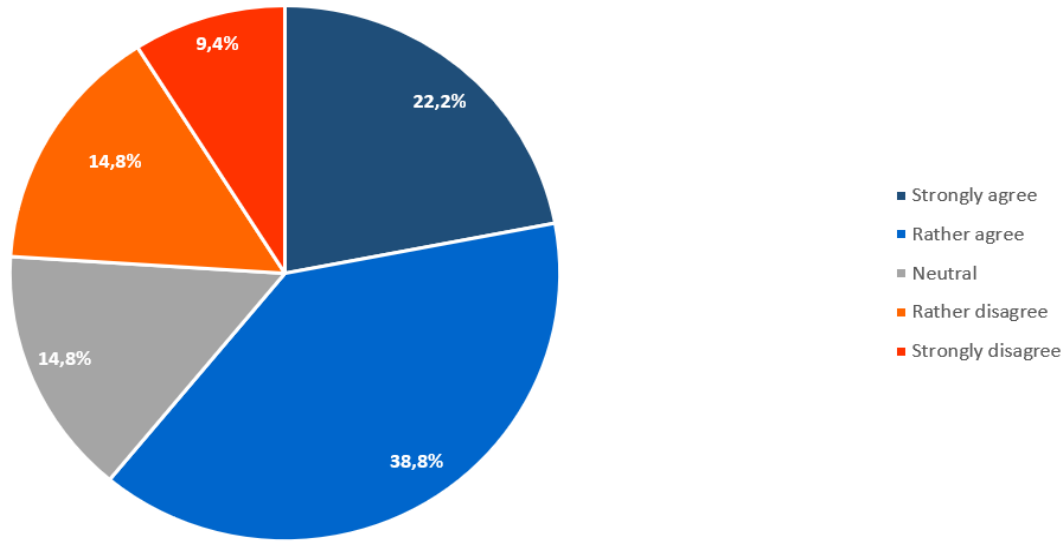


Figure 5 – The companies negatively affected by COVID-19 lockdown

14,8% of firms stated that there was a neutral effect of crises on their operational activities. In this case, there was a different attitude to the current situation. At the same time, some indicated that there was a change in clients' behaviour, with a shift to a different type of product, or even an increase in partner sales when the core product totally failed. Others indicated the difficulties they needed to handle but saw it as a regular challenge they had been facing before.

24,1% of participants reported a positive effect from the corona lockdown. In some cases, the growth in sales was significant, up to 400%, and these firms had to hire new employees. 18,5% declared an increase in sales and the positive effect of corona reflected in gaining new contracts and potential partners. That may be explained with the characteristics of the technological products, more likely digital solutions, and capability for prompt adjustments to the new demands of the market.

4.5 How did companies respond to COVID-19 downturn?

This question is an important one, as it helps to shed further light on the ways in which shocks, such as COVID-19 and its resultant economic impacts, are influencing firm behaviour. The respondents were given seven options of behaviour, based on pre-research. They were not limited to the number of choices. Here we sought to explore how the behaviour differed across firms, and how a firm's characteristics may have influenced this differing behaviour.

How did start-ups respond to COVID-19 outbreak?

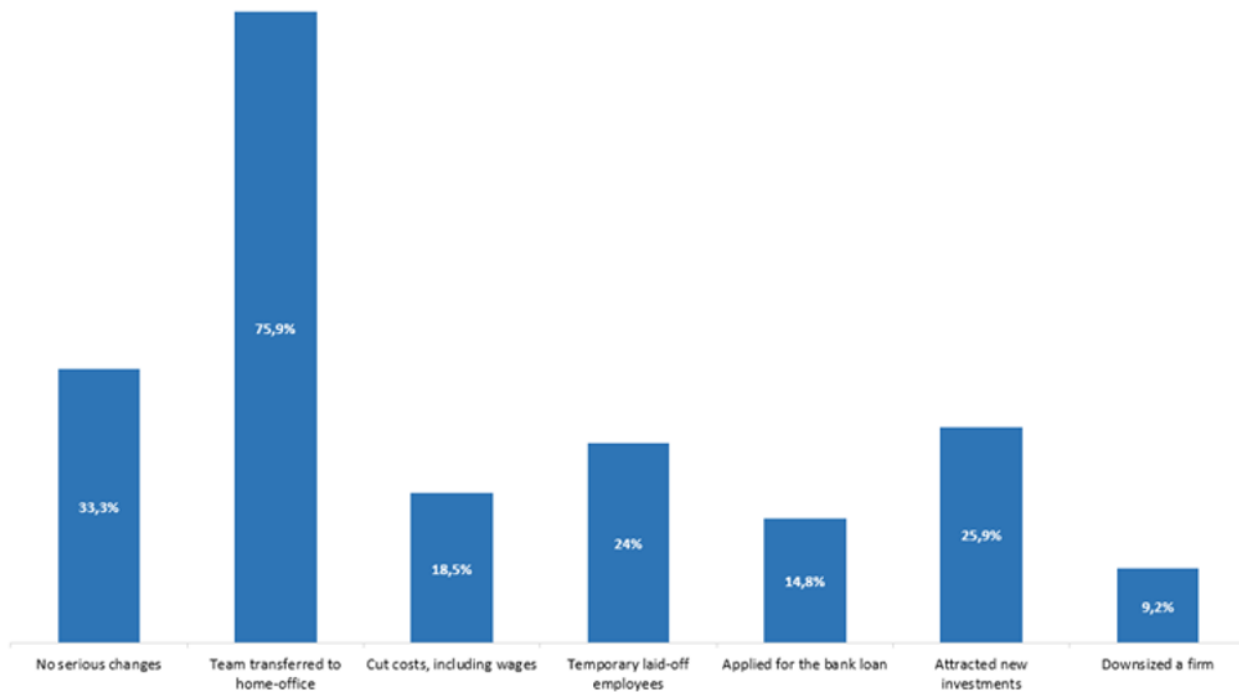


Figure 6 – the response to the COVID-19 outbreak

Surprisingly 33,3% of respondents stated that their operational activities did not have any severe changes. In that, there were representatives of both affected and not affected firms. In most cases, that was the only chosen option. In a couple of cases, it was accompanied by an application for a loan.

24% of firms indicated that they did not send their employees to home-office. Those firms had a comparably small size, having three employees on average. It could be assumed that people preferred to have the option of a comfortable office workspace. Home-office was not the absolute preference of workforce.

18,5% of respondents reported that they had to cut costs, including wages. This group includes both positively and negatively affected firms. These figures could indicate a population that decided to readjust the financial streams despite the effect.

The group of 24% of firms that laid-off employees attracts more interest than others. At first sight, this measure would highlight firms seriously damaged by the current situation. Still, it is a half part of firms that reported difficulties. Interestingly, all the firms that laid off employees worked on the international market only. R&D-stage firms also did not lay off personnel. In addition to these figures, there were comments of three firms, sharing that it was critical for them to keep employees on projects.

14,8% of firms applied for announced loans with governmental support. All of those firms worked on the international market. 18,5% of firms stated that they managed to attract new investments. These firms belonged to different groups, both benefiting and struggling from the corona.

9,2% of firms stated that they had taken a decision to downsize. That is a number of firms that were negatively affected and were forced to take radical measures. And still, this is a group of firms that emphasized their efforts on developing and launching new products.

In general, 12,9% of the set highlighted that they changed their focus to quality improvements and even developed new products and made strategic adjustments.

5 Findings

The review of the theoretical papers regarding the definition of start-up and characteristics that signal a higher probability of being resilient to crises allows us to develop a list of such indicators. That first is a year of establishment, meaning both if it was a period of economic contraction in which the firm was founded and the more general age of a firm. Then comes the size of a firm and its stage of organizational development. Scholars found out that the affiliation to the national market also benefits to sustainability of a newly established organization.

When it comes to the current research of Norwegian start-ups' response to COVID-19 crises, only a few of the characteristics proved to be of interest. Though, that does not mean that they would not be verified on a larger population.

The quantitative analysis proved the relevance of a firm's size, characteristics of establishment year and stage of organizational development to predict the sensitivity to crises. And that makes sense. The bigger the number of employees, the higher the labour costs. While the reduction of employees in the short run may benefit to readjusting the tangible and intangible assets (Asquith et al., 1994; Denis & Denis, 1994). Moving to the scaling phase of development is also connected to the previous characteristic, as the organization at that stage already has a balanced and diversified economy. Surprising is the result that shows, in contrast to theory, the positive effect of the negative characteristics of a year on facing the crisis. That can be explained by the experience gained in the previous distress, which makes the firm prepared and knowledgeable about better strategies for such a period of time.

While the quantitative analysis did not provide evidence, the qualitative analysis revealed some interesting patterns indirectly supporting the remaining characteristics.

The temporary employee reduction, which is a specific option only to Norway due to support measures, are indeed worthy of deeper research. The curious outcome is that only firms that belong to the international market laid-off their personal. That may be signaling about the grounds for evidence of the abovementioned characteristics.

Another finding is that there were no employees laid-off among the R&D stage firms. That makes sense considering that these firms of the current sample still have, on average, 4,8 employees. They cannot use these tools as a security measure because these few people are crucial to support the minimal operational activity of a firm, and a reduction in the number of workers will likely come at the expense of operationally critical activities.

The unexpected input for current research came from a feedback form, where respondents could share how the firm was affected by crisis and some ideas. The first one is that 18,5% of firms experienced a sales increase and a positive effect during the crisis. The restricting measures force to move a huge amount of cooperation online. That turned into tremendous opportunities for IT and IoT sector firms. And even those who were not so lucky to sell their solution properly stated about the importance of strategic readjustments, product improvement within this period of time, and could lend credence to the notion of periods of great change being times in which great opportunities can be embraced by those firms which are agile enough to take advantage of them.

The second unexpected feedback was the attitude to the reduction of employees in the distress period. Few participants stated that they put serious efforts to avoid lay-offs of any employee that are essential to keep the projects going. However, there is an understanding of the significant support that that tool provides to the Norwegian economy. However, that solution does not fit all types of organizations. That makes sense taking into consideration the nature of a newly established firm. The rapid decline of the level of activity of a firm does not stop the R&D processes in technological start-ups. The distress times forces them even more to work on development, improvement, and generating additional value.

Moreover, the personal feedback of the respondents provides a feeling that the pandemic lockdown rather stimulates the entrepreneurs to take a challenge than sit tight. These are the citations from anonymous responses left by the firms. "A small and flexible company like ours are rigged for uncharted territories so we embrace this crisis for what it's worth." "For us longer term COVID-19 is as much an opportunity as a challenge." "We see COVID-19 delaying some of our company ambitions, but ultimately not reducing these ambitions at all." This kind of attitude describes the Norwegian entrepreneurial community as an active team member, accepting the new rules of the game and willing to win.

Further research could also have a very definitive practical implication. The current case demonstrates the adaptation potential of newly-established firms and high capacity for the creation of innovative products in response to the demand. The prompt response of a few Norwegian start-ups to the demand of the local community ("*Smart cities companies*", 2020) could be analysed as a separate business case. Based on that a solution, like a digital platform for communication, could be developed to increase the better connection of the start-up community with potential clients. Local communities or government often take that role.

6 Discussion / Conclusion

The purpose of the current research was to explore the nature of a start-up and bring more contextual value of the COVID-19 crisis in understanding how it impacts the newly established technological firms within Norway. The theoretical frame that was developed proved its relevance only partly. Though the mixed-method research outcomes of 54 innovative start-ups are not very strong, they provide a motivation for further research. Besides, first-hand feedback from entrepreneurs brought a few unexpected insights and, as such, enhance the value of the research.

The COVID-19 crisis became a huge distress for Norway in general. It started as a global public health crisis. Following the measures are taken by the government to secure public health led to lockdown with serious economic consequences and a fundamental change to working patterns. The current situation is very different from the previous economic crises, as it brings drastic changes to the environment.

People, society, commercial and non-commercial organizations were not prepared for new forms of interaction and co-operation and now need to adapt quite rapidly to the changes required.

This distinction in types of distress highlights the necessity to review the capacities that society has. It is essential to understand that different types of crises may require diversified solutions (Doern, 2019). The response of the Norwegian government with unprecedented support became a key to security for many firms who at the outset were set to suffer going through the pandemic. It became possible, among other reasons, due to the accumulated previous crisis management experience for the Norwegian state to respond quickly to an evolving crisis.

The conditions of uncertainty and constant changes, where we ended to be, requires all the stakeholders to stay flexible. When coming back to newly established firms, their small size and entrepreneurial nature, therefore, the flexible organizational structure may become their weak place or strengthen a firm in surviving (Latham, 2009). Due to that, in the place where larger companies readjust their assets and cut costs, smaller organizations improve and develop their strategy (Shama, 1993).

Supporting firms in this and giving them an opportunity to stay creative and proactive will benefit better as it is the individual who brings greater value to a firm (Bellerby, 2017).

Technological newly established firms are, in fact, the source of inventions and findings that may generate and adopt early innovations, leading the communities to changes. Especially when it comes to digital solutions, that is so relevant for the pandemic case. The technological start-ups as a new organizational type of our time are formed not only by business context, but also by society, culture, social norms, and production development (Allen, J., and Massey, D., 1988). The proper economic environment and policies should contribute to the innovative entrepreneur and his firm when he chooses to grow, rather than to just survive.

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Appendix A

The online questionnaire: "Research of the behaviour of young innovative companies in economic crises"

1. What is the name of your company? Hint: The company AS
2. When was your company established?
Hint: The year
3. What is the size of your company in Norway?
Hint: Amount of people employed
4. What is the primary market of your product?
Options:
 - National
 - International
5. What was the stage of your product development by the time of economic shutdown?
Options:
 - R&D stage
 - Product in commercialization
 - Scaling phase
6. What makes your business unique?
Hint: E.g. unique product or service, specific way of production or delivery, business model
7. The operational activities of your company are negatively affected by the COVID-19 outbreak.
Options:
 - Strongly agree
 - Rather agree
 - Neutral
 - Rather disagree
 - Strongly disagree
8. How was your business affected?
Hint: E.g. decrease in sales, loss of contracts with customers, price increase/decrease in suppliers' services, increase of interest among potential clients etc.
9. How did your company respond to the current situation? You can pick several options that are relevant. Options:
 - No serious changes
 - The team was transferred to home-office mode
 - We had to cut costs, including the wages
 - Our employees were temporary laid-off
 - We applied for the bank loan, supported by government
 - We managed to attract new investments
 - We made a decision to downsize the firm
10. Did the current economic situation negatively affect your plans on further company growth or scaling of the business? Options:
 - Yes
 - No
11. You are welcome to provide some more details if you are willing and feel that it may be relevant for the research (Optional)

Appendix B

```
. reg Empllaidoff AffectedbyCorona Size Mrkt_nat, robust
```

Linear regression

```
Number of obs =    54
F( 3, 50) = 11.31
Prob > F      = 0.0000
R-squared     = 0.3210
Root MSE     = .36611
```

Empllaidoff	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
AffectedbyCorona	.192812	.0985787	1.96	0.056	-.0051891	.390813
Size	.0070222	.0030538	2.30	0.026	.0008884	.0131559
Mrkt_nat	-.3144197	.0901021	-3.49	0.001	-.495395	-.1334444
_cons	.1614396	.102631	1.57	0.122	-.0447008	.3675801

```
. reg Aff_Fut_growth BY3 Size Empllaidoff Cutcosts, robust
```

Linear regression

```
Number of obs =    54
F( 4, 49) = 4.83
Prob > F      = 0.0023
R-squared     = 0.1850
Root MSE     = .44017
```

Aff_Fut_gr~h	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
BY3	.0198862	.1388474	0.14	0.887	-.259138	.2989105
Size	-.0112035	.0029512	-3.80	0.000	-.0171341	-.005273
Empllaidoff	.3355862	.1642001	2.04	0.046	.0056138	.6655586
Cutcosts	.2046985	.1735585	1.18	0.244	-.1440804	.5534774
_cons	.3231024	.0844211	3.83	0.000	.1534517	.492753