



Norwegian University of  
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# Behavioral Integration in High-Tech Boards

A Quantitative Study of the Antecedents of  
Board Behavioral Integration in Scandinavian  
High-Tech Start-up Companies

**Kristina Brend**

Industrial Economics and Technology Management

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Supervisor: Arild Aspelund, IØT

Norwegian University of Science and Technology

Department of Industrial Economics and Technology Management





# Preface

This master thesis is written by Kristina Brend in the spring term of 2018. The author has studied at the Norwegian University of Science and Technology's Department of Industrial Economics and Technology Management.

The author wants to express sincere gratitude to her supervisors, Arild Aspelund and Ekaterina S. Bjørnåli, for providing knowledge, surveys, comments and input. They made an invaluable contribution during all the stages of the process of writing this master thesis and have provided the author with relevant feedback and opinions.

The study has followed a quantitative method design and used questionnaires answered by CEOs in Norwegian and Swedish high-tech start-up companies. It is worth to mention that more than  $\frac{1}{3}$  of the data collection has been conducted by the author. The final sample consisted of 94 companies.

Some references in this thesis are made to the authors' previous work, a multiple case study conducted during autumn 2016 (Brend, 2016). In that study, semi-structured interviews were used, with nine CEOs and board members of Norwegian high-tech start-up companies participating. Findings showed that design and use of the concept behavioral integration in board context might be useful. The work in this case study provided helpful insights useful to this master thesis, especially concerning hypothesis development and study design.

The writing of this master thesis has been a highly valuable learning process. The theoretical review, gathering and analysis of data, all have provided insights into the field of entrepreneurial and governance research, and gave the author a good comprehension of the methodological processes.

The author hopes that the research results will be useful to entrepreneurs, top management teams, the board of directors and start-up companies. In addition, the author hopes that future researchers will use this paper as a foundation for further studies.



# Abstract

**Purpose:** Given prior limited research on boards in high-tech start-ups, the author investigates whether or not behavioral integration can be a validated measure for company board context, and also what constitutes a board with high behavioral integration while exploring in depth: the effect caused by (1) trust, (2) the chairman of the boards leadership skills, (3) cognitive distance between board members and (4) informal communication within the board chair and the Chief Executive Officer (CEO).

**Methodology/approach:** This study design is quantitative, and the results are based on responses from 94 high-tech start-ups established in Norway and Sweden.

**Findings:** The theoretical model of behavioral integration was validated for board context, and further four hypotheses were tested. (1) Trust and (3) cognitive distance was found to affect board behavioral integration (BBI) positively, and a small effect was found with (2) board chair leadership skills. The hypothesis concerning (4) informal communication between board chair and CEO was not supported.

**Research limitations/implications:** To strengthen the generalizability of the findings it is important to eliminate the selection bias in the sample, and get samples from more than one area of the world. One could get a more detailed insight into how the boards' function through qualitative and longitudinal studies. The study findings are a valuable start for further research, to strengthen and develop further.

**Originality/value:** While the corporate governance and entrepreneur research streams have focused on behavioral integration in top-management teams (TMT), this study combines the two streams by looking at behavioral integration in small entrepreneurial enterprises within the high-tech industry and validating the BI model for board context.

**Keywords:** *high tech startups, high-tech boards, behavioral integration, board behavioral integration, startup board integration, board as a team, board service role*

## Sammendrag (Norwegian Summary)

Fokuset på styret i oppstartsbedrifter har økt innen entreprenørskaps- og styreforskning de siste årene, og man har fått en bedre forståelse for styrets funksjon i oppstartsselskaper. Likevel, med den hurtige utviklingen i moderne forretningsutvikling, er det fortsatt mye som gjenstår for oss å forstå, blant annet styrets påvirkning i oppstartsselskaper. Denne studien undersøker om begreper rundt adferdsmønster (behavioral integration) i ledelse kan brukes om styrer i høyteknologiske oppstartsselskaper, og hvilke faktorer som påvirker styrets adferdsmønster.

Studien undersøkte høyteknologiske oppstartsbedrifter i Norge og Sverige, og gjennom kvantitativ analyse ble 94 bedrifter undersøkt. Typisk for disse typene bedrifter er at de mangler ressurser og har begrenset med tid før de må lykkes på markedet. En løsning mange benytter seg av er å søke etter nye medlemmer til styreposisjoner. Medlemmene av styret kan bidra med ressurser, dele nettverk og kontakter, øke firmaets legitimitet og delta i strategiske beslutninger.

Den teoretiske modellen om styrets adferdsmønster ble testet, og fire hypoteser om hvilke faktorer som påvirker modellen ble utformet og undersøkt. Studien resulterte i følgende konklusjoner: (1) Tillit, (2) kognitiv avstand, og (3) styreleders lederegenskaper påvirker styrets adferdsmønster positivt. Modellen om styrets adferdsmønster ble validert for å brukes i konteksten høyteknologiske oppstartsselskapers styrer.

Undersøkelsen støtter ikke hypotesen om at mer uformell kommunikasjon mellom daglig leder og styreleder positivt påvirker styrets adferdsmønster.

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# Abbreviations Used

CEO - Chief Executive Officer

BClead - Board Chair Leadership Skills

BI - Behavioral Integration

BBI - Board Behavioral Integration

FTE - Full-Time Employees

SME - Small and Medium-Sized Enterprises

SPSS - Statistical Package for the Social Sciences

TMT - Top Management Team

US - United States of America

# Introduction

This paper validates a measure for board behavioral integration (BBI) and investigates the properties of a behaviorally integrated board in the context of high-tech start-ups.

Scandinavia, and especially Norway, is an interesting case, because of the high amount of small businesses. In 2018 there are 577 067 active companies, where 89,5% of them has less than 10 employees. In a time where Norway is restructuring the economy to become independent of oil profits, it is critical to search for success factors for high-tech start-ups.

New high-tech start-ups are seen as an essential element of the current economy, but the high-tech industry is characterized by risk and challenge. Venkataraman (1997) states that the liability of newness and smallness these companies face can be overcome by integrating and transforming resources to create an organizational capability, which in turn can be used to pursue promising market opportunities. The author believes such resources can be utilized by a high-performing board of directors. A high-performing team takes better and more efficient decisions. Hambrick and Mason (1984) introduce behavioral integration as a measure for these active groups, and behavioral integration has later been found to increase performance in top management teams in small- and medium-sized enterprises (SMEs) (Lubatkin, Simsek, Ling & Veiga 2006).

The composition and collaboration of the entrepreneurial teams are often recognized as a critical factor for survival and success of high-tech start-ups (Cooper & Daily, 1997; Birley & Stockley, 2000; Clarysse & Moray, 2004; Ensley & Hmieleski, 2005; Vanaelst et al., 2006). However, there is a limited focus on the entrepreneurial teams as a composition of both top

management teams (TMTs) and board members (Bjørnåli, 2017). The author finds this unexpected, given board research stating that the board of directors appear to be more actively involved in strategic decision making within high-tech start-ups, compared to large and established corporations (Gabrielsson & Huse, 2002). The author believes the composition and collaboration of the entrepreneurial board of directors also is a critical factor for survival and success in high-tech start-ups. A literature review from Bjørnåli (2017) finds that board researchers have attempted to identify the essential ingredients for building effective boards. They do this by using quantitative data, often from secondary sources and the dominant empirical context is found to be in the United States of America (US). This study adds to this stream of research by validating a model for BI in board context and gathering new data from Europe, more specifically Norway and Sweden.

This study will answer two research questions. The first research question is whether or not the concept of *behavioral integration, as theoretically described in earlier TMT research, can be validated in the context of high-tech start-up boards?* Further, this study will investigate *what constitutes a high-tech start-up board that is behaviorally integrated?* This study tests whether trust, cognitive conflict, the chairman of the board's leadership skills, and informal communication between CEO and the board chair has an effect on the level of behavioral integration within the board.

This paper is structured as follows: First, theoretical concepts are introduced, followed by the development of hypotheses. Second, the method used for data collection, data analysis and measures are explained. Third, the sample and the results from the analysis are presented and

finally discussed along with implications for theory, practice, limitations and further research.

The paper is closed with a conclusion.

# Theory

Within the governance research stream, there has been much focus on what constitutes an effective board of directors in large corporations (Huse, 2007). While in the entrepreneurial research stream, the focus has been mostly on the top management team (TMT), their composition and how their performance affects the success of the start-up (Eisenhardt & Schoonhoven, 1990; Hambrick et al., 1996; Wiersema & Bantel, 1992). In a large corporation, the owners will hire a board of directors that protect their interests. However, in a start-up company, the owner(s) is often also actively involved in the management and day-to-day operations of the company and will often fill the board of directors positions themselves and recruit all the other board members internally, or within their limited external network or family.

High-tech start-ups refer to young entrepreneurial firms, no older than ten years, developing new technology (hardware, software or mechanical) and not only providing services based on technology developed by others (Burgel and Murray, 2000). It is established among scholars that start-ups, especially in the high-tech industry, have limited resources, and this does not facilitate their growth and survival (Shane & Venkataraman, 2000; Eckhardt & Shane, 2003).

In the recent years, the involvement of the board of directors and their contribution to a firm's performance and development has received more attention (Zhang et al., 2011). The role of the board is traditionally split into two different roles; a service role, and a controlling role (Pfeffer & Salancik, 1978). The controlling role has been a widely used theory on boards in

corporate studies (Huse & Rindova, 2001). In the latter years, studies have looked at the effect of the board's service involvement. Fernhaber and McDougall-Covin (2009) found that venture capitalists who invested in high-tech firms acted as catalysts in the internationalization of these firms by bringing in knowledge and reputation. Zhang et al. (2011) discovered that venture capitalists were highly involved in strategy formulation and evaluation in US venture capital-backed firms.

However, it is surprisingly little research done on how to construct the board to best act out their service role. How does one organize for board service role, and are there any particular traits one can focus on, to make a highly functional board of directors that contribute to firm performance?

In order to know how to organize for a high performing board, the author searched for a good way to measure performance. The performance of high-tech startups is a measure hard to quantify. Several methods have been applied by researchers, for example, Shane and Stuart (2002), who found that since young companies have limited performance track records, historical measurements will not suffice. One measurement used is time to international markets, but this measure could make comparison to other research hard. Also, since this study is focusing on high-tech start-ups, a lot of the companies are born globals through the very nature of what their product is. To add to the complexity, Pettersen and Tobiassen (2012) found that Norwegian new ventures take longer time to internationalization than the US. ventures, while Bjørnåli and Aspelund (2012) found that Norwegian academic spin-off companies are often premature in their internationalization, due to lack of viable business or product to enter new markets. One could look at financial results as a measure, but since

Norwegian start-ups move slow, this might give skew results for younger companies. The different stages a high-tech start-up company goes through (Bjørnåli and Gulbrandsen, 2010) could be a measurement, but here there are considerable differences on how long a company stays in one phase based on industry. A high-tech medical company is an example of a typical slow company, due to the strict Norwegian regulations. The last measurement that can be applied is the effectiveness of the firm, hereunder, how effective the TMTs are, including their extension, the board of directors. Many researchers have adopted this measure (Zahra & Covin, 1993, Baron & Markman, 2003; Pearce & Sims, 2002). Bjørnåli, Knockaert and Erikson (2016) find effectiveness to be the measure best fitted for research on performance in TMT for start-up companies.

An effective TMT or board of directors is one that makes better decisions, and Carmeli and Schaubroeck (2011) found that behavioral integration is related to improved quality of decisions. Also, Lubatkin, Simsek, Ling & Veiga (2006) found that "SMEs with behaviorally integrated TMTs are better able to jointly pursue an exploratory and exploitative orientation and, by doing so, achieve higher levels of subsequent relative performance.

Boards with behaviorally integrated members are more likely to be successful in fulfilling their tasks, thus contributing to the performance of both the board and the company. Higher performance is one of the reasons why behavioral integration (BI) matters, especially for high-tech start-up boards, who have a dynamic work environment and rely on the expertise of the directors. A non-effective board will affect the company performance negatively, given that the TMT relies on the resources of the board for strategic work (Zhang et al. 2011).

Mooney et al. (2007) also found that in firms with less BI, a cognitive conflict would easier

develop to an affective conflict, which again causes a group to be less effective. Designing for high behavioral integration in the board is therefore of interest to practitioners. Seeing as it is not the board's task (by law) to be creative or innovative when it comes to technological solutions or products, one would not expect innovation to be a task for the board. However, high-tech start-ups operate in a highly dynamic environment (Garg, 2013) and therefore there is a need for creativity and innovation in the decision making. Forbes and Milliken (1999) state that in order to be effective the board must seek to combine their insights in creative, synergistic ways which is best done in a board that collaborates well.

Knowing that BI is related to both better decision making and performance, it is a good measure to investigate further to find what traits constitute an effective board. This study first checks whether BI can be applied in the high-tech start-up board context, and further investigates the particular traits or characteristics that lead to a board of high performance.

While the TMT members meet daily and are concerned with the firm's strategic and daily operations, the board meets less often, and its interest in the start-up can come from different reasons. Both employees and founders who have a strong passion for the start-up and the technology, may be the board members. Other board members can be e.g., venture capitalists interested in protecting their investment, (Garg, 2013) while also being interested in the firm's best.

Similarly to team research, factors that may influence BI drawing from TMT and board research can be divided into factors related to board structure and board processes (Aranda et al., 1998; Huse, 2007). Among structural characteristics of the board that may contribute to,

or hinder, BI are board composition, diversity and proximity. Processes are the actions that individuals, groups and organizations engage in as a response to an input, and that lead to a specific outcome. At the group level, processes can be, e.g., communication, leadership, power, politics, as well as conflict and negotiation (Robbins & Judge, 2012). In this study, the author looks at situation-related processes like communication, cognitive processes related to human behavior, and psychology. Among the process characteristics of the board that may have consequences for BI is trust, board chair leadership skills, cognitive conflict and the nature of communication between board members.

## Theoretical Framework

When looking at boards in an entrepreneurial context, it is hard to find one single theory to explain the behavior, impact and performance of high-tech boards. In the entrepreneurial research, there are various theories applied when discussing both boards, behavioral integration and teams. The same is the case in governance research. This study has mentioned a few already, but some typical examples are agency theory, upper-echelon theory, resource-based view, team production theory and stage-based theory. Joint board and entrepreneurial research tend to combine more than one theory (Bjørnåli, Knockaert and Erikson, 2016), and this method is adopted in this study. In the following, the theories used and their foundations will be described. Further, the theories are applied to develop the hypothesis.

## Resource Dependence Theory

The resource dependence theory describes how the external resources in the environment of a firm affect the internal characteristics of the firm. The originating study of this theory is Pfeffer and Salancik's (1978), who focus on five actions a firm can take to reduce the dependency on these external resources. The actions are mergers and acquisitions, joint venturing firms, the board of directors, political action and executive succession. The board of directors can contribute with advice and counsel, information about the environment, access to resources and legitimacy, in context of resource dependence theory (Pfeffer and Salancik, 1978).

In this study, the board of directors is viewed as an essential tool for high-tech start-ups to reduce their dependency on the external environment by accessing critical resources (Lynall, Golden & Hillman, 2003, Knockaert & Ucbasaran, 2013). Previous research has found that boards contribute to the use of network in the internationalization process (Bjørnåli & Aspelund, 2012), and in the team member addition process (Bjørnåli & Erikson, 2010). The board of directors is, therefore, an important factor that helps to minimize the dependency on external resources.

## Upper Echelons Theory

Hambrick and Mason (1984) first introduced the upper echelons theory. They claim that an organization's outcome is a reflection of the leadership's decisions, and based on the TMT's construal, meaning how individuals perceive, comprehend, and interpret the world around

them, particularly the behavior or action of others towards themselves. This construal is then influenced by the executives' former experience, moral, values, and personality. The theory has been widely investigated and gives a good explanation of the effect that TMT's have on organizations (Hambrick, 2007). Hambrick also introduced a new term within this theory namely, behavioral integration (BI). The research on behavioral integration is a somewhat new area, and Hambrick introduced it first in the 1990's. The concept has been central in recent research on cognitive and affective conflict in teams and firms.

Hambrick defined BI for TMTs as a process of collaborative behavior, quantity, and quality of information exchanged with emphasis on joint decision making. In other words, a team level process with both a social and a task dimension. Simsek et al. (2005) explain how Hambrick in his case studies of 1995 and 1984 “conceptualized behavioral integration as a meta-construct intended to capture three key interrelated and reinforcing elements of TMT process, including a team’s (1) level of collaborative behavior, (2) quantity and quality of information exchanged, and (3) emphasis on joint decision making” (p. 69). This meta-construct has two dimensions, one social and one task related. The social dimension incorporated the TMTs level of collaborative behavior, while the task dimension is concerned around the quantity and quality of information exchanged as well as joint decision making. The board can also be considered a team, meeting on a less regular basis than the TMT, but with equal importance for the strategy development and performance of a young high-tech start-up. An important distinction is, however, that the board is not concerned with day to day operations of the company. Mooney et al. (2007) designed five items for capturing the key attributes of behavioral integration, namely mutual and collective interaction, joint decision making, and resource and information sharing, which fit the context of high-tech boards. In

this study, Upper Echelon theory is applied by using BI as a central concept that will first be validated for board context and then tested to find what constitutes a behaviorally integrated board of directors in high-tech start-ups.

## Corporate Governance Theory

Corporate governance theory is the view of how firms are directed or controlled (Huse, 2007). This theory describes the monitoring, controlling and incentives of the TMT (Williamson, 1984). In other words, the theory looks at how a firm's stakeholders, shareholders, and managers interact and how they create value. In this study, the definition of Huse (2007) on corporate governance is used: "Corporate governance is seen as the interactions between various internal and external actors and the board members in directing a firm for value creation" (Huse, 2007, p 15).

As mentioned earlier, the board involvement as a service role is the most important aspect from this theory applied in this study. If the board of directors has a service role towards the TMT, this can positively affect the firm's performance (Kim, Burns & Prescott, 2009). For smaller firms, with inexperienced management, Bjørnåli, Knockaert and Erikson (2016) found that a board with an active service role can be essential for survival.

## Development of Hypothesis

In 2007 Mooney et al. designed a model containing five items to capture the key attributes of behavioral integration for TMTs. These five items consisted of mutual and collective interaction, joint decision making, and resource and information sharing. The first hypothesis

is looking to answer research question one by testing whether this model fits the context of high-tech start-up boards.

*H1: Can behavioral integration, as theoretically described in earlier TMT research, be validated in the context of high-tech start-up boards?*

When knowing that BI has positive impact on a team, like better decision making, efficiency and eventually, better firm or project performance, the following hypotheses are related to research question two and attempts to find characteristics that lead to behavioral integration in high-tech start-up boards.

*H2: What constitutes a high-tech start-up board that is behaviorally integrated?*

To create an effective team or collaboration Robbins and Judge (2012) state that a climate for trust is essential. Trust is defined as “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another” (Rousseau et al. 1998: 395). Trust plays a key role in regulating cooperative behavior, not only at the inter-firm level (Ring & Van de Ven, 1992) but also at the intra-firm level (Rousseau et al. 1998). It implies a strong confidence in the predictability of outcomes (McKnight et al. 1998), which facilitates the development of collaborations between the board and the management, and is therefore regarded as a must for an effective board service task performance (Westphal 1999), and a positive impact on board control tasks (Van Ees et al. 2009). Trust refers to a person's willingness to be vulnerable to another party, based on a belief that the other party is reliable, concerned, open and competent (Mishra, 1996). This is

also true for collaboration within management groups (Sjøvold, 2006), including TMTs (Carmeli et al., 2012) and boards (Huse, 2007). Talaulicar et al. (2005) conclude that "benefitting from heterogeneous groups and cognitive conflicts without suffering from the inherent dangers requires trust among the group members (Dooley & Fryxell, 1999, Mayer et al., 1995 and Simons & Peterson, 2000)", suggesting that trust serves as a mediation factor for groups with complex tasks, like boards. For BBI, trust is expected to be essential and positive:

*H2a: Trust will positively affect Board Behavioral Integration*

It is natural to think that the leadership of any group or team has some effect on its success or lack of success. For boards, the formal leader is the board chairperson. Recent research has stated that the board chair role should go beyond merely box-ticking agenda points (Huse, 2007). In academic research, the role of the board chairperson and the tasks assigned to this role have received limited attention. Huse (2007) sums up the usual suspects in this research to be finding CEO duality (when the CEO and board chair is the same person), ownership, compensations, tenure, full- or part-time positions and whether or not the chairperson used to be the CEO. In agency theory, a firm with CEO duality will promote entrenchment, which means the board will come back to the same ideas and conclusions in every discussion. In most systems, duality is not allowed, but for start-ups, it is quite common. CEO duality is, as mentioned, commonly used as a concept in governance research, but no clear connection has ever been found between the existence of CEO duality and firm financial performance (Dalton et al., 1999).

The primary tasks of the leadership of a board include coordination, integration, communication and molding a group of individuals into a well-functioning team. This is important because the board members often are outsiders to the firm, and have limited time and resources to get up to date on the matters at hand (MacAvoy and Millstein, 2003).

Furr and Furr (2005) found that few companies and board members have expectations about the role of the board chair and few evaluate the effectiveness of their chairperson. This is surprising, when seeing that they also found that the chair leadership behavior affects the boards' effectiveness, because the board is a social system with several different personalities and relationships.

There is a gap between the traditionally defined role of the board chair as a box-ticking role, and the tasks required by the board leadership to be effective. Norwegian law also only lists the financial responsibilities of the board members, which may lead to many firms not utilizing the potential of the board chair, and the board members. Cadburry (2002) even concludes that the board chair should take on a coaching role, which achieves satisfaction through the achievement of others. Therefore the chairperson should work to support both the CEO and the other board members, and bring out their potential as a team (MacAvoy & Millstein, 2003). According to Huse (2007), it is the board leadership's responsibility to mold the board into a cohesive group, and therefore the author concludes with this second hypothesis:

*H2b: Board Chair Leadership skills will positively affect Board Behavior Integration*

If one is interested in creating an environment for BBI, the way information is processed, or the cognitive antecedents, are important to look at. A process characteristic often discussed in the literature, is cognitive distance. Cognitive distance refers to how people "interpret, understand and evaluate the world differently" (Nooteboom et al., 2007). Their perception does not have to be equal in the organizational context, but team members need to share a set of basic perceptions and values or a "system of shared meanings" (Smircich, 1983). Otherwise, they have a large cognitive distance. A cognitive distance may spur cognitive conflict. In this study, the author uses cognitive diversity and cognitive distance as interchangeable terms. Forbes and Milliken define cognitive conflict as the "task-oriented differences in judgment among group members" (1999: p. 494) and cites Jehn's definition: "disagreements about the content of the tasks being performed, including differences in viewpoints, ideas, and opinions" (Jehn 1995, p.258). Cognitive conflicts are likely to appear in groups that are interdependent and face complex decision-making tasks, like boards (Forbes & Milliken 1999). Miller et al. (1998) state that "variation in enduring beliefs and preferences tends to create disagreements when specific strategic issues are being considered (Lant et al., 1992), cognitive diversity probably influences both comprehensiveness and extensiveness". Nooteboom et al. (2007) found an inverted-U shaped relationship when investigating the optimal level of cognitive distance to foster innovation, suggesting too much cognitive distance is harmful to team performance and may lead to conflicts of affective nature, while just enough cognitive distance is fruitful for innovative capabilities of a team. Cognitive conflict within a team will, according to Forbes and Milliken (1999) lead to more careful evaluation of alternatives which again contribute to the quality of strategic decision making. However, some "directors respond to high levels of cognitive conflict on the board by reducing, rather than increasing, their commitment to the board (Mace, 1986; cf. Forbes &

Milliken, 1999, p. 494) and the author, therefore, expects cognitive conflict to have a positive relation to BBI.

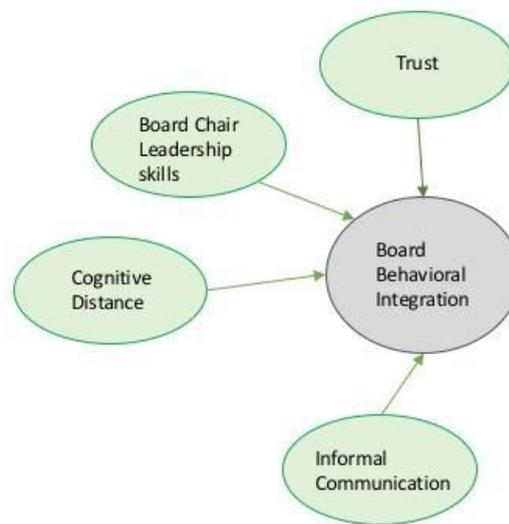
*H2c: Cognitive Distance will positively affect Board Behavioral Integration*

Communication serves four major functions within a group or organization: control, motivation, emotional expression, and information (Robbins & Judge, 2012) and is therefore essential. Formal communication in board context would be the board meetings as well as the formal dialogue between CEO and the board members (Huse et al., 2005). All other communication between the board members outside of the board meetings is defined as informal communication in this study. Informal communication serves to employees' needs: "small talk creates a sense of closeness and friendship among those who share information" (Robbins & Judge, 2012. p. 343). For instance, Huse et al. (2005) describe how informal communication between board members at the Norwegian enterprise TINE provided additional opportunities for the board members to develop a context for strategic discussions, as well as to improve the number of decisions episodes where they had influence. "This system created professional and friendship ties between members of the corporate board and the top management team" and "facilitated communication and coordination" (Huse et al. 2005, p 290). How often informal communication is practiced between the chairman of the board and the CEO, and among the other board members can have a direct link to the degree of BI. A higher degree of informal communication leads to an increase in social proximity (Villani et al. 2016), and this fosters collaboration. Villani et al. (2016) argue that less proximate groups have to deal with the transaction, search and bargaining costs. The author,

therefore, expects the degree of informal communication between board chair and CEO to affect BBI positively.

*H2d: Informal Communication between board chair and CEO will positively affect Board Behavioral Integration*

Below, part two of the hypothesis relationships are summarized and illustrated in a model:



*Figure 1: Summary of hypotheses*

Trust, board chair leadership skills, cognitive distance and informal communication between board chair and CEO are expected to affect BBI positively.

# Method

This chapter presents the design of the study and the method of data gathering. The author will also present the different variables both dependent, independent and control variables chosen for this study.

## Sample and data collection

In order to investigate the hypothesis, a quantitative method was chosen. The data was collected during the spring term of 2017 using electronic surveys sent to CEOs in high-tech start-ups in the area of Trondheim, Norway. Of the total 98 companies contacted, 45 surveys were collected, obtaining a 44,1% response rate.

The survey included 34 questions of broad range and was designed together with post.doc Ekaterina S. Bjørnåli at NTNU Business School. The full list of questions can be found in Appendix A. In the design process, Ekaterina S. Bjørnåli also consulted other international researchers with field expertise, to get feedback and ensure relevance in the survey's questions. The questions were also pretested to minimize social desirability bias (Tourangeau et al., 2000). The author got good feedback from the pre-tests during the semi-structured interviews in her prior work (Brend, 2016), for example, some of the CEOs gave feedback about a few questions being ambiguous interpreted. The questions in the survey were descriptive but used a Likert seven-point scale from 1 (completely disagree) to 7 (completely agree). In addition, to minimize the bias of response (Friedman et al., 1994), some of the questions were reversed. To limit the common method bias, the study has included more

independent variables in the research with small ( $p \leq 0.30$ ) bivariate correlation (Siemsen et al., 2010).

Companies that were chosen eligible for the study were established within a period of 1 to 15 years at the time of the survey and had to fit in the definition of high-tech startups described above. Different industries within high-tech were represented, and other variations were the number of employees, CEO tenure, size of board and TMT, and development stage. When contacting a broad range of companies and only getting 44,1% response rate, there might appear some selection bias in the sample.

The CEO, who is in charge of managing the company and leading the TMT's activities, but also participates in every board meeting, was targeted to fill out the survey. The reason for the choice of this actor is that it implies broad knowledge of a firm's culture, process, performance, and history (Miller & Toulouse, 1986) and the CEO also has direct communication with the board (Huse, 2007). When studying internal processes within the board, the author acknowledges the need for more than one respondent from the board and will recommend further research to target both CEO and board chair or for CEO duality, target on additional board director. By targeting more than one board member one could have gotten additional insights, but board members are very busy people, and this could have resulted in fewer samples for the research (Glick et al., 1990). Another reason for choosing one respondent is that this particular study also had time restrictions. However, earlier research has provided empirical evidence that individual answers are reliable to study group phenomenon (Atuahene-Gima and Murray, 2004).

All the participants in the study were assured confidentiality of their answers. Only the author of the study and her supervisor have access to the data, stored safely on protected servers. The research has been reported and approved by the Norwegian Science Data Service Company in 2014.

The primary process of data collection took three months to complete. Two sources were used to acquire the data. First, the author coded a script in Java and applied it to the REST-API of the Norwegian Brønnøysund Register to get listings of all relevant companies and their CEOs. The script resulted in a list of 463 companies'. The Norwegian Brønnøysund Register Centre is a government agency responsible for the management of numerous public registers for Norway, and governmental systems for digital exchange of information (The Norwegian Brønnøysund Register Centre, 2018). This list contained some companies subdivisions of themselves (duplicates), some bankrupt companies, some newly merged or departments from large international corporations. A few of the listings represented tech companies with only one employee, or did not have any activity in the last three years, or did not fit the characteristics required for high-tech start-ups. These 157 companies were excluded leaving a sample of 306. The next step was to compare the remainder of the companies to earlier data collection done by Postdoc Ekaterina S. Bjørnåli and her master students. This excluded another 112 companies who already had been contacted with a version of the questionnaire and either willing to respond (77) or not wanting to be contacted again (35), leaving a sample of 105 companies. One primary source was used to quality assure the 105 companies, "The Impello Analysis 2016". "The Impello Analysis" is an annual, fact-based review of the high-tech sector in the Trondheim Region (10 municipalities in Mid-Norway), including a

complete listing of companies (Impello, 2018). For 2016 they reported 511 high-tech companies and 85 subdivisions. After sorting by founding year 0-15 and comparing with the list of 105 high-tech start-up companies from the Brønnøysund Register Centre, the author consulted the company Impello Consulting about the difference. This resulted in the exclusion of another 16 companies because they did not produce any technology of their own, or only functioned as technical consultants which is not in line with the definition of high-tech start-up companies described in the introduction of this study. In the first step of collection data, the author created an online survey and formulated personal email invitations to all 89 companies. As the Impello Technology Company report only provided company names, public databases were used to collect the names of CEOs. Email addresses and phone numbers were collected by public listings and company web pages. Where the author could not find this information, the CEOs were contacted by professional social media, like LinkedIn. E-mail and personal call follow-ups were conducted to get as many replies as possible, both one and three weeks after they received the survey. All data collection and respondent communication were handled electronically to ensure a fast and responsive process. In total 89 companies were approached.

45 CEOs gave responses to the questionnaires, resulting in a response rate equal to 44,1%. Unfortunately, some CEOs did not finish the survey or left out crucial information for this research, leaving the obtained number at 31 completed questionnaires. This final response rate is equal to 35 %, which is quite good and higher than the average response rate (below 30%) for SMEs (Gabrielsson, 2007). A success factor may have been the quality assurance by Impello Consulting Company, the personal emails and calls, as well as making the survey as user-friendly as possible (online and short). The responses were supplied with 77

questionnaires provided by the project supervisor, postdoc Ekaterina S. Bjørnåli, in order to increase the sample size.

Received survey answers were double-checked with other data sources to ensure validity. Two different databases provided accounting information, information on the TMT and board, and the companies contact information were applied: Brønnøysund Register Centre and forvalt.no. The companies websites were also used when they were available. In case of data ambiguity or if the answers in the questionnaire were missing, the CEOs were contacted and kindly asked to confirm the information.

All the questionnaires were manually inspected to ensure validity. Six of the responses were excluded because they were missing too many variables. Four other companies did not specify their name or organizational number, and it was therefore impossible to track down their company age, sales numbers and the number of employees. In 14 cases the author contacted the companies that had filled out surveys with missing variables and asked if they kindly could complete the survey. In total ten had to be excluded, thus giving a final sample consisting of 108 responses.

Statistical utility SPSS 24.0 was used for the analysis. The data were coded into the IBM software program called “Statistical Package for the Social Sciences” (SPSS) by the author and were later controlled for mistypes. This control helped to minimize data mistakes, which is a common tendency for survey participants. These type of tendencies are important to account for in social studies, and are referred to as part of the response bias (Hair, Babin & Anderson, 2010). Of the 108 companies in the sample, 17 were excluded by SPPS from the

sample when the multiple regression was applied, because no missing values for the variable values used are allowed in SPSS.

## Measures

In this chapter, the variables used in the regression tests are presented. Initially, the author looks into the dependent variable. Secondly, the independent variables are presented, and finally, the control variables. All dependent and independent scale variables are checked for scale reliability with the internal consistency-coefficient Cronbach's Alpha (Gliem & Gliem, 2003). These variables are also analyzed further to exclude multidimensionality, through confirmatory factor analysis.

### Dependent variable

The dependent variable is representing board behavioral integration (BBI) (Mooney et al., 2007; Hambrick, 1984) as described in the theory chapter. The scale used to assess board behavioral integration contains five items:

"Board members

- ❖ Are mutually responsible for decisions
- ❖ Have a clear understanding of the issues and needs of each member
- ❖ Help each other solve problems
- ❖ Share relevant information with each other
- ❖ Share resources with each other"

The respondents were asked to indicate how much they agree with the statements on a scale from 1 (completely disagree) to 7 (completely agree). The Cronbach alpha coefficient for this

summed scale is 0,938 which is well above the accepted value of 0.600 (Hair et al., 2010).

The factor analysis for this scale variable is tested with the strictest method maximum likelihood, and the factor loadings in the Factor Matrix is presented in the table below. With all the items grouped into one factor, resulted in values well over the 0.69 which indicate they explain the same underlying concept well.

<b>Board behavioral integration scale variable</b>	<b>Factor Loadings</b>	<b>Cronbach's alpha coefficient</b>
Board members are mutually responsible for decisions	0.693	
Board members have a clear understanding of the issues and needs of each member	0.902	
Board members help each other solve problems	0.933	
Board members share relevant information with each other	0.917	
Board members share resources with each other	0.906	
<b>Summed scale:</b>		0,938

*Table 1: Factor analysis for BBI variable*

## Independent variables

The respondents were asked to indicate how much they agreed with the statements from 1 (completely disagree) to 7 (completely agree) in all the independent variables listed below.

The independent variables are scale based with 3-5 items, except for the last variable, which is a single item variable.

### Trust

“To what extent do you agree with the following statements:

- ❖ Every board member is characterized by absolute integrity

- ❖ One can assume that during board meetings everybody tells the truth
- ❖ Board members can be sure to trust each other
- ❖ Board members can trust that mutual promises are kept”

The Cronbach alpha coefficient for this summed scale is 0,919 which is well above the accepted value of 0.600 (Hair et al., 2010). The factor analysis for this scale variable is also tested with maximum likelihood, and the factor loadings in the Factor Matrix is presented in the table below. With all the items grouped into one factor, the test resulted in values well over the 0.7, which indicated they explain the same underlying concept well.

<b>Trust scale variable</b>	<b>Factor Loadings</b>	<b>Cronbach's alpha coefficient</b>
Every board member is characterized by absolute integrity	0.736	
One can assume that during board meetings everybody tells the truth	0.941	
Board members can be sure to trust each other	0.922	
Board members can trust that mutual promises are kept	0.870	
<b>Summed scale:</b>		0,919

*Table 2: Factor analysis for trust variable*

#### Board Chair leadership skills

“Our board chair is especially skilled in:

- ❖ Motivating and using each board member’s competence
- ❖ Formulating proposals for decisions and summarizing board negotiation
- ❖ Chairing board discussions without promoting his/her agenda”

The Cronbach alpha coefficient for this summed scale is 0,904 which is well above the accepted value of 0.600 (Hair et al., 2010). The factor analysis for this scale variable is tested with the strictest method maximum likelihood. The factor loadings in the Factor Matrix is presented in the table below. All the items grouped into one factor, with values well over the 0.8 which indicated they explain the same underlying concept very well.

<b>Board Leadership skills scale variable</b>	<b>Factor Loadings</b>	<b>Cronbach's alpha coefficient</b>
Our board chair is especially skilled in motivating and using each board member's competence	0.845	
Our board chair is especially skilled in formulating proposals for decisions and summarizing board negotiation	0.862	
Our board chair is especially skilled in chairing board discussions without promoting his/her agenda	0.907	
<b>Summed scale:</b>		0,904

*Table 3: Factor analysis for board leadership skills variable*

### Cognitive Distance

How strongly do members of the board (dis)agree with each other about:

- ❖ The best way to maximize the firm's long-term profitability?
- ❖ What the firm's priorities should be?
- ❖ The best way to ensure the firm's long-run survival?
- ❖ Which organizational objectives should be considered most important?

The respondents were asked to indicate how much they agree with the statements on a scale from 1 (completely disagree) to 7 (completely agree). The Cronbach alpha coefficient for this summed scale is 0,934 which is well above the accepted value of 0.600 (Hair et al., 2010).

The factor analysis for this scale variable is tested with the strictest method maximum likelihood, and the factor loadings in the Factor Matrix is presented in the table below, all the items grouped to one factor, with values well over the 0.8 which indicated they explain the same underlying concept very well.

<b>Cognitive distance scale variable</b>	<b>Factor Loadings</b>	<b>Cronbach's alpha coefficient</b>
How strongly do members of the board (dis)agree with each other about the best way to maximize the firm's long-term profitability?	0.874	
How strongly do members of the board (dis)agree with each other about what the firm's priorities should be?	0.917	
How strongly do members of the board (dis)agree with each other about the best way to ensure the firm's long-run survival?	0.907	
How strongly do members of the board (dis)agree with each other about which organizational objectives should be considered most important?	0.838	
<b>Summed scale:</b>		0,934

*Table 4: Factor analysis for cognitive distance variable*

### Informal Communication

As described in the theory chapter, Huse et al. (2005) found that informal communication between board members created professional and friendship ties between members of the corporate board and the top management team and facilitated more communication and coordination. This variable is built from the following single item measure:

- ❖ How frequent is the informal communication between the CEO and board chair?

## Control Variables

The control variables is a group of variables that are not the primary focus of the study. They were included in the regression model and kept constant, to minimize their effect on the analysis and exclude undesirable interactions described further.

### Firm age

The expertise that is needed from the board of directors varies for young and mature firms (Hambrick and Mason, 1984), therefore this variable was controlled. The average value for a firm's age was equal to 8.37 years, but varied from one to 15 years. The study included a broad range of companies with different ages to increase the sample size. In addition, it takes many years to get over the liability of newness for a new company, and thus the role of the board may be critical for younger companies (Hillman and Dalziel, 2003).

### The number of full-time employees (FTE)

FTE was registered at the end of 2016. The service role of the board may vary for the different firm sizes (Zahra and Pearce, 1989). The mean FTE value was equal to 6.91 employees, but values varied significantly from one (only CEO) to 60 employees, and therefore contributed to high values for standard deviation.

## Board size

The CEOs were asked to specify the number of board members. The board's service role contribution may vary in context of the board size (Zahra, Neubaum and Huse, 2000). The average number of board members was equal to 4.0.

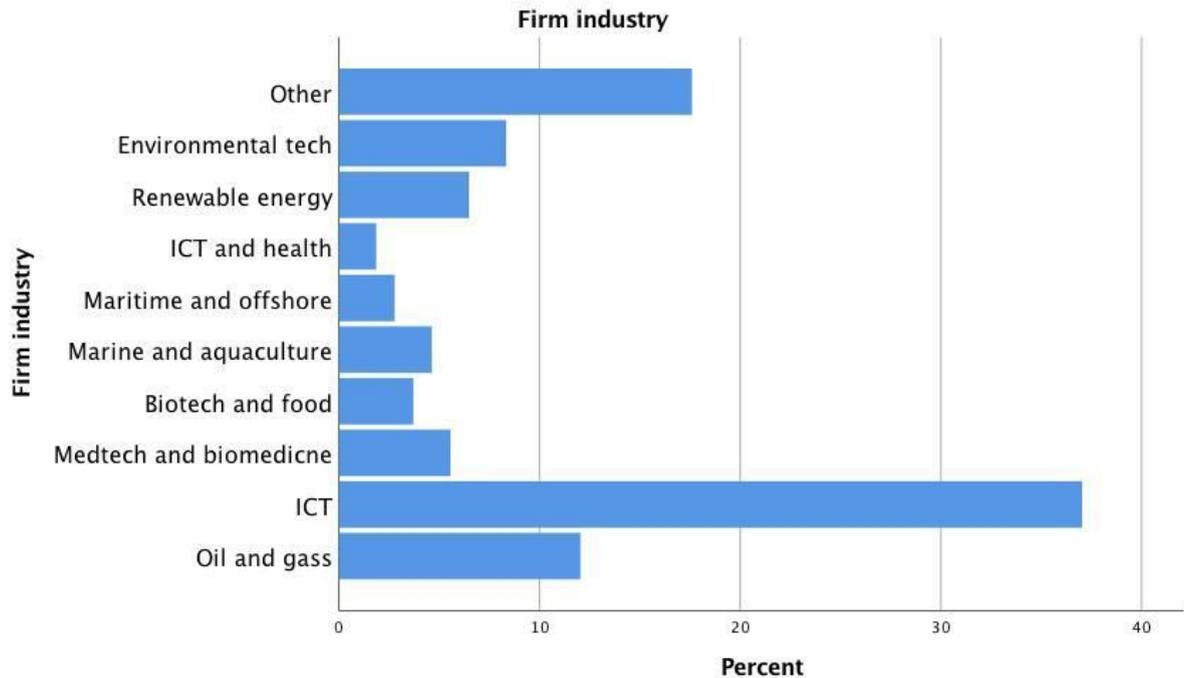
# Results

First, in this chapter, the author first presents descriptives about the variables and the sample. Second, the data is validated for regression by checking for normality, homoscedasticity, linearity and multicollinearity. Third, the results of the analysis are presented, and finally, the conclusion of the hypothesis are summarized in a model.

## Sample Descriptives

All the companies tested are from 0 to 15 years old at the time of the tests, operating in the high tech start-up industry in Scandinavia, hereunder Norway, and a few (12%) in Sweden.

The analysis went from 108 cases down to 94 with all variables included, this is an acceptable decrease, due to some companies not answering all questions. For example, the informal communication between board chair and CEO have 102 responses, naturally because in some cases there are CEO duality. In linear regression, there is a rule of thumb that the sample size should be at least 20 cases per independent variable (Tabachnick and Fidell, 1989). This study uses four independent variables (4 times 20 equals 80) and with 94 cases this is acceptable. Figure 2 presents an overview of the different industries represented in the study.



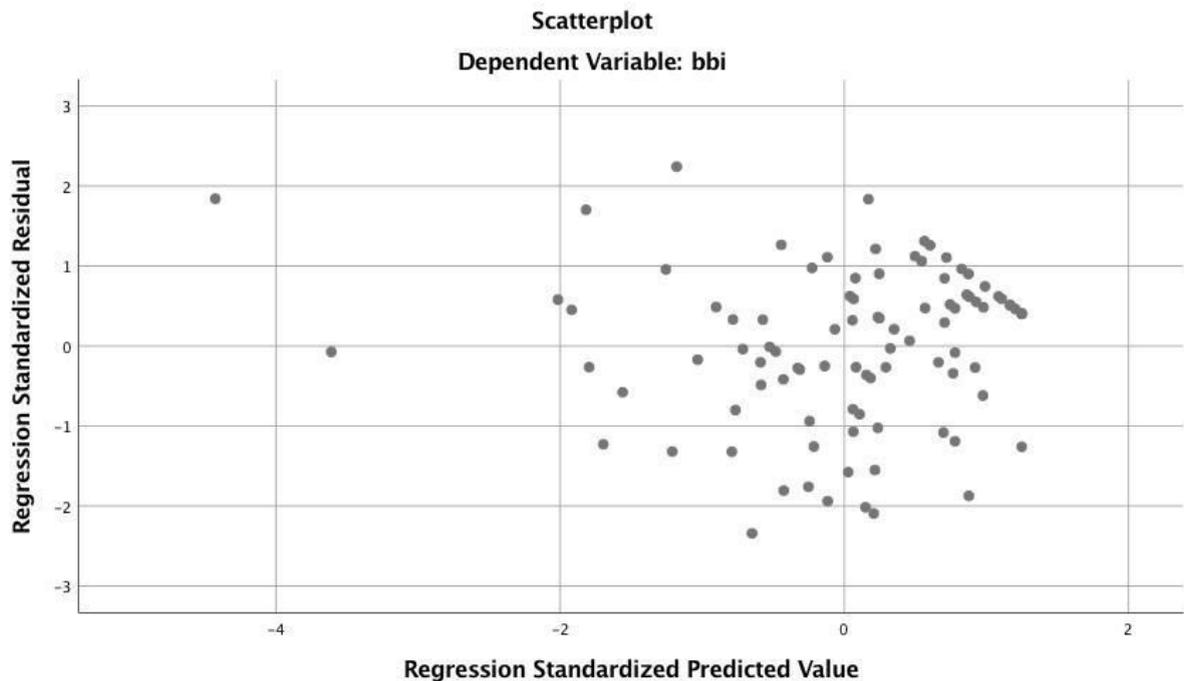
*Figure 2: Overview of the industries represented in the study*

Other interesting descriptives about the cases are that 91,7% of the responses are from the CEO's of the companies, while the rest is from other board members or TMT members. On average the CEO tenure is 5,02 years. 85,2% of the respondents are male. In 2016 the average number of board meetings held with physical presence was four. 13,9% of the companies have not yet developed their first product, while the rest started selling their first product between 1991 and 2017. These numbers mean some of the companies had their product ready before the founding year, at most as much as ten years before. The slowest time to market in the sample is one company that used 11 years. The mean for time to market is 2,29 years. 44,4 percent have applied for a patent. 77% have international activities, where 64,8% has closed the first international deal.

## Regression Validation

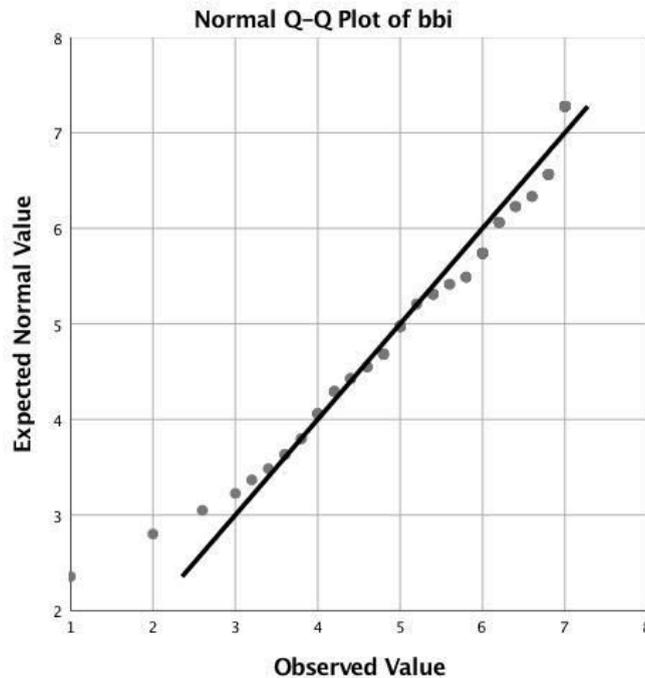
Before conducting linear regression, five assumptions for the statistical method were tested, namely linear relationship, multivariate normality, multicollinearity, autocorrelation and homoscedasticity.

First, for a statistical method to have a linear relationship, the scatterplot for the dependent variable BBI on the regression standardized residual must be rectangular. The scatterplot below shows that except for a few outliers the plot can fit a rectangular model, so this assumption is ok.



*Figure 3: Scatterplot of regression standardized residuals on predicted value*

Second, multivariate normality in the variables is tested with a Q-Q plot, which should form a linear line to be fit for regression. The plot below shows a result that is acceptable close to a straight line, and the multivariate normality assumption for this study is therefore met.



*Figure 4: Normal Q-Q Plot for expected normal value on observed value*

Third, there can be little or no multicollinearity in the data, which can be checked in two ways. In the correlation matrix (Table 6 below) the Pearson's Bivariate Correlation among independent variables should be smaller than 0.8 - this is true for all the cases, but many of the correlations are high, and another test to rule out multicollinearity in the data is therefore applied.

The second test to find whether the data has little or no multicollinearity is the Variance Inflation Factor (VIF) of the linear regression. The results should be smaller than 10 for no multicollinearity to be present, which is true for all the variables in this sample ( $VIF < 2$  - see Table 6 below), and little or no multicollinearity is therefore present in this data.

Fourth, autocorrelation occurs when the residuals are not independent of each other, in other words, when they are grouped together very close. Autocorrelation can be tested with a

scatterplot, as seen in figure 4. The scatterplot forms a rectangular shape except for a few outliers, but there is no single defined grouping. Autocorrelation is therefore not present in this sample.

Finally, we check for homoscedasticity. Homoscedasticity refers to whether the residuals are equally distributed, or whether they tend to bunch together at some values, and at other values, spread far apart. So one should look for a rectangular shape of dots, this represents homoscedasticity. The scatter plot is a good way to check whether the data are homoscedastic, meaning the residuals are equal across the regression line. In the figure above, there is no sign of heteroscedasticity, because the values do not form a line, they are more rectangularly shaped, except for some outliers. The data therefore holds for this assumption.

The tests show that this study holds for all five assumptions for linear regression.

Cross-sectional studies often have both very small and large values and, thus, are more likely to have some heteroscedasticity, but in this case, the sample is good. The table below summarizes the assumptions and their results.

<b>Assumption</b>	<b>Conclusion</b>
Linear relationship	OK
Multivariate normality	OK
Little or no multicollinearity	OK
No autocorrelation	OK
Homoscedasticity	OK

*Table 5: Summary of regression validation assumptions and results*

## Regression Results

The hypotheses were tested through two different models by using hierarchical multivariate regression. This method is best suited for discovering relations between dependent and independent variables. A t-test or ANOVA could have been used, but it does not take covariation between independent variables into account, and this is not desirable as several independent and control variables can interact.

Table 6 shows some high Pearson correlations between several of the independent variables, as well as the dependent variable BBI. With some of the independent variables having correlation values over .6, which means that multicollinearity is likely to be present. The author therefore tested this further by checking the VIF (variance inflation factor) for the model, which is another indicator of multicollinearity effects and could result in misleading effects if too high (Field, 2007). The VIF values were well below two, which means multicollinearities is unlikely to be present (Hayes, 2013), as the accepted threshold is 10 (Kutner et al., 2005). The sample is therefore suitable for regression test.

Table 6 shows relations between dependent and independent variables that were significant on a .01 level for many of the variables including Board behavioral integration (BBI) and Trust ( $r=0.736$ ), for Trust and Board Chair Leadership (BCLead) skills ( $r=0.0396$ ), for BBI and Cognitive Distance ( $r=0.692$ ), Trust and BClead ( $r=0.600$ ), BClead and Cognitive Distance ( $r=0.562$ ), BBI and Informal Communication ( $r=0.410$ ), Trust and Informal Communication ( $r=0.449$ ) and Cognitive Distance and Informal Communication ( $r=0.459$ )

Relations between dependent and independent variables significant on a 0.05 level was for BBI and BClead ( $r=0.551$ ) and BClead and Informal Communication ( $r=0.326$ ).

Variable	Correlations							
	1	2	3	4	5	6	7	8
1 - Board Behavioral Integration	1							
2 - Trust	0.736 (0.000)***	1						
3 - Board Chair Leadership skills	0.551 (0.000)***	0.396 (0.000)***	1					
4 - Cognitive Distance	0.692 (0.000)***	0.600 (0.000)***	0.562 (0.000)***	1				
5 - Informal Communication	0.410 (0.000)***	0.449 (0.000)***	0.326 (0.001)***	0.459 (0.000)***	1			
6 - Board Size	-0.075 (0.440)	-0.070 (0.482)	0.189 (0.053)†	-0.124 (0.202)	0.005 (0.962)	1		
7 - Firm Age	-0.026 (0.794)	-0.073 (0.460)	0.095 (0.334)	-0.034 (0.725)	-0.033 (0.744)	0.197* (0.041)	1	
8 - Full time Equivalent (FTE)	0.057 (0.562)	0.145 (0.142)	0.095 (0.337)	-0.030 (0.761)	-0.060 (0.547)	0.260 (0.007)**	0.311 (0.001)***	1
Statistics								
Mean Value	5.5178	6.1611	5.1587	5.3692	5.7549	4.00	8.3796	6.9120
Standard Deviations	1.25381	1.03806	1.34537	1.18229	1.42423	1.421	4.13039	10.53628
Collinearity Statistics								
VIF (Variance Inflation Factor)		1.882	1.416	1.758	1.276	1.216	1.129	1.235

(Significance: †  $p < .1$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .005$ )

Table 6: Descriptive statistics with pearson correlations (significance), mean values and standard deviations.

The control variables Board Size, Firm Age and Full-Time Equivalent (FTE) are not significant with the dependent variable BBI or the independent variables.

The significant variables were further examined with the help of regression models, full results as listed in table 7. The R parameter, a measure of how well data fit into a statistical

model, was over .6 for model 2. As R<sup>2</sup> is often criticized for being a lesser choice in explanation of the variables in the model, the adjusted R<sup>2</sup> values were also included (Eikemo and Clausen, 2007).

Two different regression models were used, and their full ANOVA results are presented in Table 9 in Appendix B. Model 1 had only control variables (F-value = 0.524, not significant ( $p > 0.1$ , adjusted R<sup>2</sup> = -0.016). This model showed that the size of the board, the age of the company and the number of full-time employees in a high tech startup does not explain the level of behavioral integration in the board.

Independent variables were added in Model 2; Trust, Board Chair leadership skills, Cognitive Distance and Informal Communication. This regression model showed improved results (F-value = 22.651,  $p < .001$ , adjusted R<sup>2</sup> = 0.620). The control variables small effects are still not significant.

Dependent variable: Board behavioral integration	<b>Model 1:</b> Only control variables.  <i>Control Variables = Board Size, Firm Age and FTE</i>	<b>Model 2:</b> Included independent variables.  <i>Independent variables = Trust, BClead, Cognitive Distance, Informal Communication</i>
<b>Dependent Variable:</b>		
Board behavioral integration (BBI)		
<b>Independent Variables:</b>		
Trust		0.593 (0.100)***
Board Chair Leadership skills (BClead)		0.142 (0.079)†
Cognitive Distance		0.308 (0.094)***
Informal Communication		-0.053 (0.065)
<b>Control Variables:</b>		
Board Size	-0.057 (0.093)	-0.016 (0.060)
Firm Age	-0.016 (0.032)	-0.001 (0.019)
Full Time Equivalent (FTE)	0.014 (0.012)	0.000 (0.008)
R Square	0.017	0.648***
Adjusted R Square	-0.016	0.620***
ANOVA F	0.524	22.651***

(Significance: †  $p < .1$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .005$ )

Table 7: Regression results. The first number in table is B-coefficient and the number in parenthesis is the standard deviation value.

However, trust showed a strong significant impact on the BBI ( $B = .593, p < .001$ ) in model 2. Cognitive Distance has a positive effect on BBI ( $B = 0.308$ ) significant at the  $p < 0.01$  level, while BClead has a small positive effect ( $B = 0.142$ ), significant at the  $p < 0.1$  level. Informal Communication showed a small negative effect on BBI ( $B = -0.053$ ), but this effect was not significant. Hence, Hypothesis 1, hypothesis 2 and hypothesis 3 is supported, but hypothesis 4 is not supported. The results are summarized in figure 5.

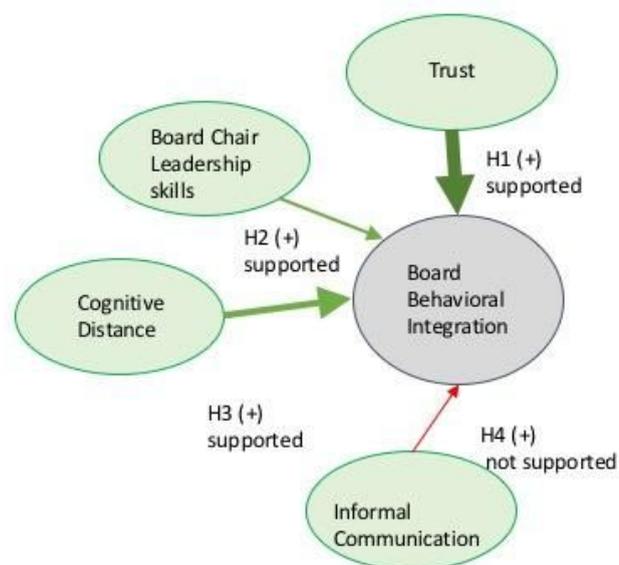


Figure 5: Structure of the four hypotheses with conclusions.

## Discussion

In this study, the author aimed to shed light on the topic of BBI in high-tech start-ups by validating a theoretical model and investigating its antecedents. Research on what constitutes behavioral integration within high-tech start-ups boards is still limited. Bjønåli and Ellingsen (2015) give us some insight into the topic and find that board behavioral integration is important for a start-ups effectiveness. However, they did not investigate what constitutes a behaviorally integrated board.

Previous researches have investigated several topics that the author explored in this study, but few have combined the different aspects into entrepreneurship research. The fundamental frameworks used were Upper Echelon, Resource Dependency theory and Corporate Governance research including board service role. The concept of BBI stems from Upper Echelon theory, and the context of high-tech startup boards is closer to entrepreneurial research.

As explained in the Introduction chapter; by exploring the antecedents and impact of BBI in high-tech start-ups, this study responds to recent calls for a closer investigation into board behaviour in small entrepreneurial firms (Daily, Dalton, & Cannella, 2003; Gabrielsson & Huse, 2004; Gnan et al., 2013; Huse, Hoskisson, Zattoni, & Vigano, 2011). Simultaneously, this study contributes to the development of the theory about board behavior by providing insights into board behavioral integration as optimal board functioning in high-tech

enterprises. The study also confirms that the scale used for BI constructed by Mooney et al. (2007) is a good measure for BBI.

The primary results from the regression analysis showed that three of the variables is a good explanation for BBI. Where (1) increased trust in the board leads to higher BBI, and contributed to more than 60% of the variance. The (2) high level of agreement (cognitive conflict) increased BBI, and (3) a board chair with good leadership skills increase the BBI.

However, surprisingly, this study does not conclude whether or not increased informal communication between the CEO and chairman of the board positively relates to BBI.

Below, the author discuss the results in light of the theory presented.

The model for BI developed by Mooney et al. (2007) lists the key traits for capturing behavioral integration in project and top management teams. It is in line with corporate governance theory, that this measure also is applicable for high-tech start-up boards, because they take on more of an active and service focused role with their board work, even though they meet less often and are not involved in the day-to-day activities (Huse, 2007; Bjørnåli, Knockaert and Erikson, 2016).

Further, that trust is essential to building a highly behaviorally integrated board is also in line with theory. Corporate governance research shows that boards with service involvement can help internationalize the company, reduce time to market, as well as have high involvement in the company's development of strategy and the evaluation of this. Trust is regarded as a must for an effective board service task performance (Westphal 1999), and this study concludes that an effective board with high performance is also behaviorally integrated.

The relationship between BBI and board chair leadership skills explains a small degree of the variance and has only a slight significance. If one look at boards in the light of traditional leadership theory, one would expect the role of the board chair to be more significant. However, in light of board service involvement in the corporate governance literature stream, all the board members function together as a group and cooperate with equal involvement. By the definition of BBI, one can see that one of the items in the variable scale is "board members a mutually responsible for decisions" which indicate that the whole board takes responsibility for progress, and the coaching role of the board leadership becomes more significant than the traditional definition of leadership. Another explanation can be that this context is high-tech start-ups, and the companies are young, small and in profoundly changing environments. This might not make room for a traditional leadership style, because effectiveness and cooperation are essential to reach market and internationalization in time.

By the definition of cognitive distance in this study, the lack of cognitive distance is positively related to BBI. This is also in line with theory, as Mooney et al. (2007) found that in firms with less behavioral integration a cognitive conflict would easier develop to an affective conflict, which again causes the group to be less effective. When a group or team has the same perceived worldview, it is easier to cooperate and be efficient in this work, as conflicts naturally take time to resolve. Having more task-related conflict can lead to better results, but an explanation of why cognitive conflict as defined in this study is positive related to BBI can be that high-tech start-ups have limited resources in both time and money, and are under pressure by the liability of smallness and newness (Venkataraman, 1997).

Finally, it is surprising that BBI and informal communication between the CEO and the board chair is not found significant in this study, this is not in line with the theory. One reason for this result could be that some formality between the CEO and the board chair is needed to focus on the progress and effectiveness a high-tech start-up needs to be successful, which is in line with other concepts e.g. agency theory. However, a more likely explanation is that the variable used "the degree of informal communication between the CEO and the board chair" was only a single item variable and a scale variable might have better captured the nuances of informal communication within the firm. The results should not be affected by some of the cases where the CEO and the board chair are the same person, namely CEO duality, because this was accounted for in the a control variables. However, as explained in the method chapter, this sample might suffer from selection bias and makes the generalization of the results challenging.

<b>Research Questions and hypotheses</b>	<b>Conclusion</b>	<b>Confidence level</b>
H1: <i>The TMT Behavioral Integration measure developed by Moony et al. (2007) applies to high-tech start-up board context as well.</i>	Supported	Strong
H2: <i>What constitutes board behavioral integration?</i>		
- H2a: <i>Trust will positively affect Board Behavioral Integration</i>	Supported	Strong
- H2b: <i>Board Chair Leadership skills will positively affect Board Behavior Integration</i>	Supported	Weak
- H2c: <i>Cognitive Distance will positively affect Board Behavioral Integration</i>	Supported	Strong
- H2d: <i>Informal Communication between board chair and CEO will positively affect Board Behavioral Integration</i>	Not supported	N/A

*Table 8: Summary of hypotheses, their conclusion and confidence level*

There are some limitations to this study, and therefore the results should be interpreted with caution. This study investigated high-tech startups in Scandinavia, mainly Norway and a few Sweden, which might not necessarily be representative of other countries, because of the uniqueness of the Scandinavian corporate culture. There are also local differences in Norwegian and Swedish corporate culture that should be accounted for. The Norwegian companies in the sample were mostly from the Trondheim area, because of the author's location, and the samples will therefore suffer some selection bias. It is therefore recommended to conduct similar studies in other countries, with focus on capturing the local corporate culture and eliminating selection bias. Further, this study is cross-sectional, and a longitudinal approach might give a broader insight. Behavioral integration and how it changes as the company evolves has yet to be investigated.

When investigating BBI, the author has assumed, in line with earlier research on TMTs, that this is one of the crucial components of effective boards that further lead to successful firms. However, this is not validated in the study. Perception variables, as mentioned in the Method chapter, can be quite effective, but can also suffer from one-response bias. Results might be better from explorative studies than quantitative design method in this type of investigations. Unfortunately, the author did not have the resources to ask the rest of the TMTs or more than one board member in each company approached, due to time constraints. Nevertheless, it is recommended to include the rest of the TMTs and the board members in future research. It might be useful to compare those answers to see how often TMTs and board members agree, and whether their answers diverge significantly from the CEOs' thoughts.

The link between BBI and performance needs to be confirmed. It would also be interesting to map the differences between companies achieving high BBI and those who do not. This study

has confirmed some of the constituents of BBI, but not how a company actually can achieve this. A practical guide for board and TMTs would also add to the research and implications for practice.

The data collection for this study is smaller than the recommended sample size for quantitative studies (Green, 1991). Fortunately, Tabachnick and Fidell (1989) suggest that as a rule of thumb it should be at preferably 20 cases per independent variable, which this study obtained. However, it is not rare that studies of entrepreneurial companies in small countries have small samples ( $N \approx 100$ ) (e.g., Erikson and Zacharakis, 2010; Kuivalainen, Saarenkto and Puumalainen, 2012). Another implication of having too small sample size is that there were too many variables studied compared to the number of participants (Green, 1991). Also, concerning samples properties, there were too many variations, e.g., the number of employees and the firm's age. High deviations can contribute to misleading regression results as they might contain outliers (Ben-Gal, 2005). Although the results seem to be robust against threats mentioned above, the use and interpretation of these results should be handled with care. As the sample size was limited, it is recommended to duplicate the study and including a larger population. The sample size and the method for data collection might also result in the study suffering from selection bias, as only 44,1% of the original population selected answered the survey that was distributed.

This study provides different practical implications for entrepreneurs, board members and top management teams. Different studies recommend regular meetings with the TMT members, contribution to collective decision-making, and most important, closer collaboration with the firm. These actions could help board members to function as an "extended TMT" (Vanaelst et

al., 2006; Zhang, Baden- Fuller and Pool, 2011). If the high-tech startups manage to achieve a high level of trust within the board, have a low amount of cognitive conflict and attain a board chair with a coaching leadership approach, they are more likely to have a high behaviorally integrated board. A high-tech start-up with BBI will be more effective, which positively affects the firms' performance.

## Conclusion

In this study, the author aimed to shed light on what constitutes behavioral integration in high-tech start-up boards (BBI). Initially, the author tested a measure developed for BI in TMTs and applied it to board context. The model was then validated with confirmatory factor analyses. Further, by using theoretical framework of resource dependency theory, upper echelon, and corporate governance research, the author developed scale variables of traits and tested these on 94 cases of high-tech start-ups in Scandinavia, through questionnaires. The results were found by use of regression analysis and showed a strong connection between trust and BBI. A small connection was found between Board leadership skills and BBI, and a moderate connection was found between cognitive distance and BBI. Surprisingly, there was not found any significant connection between BBI and informal communication. The results of the study should be handled with care, as the sample cases might be the result of selection and oner-respondent bias, and therefore skew. The study was conducted as a masters thesis with limited time frame and resources.

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# Appendix A: Questionnaire

## Survey Questions

I. What role do you have in the firm? <sub>1</sub> CEO <sub>2</sub> If other, please specify.....

II. Do you wish that we send you a summary of our research results? <sub>1</sub> Yes <sub>2</sub> No

### Part A. About your firm

A1 Organization number or company name: .....

A2 Please describe the phases of technology (product or service) development your firm has been at or are now at and fill in the year it has reached or going to reach the milestone:

• The first product (or service) was developed (or year planned) <sub>1</sub> Yes → Year: ..... <sub>2</sub> No

A4 How has your company grown over the past years?

	2013	2014	2015	Estimate for 2016
Number of full-time equivalents				
Number of patents				
Number of products and/or services				

A6a Has your firm had international activities? <sub>1</sub> Yes <sub>2</sub> No

A6b In which country, and when (if possible to date), did your firm make the first strategic agreement or first sale outside your country?

<sub>1</sub> Agreement Country ..... Year..... <sub>2</sub> Sale Country..... Year.....

A7 Mark for the following: My company initiates far more number of actions and far faster actions than direct competitors concerning:

	Far fewer actions							Far more actions							Far slower							Far faster						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
• Market expansion																												
• New product introduction																												
• New service offering																												

### Part B. About the board of directors

C1 How many directors is on your board ? Number: \_\_\_\_\_

C2 How many board meetings with members physically present were held in?:  
2016 \_\_, 2015 \_\_

C3 How many members are/ have the following background:  Women

outside directors (not TMT members or employees)  Venture capital investors

have owner interests in the company  experts in law, financing, sales etc  
 Employees  Younger than 40 years

C4 How frequent is the informal communication between:

	Very seldom						Very frequent
• CEO and board chair	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• CEO and other board members	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• All board members	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>

C5 To what extent do you agree with the following statements:

	Totally disagree						Totally agree
• Every board member is characterized by absolute integrity	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• One can assume that during board meetings everybody tells the truth	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Board members can be sure to trust each other	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Board members can trust that mutual promises are kept	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>

C6 How strongly do members of the board (dis)agree with each other about:

	We strongly disagree						We strongly agree
• the best way to maximize the firm's long term profitability?	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• what the firm's priorities should be?	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• the best way to ensure the firm's long-run survival?	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• which organizational objectives should be considered most important?	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>

C7 Board members:

	Totally disagree						Totally agree
• are mutually responsible for decisions	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• have a clear understanding of the issues and needs of each member	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• help each other solve problems	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• share relevant information with each other	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• share resources with each other	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>

C8a When have the firm possibly recruited a prestigious (high-status) director? Year: ..... <sub>2</sub> Never

C8b To which degree the prestige credentials of the outside director(s) are important to your company:

	Not important at all						Very important
• Experience as an outside director	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Experience as an executive as vice president or above	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• A degree from an elite educational institution	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Social connections	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Industry experience	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• An outside director is associated with high status institution(s) and/or organization(s)	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Financial experience	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>

- Start-up experience <sub>1</sub> <sub>2</sub> <sub>3</sub> <sub>4</sub> <sub>5</sub> <sub>6</sub> <sub>7</sub>
- Woman <sub>1</sub> <sub>2</sub> <sub>3</sub> <sub>4</sub> <sub>5</sub> <sub>6</sub> <sub>7</sub>
- Younger than 40 år <sub>1</sub> <sub>2</sub> <sub>3</sub> <sub>4</sub> <sub>5</sub> <sub>6</sub> <sub>7</sub>
- "Celebrity"-status (e.g. Petter Northug, Aksel Lund Svindal, Sigrid Bonde Tusvik) <sub>1</sub> <sub>2</sub> <sub>3</sub> <sub>4</sub> <sub>5</sub> <sub>6</sub> <sub>7</sub>

C8c To what degree do you think your board is professional? <sub>1</sub> <sub>2</sub> <sub>3</sub> <sub>4</sub> <sub>5</sub> <sub>6</sub> <sub>7</sub>

C8d Have you asked a celebrity to join your board of directors? (e.g. Petter Northug, Aksel Lund Svindal etc.) <sub>1</sub> Yes <sub>2</sub> No

C8e Would you have a celebrity on your board of directors if you had the opportunity? <sub>1</sub> Yes <sub>2</sub> No

C9b Think about situations over the past two years when the board members made important decisions regarding the firm's future. How effective the board was regarding:

• quantity of ideas	<input type="checkbox"/>								
• quality of solutions	<input type="checkbox"/>								
• level of creativity and innovation	<input type="checkbox"/>								

C9c Our board chair is especially skilled in:

• motivating and using each board member's competence	<input type="checkbox"/>								
• formulating proposals for decisions and summarizing board negotiation	<input type="checkbox"/>								
• chairing board discussions without promoting his/her agenda	<input type="checkbox"/>								

- C10 Our board members:
- |   |                                       |                                       |                                       |                                       |                                       |                                       |                                       |  |                  |
|---|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|--|------------------|
|   | To very little extent                 |                                       |                                       |                                       |                                       |                                       |                                       |  | Very extensively |
| • can obtain information about the industry from our network faster than competitors obtain the same information    | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                  |
| • have a professional relationship with someone influential in the industry   | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                  |
| • have engaged with someone influential in the industry in informal social activity (e.g. eating a dinner together) | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                  |

- C11 Our board members represent a wide variety in:
- |  |                                       |                                       |                                       |                                       |                                       |                                       |                                       |  |                 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|--|-----------------|
|  | To small degree                       |                                       |                                       |                                       |                                       |                                       |                                       |  | To large degree |
| • Functional background (sales, finance, accounting etc.)      | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                 |
| • Industrial background (different industries, sectors etc.)   | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                 |
| • Education background (various universities, disciplines)     | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                 |
| • Personality (various degrees of creativity, action-oriented) | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                 |
| • Age  | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                 |
| • Previous experience of starting up ventures                  | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                 |
| • Management experience  | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                 |
| • International experience (worked abroad, of foreign origin)  | <input type="checkbox"/> <sub>1</sub> | <input type="checkbox"/> <sub>2</sub> | <input type="checkbox"/> <sub>3</sub> | <input type="checkbox"/> <sub>4</sub> | <input type="checkbox"/> <sub>5</sub> | <input type="checkbox"/> <sub>6</sub> | <input type="checkbox"/> <sub>7</sub> |  |                 |

- C12 Do the board members receive compensation?
- <sub>1</sub> Yes, a mean of 30 000 NOK pr. board member pr. year
  - <sub>2</sub> Yes, a mean of 50 000 NOK pr. board member pr. year
  - <sub>3</sub> Yes, a mean of 100 000 NOK pr. board member pr. year
  - <sub>4</sub> Yes, a mean of more than 100 000 NOK pr. board member pr. year

<sub>5</sub> No, the board members do not receive any compensation

E2 To what extent do the following statements apply to the relations between your TMT and board of directors?	Apply perfectly							Do not apply at all
TMT/board members are characterized by absolute integrity	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>	
One can assume that during the common meetings everybody tells the truth	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>	
TMT and board members can be sure to trust each other	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>	
TMT and board members can trust that mutual promises are kept	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>	

### Part C. About the management

B1 How long has the CEO been working in the firm?	Number of years: _____
B1a Is the CEO also board chair in the firm?	<input type="checkbox"/> <sub>1</sub> Yes <input type="checkbox"/> <sub>2</sub> No

B2 How many members are in your top management team (TMT)? \_\_\_\_\_ members

B4 How many members are in both TMT and board of directors? \_\_\_\_\_ members

B14a Please indicate to what extent you agree with the following statements:	Totally disagree						Totally agree
• Our TMT copes with change very well	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Our TMT changes behaviour to meet demands of the situation	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Our TMT faces new problems effectively	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Our TMT is highly effective	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Our TMT works on important problems	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Our TMT does very good work	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>

B14b Grade the performance of this team in the light of established performance standards:	Very poor performance						Very high performance
• The amount of work the team produces	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• The quality of work the team produces	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>
• Your overall evaluation of the team's effectiveness	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>

B12 To what extent do the following statements apply to your TMT regarding the form, care and use of relationships to firm partners (customer, suppliers, technology partners etc.):	Statement does not apply at all						Statement applies completely
• we inform ourselves of our partners' goals, potential and strategies, as well as analyze what we would like and desire to achieve with each partner	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>	<input type="checkbox"/> <sub>4</sub>	<input type="checkbox"/> <sub>5</sub>	<input type="checkbox"/> <sub>6</sub>	<input type="checkbox"/> <sub>7</sub>

• we match the use of resources (e.g. personnel, finance) to the individual relationship and appoint coordinators who are responsible for the relationships with our partners	<input type="checkbox"/>						
•we discuss regularly with our partners how we can support each other in our success	<input type="checkbox"/>						
• we have the ability to build good relational skills with business partners	<input type="checkbox"/>						
• we can deal flexibly with our partners and almost always solve problems constructively with our partners	<input type="checkbox"/>						
• we know our partners' markets and products/procedures/services	<input type="checkbox"/>						
• we know our partners' strengths and weaknesses, potentials and strategies	<input type="checkbox"/>						
• TMT members have regular meetings for every project and give feedback to eachother	<input type="checkbox"/>						
• In our organization, information is rarely spontaneously exchanged	<input type="checkbox"/>						

| B10 Our TMT members:   | To very little extent    | <input type="checkbox"/> | Very extensively         |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| • can obtain information about the industry from our network faster than competitors can obtain the same information | <input type="checkbox"/> |
| • have a professional relationship with someone influential in the industry  | <input type="checkbox"/> |
| • have engaged with someone influential in the industry in informal social activity (e.g. playing tennis)            | <input type="checkbox"/> |

## Appendix B: Anova models

		ANOVA <sup>a</sup>				
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.261	3	.754	.524	.667 <sup>b</sup>
	Residual	129.544	90	1.439		
	Total	131.805	93			
2	Regression	85.455	7	12.208	22.651	.000 <sup>c</sup>
	Residual	46.350	86	.539		
	Total	131.805	93			

*Table 9: ANOVA analysis results.*

Table 9 shows the output of the ANOVA analysis from SPSS and whether there is a statistically significant difference between the group means. We can see that the significance value is 0.667 for model 1 and 0.000 for model 2, which means the first model is not significant (only control variables) while model 2 is below 0.05, and, therefore, there is a statistically significant difference in the mean of board behavioral integration and the dependent variables chosen.