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Top Management Team's Performance in New Technology-Based Firms:

A Quantitative Study of the Impact of Network Capabilities, Top Management Team's Behavioural Integration and Board Service Role on Top Management Team's Effectiveness

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Preface

This master thesis is written by Ekaterina Fedorova and Torgeir Aadland during the spring term 2015. Both authors studied at the Norwegian University of Science and Technology's School of Entrepreneurship, the Department of Industrial Economics and Technology Management.

We want to express our deep gratitude to our supervisor, Ekaterina S. Bjørnåli, for providing knowledge, surveys, comments and input. She made an invaluable contribution during all the stages of the master thesis writing process, and provided us important feedback and opinions. Her help has been inestimable in our work.

The study followed a quantitative method design, and used questionnaires answered by CEOs in Norwegian new technology-based firms. It is worth to mention that the data collection was mostly conducted by the authors. Our final sample consisted of 54 companies.

Some references in this thesis are made to our previous work, a multiple case study conducted during the autumn 2014 (Fedorova and Aadland, 2015). In that study, semi-structured interviews were used, with 15 CEOs of Norwegian high-tech start-up companies participating. Findings showed that top management team and board members should be considered as one team rather than two separate groups in terms of networking. The "feeling of ownership", identification with the team and informal communication were all identified as the strongest factors that contributed most to smooth cooperation between the board and the top management team. Another finding of the study was that if the collaboration between the top management team and board is poor, the top management team's network capabilities are poor as well. This case study's work provided helpful insights useful to our master thesis, especially concerning hypothesis development and study design.

The writing of this master thesis was a highly valuable learning process. The theoretical review, gathering and analysis of data, all provided insights into an interesting field of entrepreneurial studies, and gave us a deep comprehension of the methodological processes. We hope that our research results will be useful to entrepreneurs, top management teams, board of directors and young companies. In addition, we hope that future researchers will use our paper as a foundation for further studies.

Abstract

In the latter years, the focus on entrepreneurial firms has increased, and as a result, our understanding of these firms has improved significantly. However, in the evolution of modern business, there are still many things to reveal and investigate, for instance the management of these firms. This study focuses on the relationship between top management team's (TMT) effectiveness, their network capabilities and behavioural integration, as well as the board of directors' service role. We wanted to investigate how the latter three affect the top management team's effectiveness. Through a quantitative method, we examined 54 new technology-based firms, most of which were academic spin-offs (ASOs), and the rest were non-academic firms who raised venture capital investment. Companies of this type often lack resources and networks, and in order to solve these problems they often acquire new members to the top management team or the board of directors. The board members can contribute by providing resources, sharing networks and contacts, increasing legitimacy, and participate in strategic decision-makings. On the other hand, as the members of the top management team are responsible for the daily operations and strategic development, their human impact and collaboration culture has an essential impact on the firm's success.

Five hypotheses about the connection between network capabilities, top management team behavioural integration, the board's service role, and top management team's effectiveness were developed. Following conclusions were drawn from the study: (1) increased network capabilities in the top management team increase its effectiveness, (2) increased board's service role increase the top management team's effectiveness, (3) the board's service role strengthens the positive relation between top management team's network capabilities and effectiveness. The study did not support our assumption that increased TMT behavioural integration positively correlates with TMT effectiveness, which was contradictory to our hypothesis. One hypothesis was inconclusive: we could not claim whether increased TMT behavioural integration would positively affect the relationship between network capabilities and the TMT's effectiveness.

Sammendrag (Norwegian Summary)

Fokuset på oppstartbedrifter i forskning innenfor entreprenørskap har økt de siste årene, og vi har fått en bedre forståelse av disse bedriftene. Likevel, med den hurtige utviklingen i moderne forretningsutvikling, er det fortsatt mye som gjenstår for oss å forstå, blant annet innenfor ledelsen og ledelsens samspill i slike bedrifter. Denne studien fokuserer på forholdet mellom ledelsens effektivitet, dens nettverkskapabiliteter og adferdsmønster (behavioral integration), samt styrets servicerolle. Vi så nøye på hvordan de tre sistnevnte kan påvirke ledelsens effektivitet. Studien undersøkte nye teknologibaserte bedrifter, og gjennom kvantitativ analyse ble 54 bedrifter undersøkt. De fleste av disse bedriftene hadde utspring fra akademia, såkalte akademiske spin-offs, og resten var teknologibaserte firmaer som har skaffet seg venture kapital. Disse nye teknologibaserte bedriftene mangler ofte ressurser og nettverk. Den løsningen som mange benytter seg av er å søke etter nye medlemmer til lederteamet eller til styreposisjoner. Medlemmene av styret kan bidra med ressurser, dele nettverk og kontakter, øke firmaets legitimitet og delta i strategiske beslutninger. Når det gjelder medlemmene av ledelsen, så er de ansvarlig for den daglige driften og den strategiske utvikling. Derfor har ledelsens humankapital og samarbeidskultur en betydelig innvirkning på firmaets suksess.

Fem hypoteser ble utformet og undersøkt. Disse analyserte sammenhengen mellom nettverkskapabiliteter, ledelsens adferdsmønster, styrets servicerolle og ledelsens effektivitet. Følgende konklusjoner ble gjort av undersøkelsen: (1) Økte nettverkskapabiliteter i ledelsen forbedrer ledelsens effektivitet, (2) økt servicerolle i styre forbedrer ledelsens effektivitet, og (3) styrets servicerolle forsterker positivt sammenhengen mellom ledelsens nettverkskapabiliteter og dens effektivitet. Undesøkelsen støttet ikke hypotesen om at positivt adferdsmønster i ledelsen økte ledelsens effektivitet. I tillegg gjorde vi ingen konklusjon om positivt adferdsmønster i ledelsen påvirket sammenhengen mellom ledelsens nettverkskapabiliteter og dens effektivitet.

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Abbreviations Used

ASO	Academic spin-off
NC	Network capabilities
NTBF	New technology-based firm
TMT	Top management team
VC	Venture capital

Introduction

For a *new technology-based firm* (NTBF), several issues need to be handled, and many plans and actions have to be executed. The *top management team* (TMT) members in NTBFs are usually responsible for both management and operational activities. These people are in charge of important strategic decisions and are engaged in the firm's activities. Unfortunately, no entrepreneurs start with a package that contains all elements for success (Rice and Habbershon, 2010). In reality, entrepreneurs in the founding stages often experience that the company's resources are scarce. As NTBFs face severe resource constraints (Rice and Habbershon, 2010), they consequently need an access to the necessary resources in order to survive. The problem of resource deficiency is not only important in the early stage, but it should be leveraged in all the stages of the firm's development in order to achieve sustainability (Rice and Habbershon, 2010). Therefore, the entrepreneurial teams often become a key resource for competitive advantage (Cooper and Bruno, 1977; Foss et al., 2008). However, many TMTs lack human capital and are quite homogeneous in terms of knowledge, education, skills, industry and functional expertise (Ensley and Hmieleski, 2005).

During the latter years, when technologies have helped firms to become more available, e.g. through digital communication aids such as phone, mail, web-pages and social medias, the effect of *networks* has become more important for firms – especially in new ventures (Davidsson and Honig, 2003). Networks have become a source of strategic collaboration for TMTs, have given access to customers or suppliers, been a "door opener" to new markets and provided access to technological environments (Gulati, Nohria and Zaheer, 2000). Both the effect and the impact of networks *in mature ventures* have been studied in detail, and strong and understandable theories have emerged. These findings show, for example, that ventures with poor or no networks might not survive (Håkansson, 1982), and the venture's performance depends on the networks and the relationships in the firm (Håkansson and Snehota, 1995). However, while the impact of the TMT on *firm's performance* has been thoroughly addressed in previous research (Klotz et al., 2014), the impact of networks and networking *within entrepreneurship* has received less attention (Jones, Coviello and Tang, 2011). Challenges that NTBFs meet in terms of resource constraints can be overcome by building strong networks (Hoang and Antoncic, 2003) and TMTs (Hannan and Freeman, 1977), but few studies investigate the impact of networks and *network capabilities* (NC) in a context of NTBFs (Mort and Weerawardena, 2006; Weerawardena et al., 2007). The NC are defined by Walter, Auer

and Ritter (2006, p. 546) as "the firm's ability to initiate, maintain and utilize relationships with various external partners". Nevertheless, it is surprising that few studies have explored this topic, given the importance of networks in overcoming the resource constraints that early stage NTBFs usually face. The alliance literature and research stream viewing firm growth through networks may be considered as an exception, but researching on networks exist mainly on the firm level and on the level of relationships. Since we are interested in the networks driven by TMT's in NTBFs, we draw on the foundation of the general network literature, but mostly on the literature exploring entrepreneurial networks and entrepreneurial teams. The alliance and other specific network literature are outside of this study's scope.

The process of building new contacts and taking care of these relations appears to be one of the most important tasks for the TMT. When strong teams could move the business forward, and networks help as means of accessing necessary resources, we find astonishingly little research that examine both characteristics simultaneously. Therefore, this gap is addressed by examining the influence of the TMT's network.

The first research question is thus: *What impact does an increased level of network capabilities have upon firm's performance?*

There are many different theories and researches on how TMT should manage a firm in order to be productive. The most influential of them is developed by Donald Hambrick, who claims that behaviourally integrated TMTs are more effective (Hambrick, 2007). According to Mooney, Holahan and Amason (2007), teams with high *behavioural integration* can indeed have better processes of teamwork. The concept of behavioural integration consists of three factors. The first one is frequent *information exchange*. This could help TMT members to be updated on the company's activities and other employees' progress. The second factor, *joint decision-making*, regards the process when TMT members collaborate and have common discussions before making decisions. However, without being able to unite all the contributions from decisions and activities in an efficient way, it will be impossible for the company to reach high levels of success. Therefore, the third factor, *collaborative behaviour*, is especially important in order to have high behavioural integration. Different researchers have presented proofs for effectiveness of behavioural integration. Carmeli and Schaubroeck (2006) provided empirical findings that TMT members with higher level of behavioural integration made better strategic decisions. It has also been shown that behavioural integration is negatively related with inability to adjust to the environment (Weitzel and Jonsson, 1989), and Whetten (1988) found that behavioural integration minimized the inactiveness of organizational processes.

Hence, the environmental relations and organizational activities should benefit from increased behavioural integration. Cooperation within the company and TMT with sharing of networks and contacts, shows increased possibilities for better utilization of networks (Grandi and Grimaldi, 2003).

The second and third research questions are therefore: *How does increased top management team behavioural integration affect firm performance?* And, in accordance with the first research question, *does increased top management team behavioural integration have an effect on the relationships between network capabilities and firm performance?*

In the recent years, studies on start-up boards have increased. Several findings show that new board members are selected to increase the level of resources in the firm, especially the resources that the TMT lacks at the current stage of the venture's lifespan (Bjørnåli and Gulbrandsen, 2010; Gabrielsson and Huse, 2005). Since the board represents a group of people with, or access to resources, the relations to the board are often highly valued for new ventures' TMTs (Knockaert, Bjørnåli and Erikson, 2015). Traditionally, the role of the board has been to control and monitor different activities in the firm, which often is referred to as *control role*. However another important role, *service*, should not be neglected: the board can contribute by their knowledge, network, experience and other resources (Huse, 2007; Zhang, Baden-Fuller and Pool, 2011). Huse (2007) groups the service tasks into three components: *advisory*, *strategic* and *network* tasks. In view of strategy, the board can also contributes by reducing the liability of newness (Hillman and Dalziel, 2003; Knockaert and Ucbasaran, 2011) and creating legitimacy (Pfeffer and Salancik, 1978; Daily and Schwenk, 1996; Zona and Zattoni, 2007). As board members become successful in their service role, team members are more likely to interact and cooperate tightly with them (Knockaert, Bjørnåli and Erikson, 2015). Having successful collaboration, board can even function as an *extended TMT* (Vanaelst et al., 2006; Zhang, Baden-Fuller and Pool, 2011). Zhang, Baden-Fuller and Pool (2011, p. 112) also claim that the board's contribution regarding network building in new ventures may add "[...] considerable value to these young firms, by exploiting both the depth and breadth of their personal knowledge and of their networks." However, few researchers have studied the effect that new ventures' boards offer in the networking process, and few have shown interest in the relations and collaboration between the board of directors and the top management team with regards to networking.

Hence, we address this gap by formulating following fourth and fifth research questions: *Would an increased board service role affect firm performance? Does increased board service role have an effect on the relationships between network capabilities and firm performance?*

This thesis is a response to the call from Pye and Pettigrew (2005) and Zona and Zattoni (2007). Zona and Zattoni (2007, p.11) call for future research on boards: "since directors may exert informal influence on managerial behaviour outside regular meetings, future research may focus on the actual behaviour of directors (inside and outside the boardroom)". Pye and Pettigrew (2005, p. 36) encouraged to study board processes "as trusting, influencing, creating, problem solving, deciding" and give attention to "outcomes in […] group/board contexts". Researchers have conducted studies on the behavioural integration of TMTs (Simsek et al., 2005), but none have adopted behavioural integration into a board setting. We also respond to Bjørnåli's (2015) call for research on the relationship between new venture's TMT and boards, and on TMT's performance in the entrepreneurial setting.

We make a first attempt to both investigate the direct effect of the board's service role on the *TMT's effectiveness*, but also to explore the moderating effect on the relation between NC and TMT effectiveness. In our work, we adopt TMT effectiveness as a measure of TMT and firm performance, as Erikson, Leunbach and Ricciardi (2015) recommend it as a useful measure for early stage ventures in entrepreneurial context. Hence, performance in our work is measured by effectiveness, and the terms are sometimes used interchangeably, but in this setting have the same meaning. A corresponding approach was made in order to check the effect of TMT behavioural integration on the TMT's effectiveness, as well as the moderating role of TMT behavioural integration on the relation between NC and TMT's effectiveness.

As we did not find any studies that examine collaborative behaviour between TMT and the board by the means of NC, this thesis addresses the existing research gaps by studying the TMT, NC and board. To sum up, we contribute by (1) uniting the TMT's network capabilities, behavioural integration and the board's service role, and explore their effect on the performance of NTBF, and (2) investigate the moderating effect of TMT behavioural integration and board's service role on the relation between NC and the TMT's effectiveness. By doing so, we advance the research on entrepreneurial networks, entrepreneurial teams and boards in NTBFs simultaneously. We also explore what influences the growth in NTBFs by revealing the relationships between TMT's network capabilities, TMT behavioural integration and board's service role.

Below, we start with a review of previous research within this subject and build our theoretical framework. We then develop our hypotheses and start with setting network capabilities into a resource-based view. The top management teams are viewed and explained by drawing on upper echelon and behavioural integration theories. The board of directors is followed up by integrating the resource-dependency view and corporate governance theory. In this part, we introduce five hypotheses. The next section describes the method, where we present our quantitative data collection and measures. Further, we present an analysis and results based on our gathered data. This part is completed by discussion of the results attained and our conclusions. The final section will present future research, limitations and implications of the study.

Theory

Innovation is needed in the world economy to create value and new jobs in the different regions (Grossman and Helpman, 1991). In Norway alone, it was established over 54 thousand new ventures in 2014, and almost 11 400 of these had activities in the ICT or research sector (Statistics Norway, 2014). In the Norwegian markets, where the local ecosystems of firms and industries are relatively small, the need for fast regionalisation and internationalisation is important in order to grow (Bjørnåli and Aspelund, 2012). An increasing research has shown that the networks of the firm has become more crucial to become viable, and especially in the fast growing industries (McDougall, Shane and Oviatt, 1994; Mort and Weerawardena, 2006).

In this paper, we investigate new technology-based firms. We adapt the definition from Bollinger, Hope and Utterback (1983) and define these companies as creators of new jobs, potential contributors to exports, and say that they have a high rate of research, development and innovation. Technology should be a foundation for their product or service. In the field of entrepreneurship research, scholars use different definitions and names for technology ventures, as high-tech new ventures, science-based entrepreneurial firms (SBEFs), university spin-offs or early technology-based ventures. These definitions coincide with our definition, and when we use different literature in our study, we adopt the findings for these firms. Two types of NTBFs were a focus in the study: *academic spin-offs* (ASO) and technology-based companies established outside academia that raised venture capital (VC) funding. We further use Nicolaou and Birley (2013, p. 1 - 2) in order to define academic spin-off company's characteristics:

> i) The transfer of core technology from an academic institution into a new company. ii) The founding member(s) may include the inventor academic(s) who may or may not be currently affiliated with the academic institution.

From the three largest universities in Norway[1], there was established 46 ASOs in 2013/2014 (Inven2 AS, 2014; NTNU Technology Transfer AS, 2014; UiB, 2013), with probably many more if counted for all universities and the companies established outside the Technology Transfer Offices (TTO). In their study, Ensley and Hmieleski (2005) found that ASOs are weaker along the dimensions of team and network than other independent start-ups. Therefore, our study would be especially valuable for ASOs since these often consist of homogenous

[1] Norwegian University of Science and Technology (NTNU), University of Bergen and University of Oslo

TMTs (Bjørnåli, 2009), and lack the strong heterogeneous networks – especially the business networks (Bjørnåli and Aspelund, 2012).

In the development of ASOs, one of the firm's main focus is raising the needed financing and gaining enough capital to be able to become a viable business. In Norway, ASO companies can be supported through Innovation Norway, public or industrial R&D grants, or through collaboration with other industry actors. However, in order to sustain growth, these financing services are often not enough. In addition, the willingness to invest in ASOs from other firms is low, mostly due to the potential long payback time in such technology firms (Bjørnåli, Sørheim and Erikson, 2010), but also because of the high uncertainty in academic spin-offs (Sørheim et al., 2011). The liability of newness and the potential lack of experience are issues that ASOs also must tackle in order to survive (Knockaert and Ucbasaran, 2011; Bjørnåli and Aspelund, 2012). Thus, ASOs, who need intensive capital, might also seek venture capital (VC).

NTBFs have many different reasons to seek VC, but one of the most important is to be able to commercialise technology and sustain growth. Venture capitalists, who often become board members, can provide various resources, give advice, and participate in strategic decisions that are important for the company (Bjørnåli, Knockaert and Erikson, 2015). Colombo and Grilli (2005) and Rimestad, Bjerkholt and Seeland (2014) claim that NTBFs that raised VC funding have higher growth and depend less on the founders' human capital. The reason is that venture capitalists function as "coaches" and contribute to improvement of financial results (Colombo and Grilli, 2005; Rimestad, Bjerkholt and Seeland, 2014).

The need for different resources, or access to resources, can be handled by developing the firm's TMT and board of directors (Knockaert, Bjørnåli and Erikson, 2015). Hannan and Freeman (1977) support this view, and state that since NTBFs are confronted with many challenges, they need a strong TMT. In addition to that, the establishment of networks and pursuit for sustainable growth are important for all new firms. Development of TMT's network can increase the competitive advantage for these high-tech firms (Hoang and Antoncic, 2003; Dubini and Aldrich, 1991). The need for different resources in different stages of a new firm's life cycle can also be regulated by adding board members (Bjørnåli and Gulbrandsen, 2010). Further, the board can function as an additional source for creating competitive advantage.

In the latter research, the involvement of the board and its contribution to a firm's development has received more attention (Zhang, Baden-Fuller and Pool, 2011). As it was mentioned before,

the role of the board has traditionally been split into two roles, a service and control role (Pfeffer and Salancik, 1978), where the control role has been a widely applied explanation to boards in corporate studies (Huse and Rindova, 2001). Having said that, recent studies have examined the effect of the board's service involvement. For instance, Fernhaber and McDougall-Covin (2009) found that venture capitalists who invested in high-tech firms acted as a catalyst in internationalization of these firms by bringing in knowledge and reputation. Zhang, Baden-Fuller and Pool (2011) discovered that venture capitalists was highly involved in strategy formulation and evaluation in US venture capital-backed firms.

Yet, it is surprising that the networking role of the board has been less explored, despite the fact that the service role and networking of board members is considered as highly important and having a positive effect on the firm's long-term competitive advantage (Zona and Zattoni, 2007). The only article and research found by the authors on board's networking role in entrepreneurial firms is written by Bjørnåli and Erikson (2010), where they study the ASO board's networking role when new TMT members are added. We find this research limited, and argue that the firm's network capabilities coupled with the board's service role deserves more attention.

In this study, our approach was to measure the performance of NTBFs, but since the performance of a firm can be complicated to quantify, and since it is difficult to decide which dimensions that are best to adapt, we explored Shane and Stuart's (2002, p. 2) findings about the topic:

> Uncertainty about the quality of start-ups in part arises from the simple fact that young companies have very short performance track records, and thus do not lend observable histories to the task of evaluating their quality.

Several measurements can be applied for firm performance, however, their quality and applicable context might vary. Time to international markets could be a rating point, but internationalization could give a false impression compared to other research. In Norway, the development time of internationalization for new ventures is higher than compared to new ventures in the US (Pettersen and Tobiassen, 2012). Pettersen and Tobiassen (2012) investigated ASOs in the petroleum industry, and they discovered that the development period of ASOs in Norway were longer compared to other countries, and that networks could increase internationalization speed. Bjørnåli and Aspelund (2012) support this and claim that Norwegian ASOs are often premature in their internationalization – they often do not have a viable business

or product to enter new markets. Financial results could also be a measure of the performance, but again, due to relatively slow development in Norwegian context, this does not work well for firms in very early stages. Other measures might be the different stages or phases the ASOs go through (Vohora, Wright and Lockett, 2004; Bjørnåli and Gulbrandsen, 2010). However, different stages do not necessary present the best image of a NTBF. For example, in the medical industry, there are many strict regulations that cause firms to be held a long time in the same phase before moving to the next. The last measurement that may be appropriate is the effectiveness of the TMT. Zahra and Covin (1993), Baron and Markman (2003), and Pearce and Sims (2002) use this measurement in their work, and Bjørnåli, Knockaert and Erikson (2015) find this measure to be best fitted in the search for performance of the TMT. Especially since the TMT in NTBFs often faces different challenges in various stages, regions and industries, but also because the industry itself has various effects on firm's development and performance. Compared to the alternatives, we therefore find TMT effectiveness best suited for our study of NTBFs, and hence adopt this measure. Below, we develop the conceptual framework and arguments for our hypotheses.

Theoretical Framework

Entrepreneurial studies use various theories when examining the TMT and board in NTBFs. Examples here are agency theory, upper-echelon theory, resource-based view, team production theory and stage-based theory, but none of these focus on the TMT and board as one unit. However, when studying the interaction between TMT and the board of directors, with a focus on their common network capability, no single theory is capable of explaining this study's phenomenon (Bjørnåli, Knockaert and Erikson, 2015). Joint TMT-board research tends to combine two or several theories. In our research, we also draw on multiple theories. In the following, we will present and explain each of them. We will first introduce the theory and its foundations before we describe how the theory applies to our research questions specifically.

Resource-Based View

The *resource-based view* investigates different firms' resources, and explain how they can help in creating competitive advantage. This theory builds on Penrose's (1958) and Wernerfelt's (1984) work, but is probably most known by Barney's (1991) development and ideas. The view is based on that firms within an industry have access to different resources – both homogenous and heterogeneous – but the firm's competitive advantage comes only from the heterogeneous resources (Barney, 1991). Barney's (1991) idea for heterogeneous resources is that these are

valuable, rare, imperfectly and non-substitutable (VRIN). Peteraf (1993) continues to develop this view, and adds attributes that the resources need to become a sustainable competitive advantage.

In the view of our research, we study different firms and their networks as a bundle of resources, and how the NTBF's TMT can explore and configure these resources to create competitive advantages. Knowledge, skills, experience and competencies are resources that the team has, but that also are accessible through network relations (Bjørnåli and Aspelund, 2012; Weerawardena et al., 2007). When investigating other external parties as sources to resources, the firm's and TMT's network capabilities are expected to have a significantly positive influence on their performance in accordance to the resource-based view and competitive advantage.

Resource Dependence Theory

The *resource dependence theory* describes how the resources in the firm's environment affect the internal characteristics in the firm. Pfeffer and Salancik's (1978) theory focuses around five different actions firms can take to reduce the dependency on external resources. These are *mergers and acquisitions, joint venturing firms, board of directors, political action* and *executive succession*. In context of resource dependence theory, the board of directors can contribute with advice and counsel, information about the environment, access to resources and legitimacy (Pfeffer and Salanick, 1978).

In our work, we focus on the board of directors as an important mechanism through which NTBFs can reduce their dependence on external environment by accessing critical resources (Lynall, Golden and Hillman, 2003). Previous research has confirmed that boards contribute in the use of network, e.g. in the internationalization process of academic spin-offs (Bjørnåli and Aspelund, 2012), and in the team member addition process (Bjørnåli and Erikson, 2010). The board of directors is therefore an important actor 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 organizational outcome is a reflection of the TMT's decisions, based on the TMT's *construal*. The construal is influenced by the executives' former experience, moral or values, and their

personality. The theory has been widely investigated through the last years, and still gives a good explanation of the effect that TMTs have on organizations (Hambrick, 2007).

Further, Hambrick introduces a new term within this theory – behavioural integration. The research on behavioural integration is a relative new area, and Hambrick introduced it first in the 90's. The concept has been central in latter research on cognitive and affective conflict in teams and firms. Mooney, Holahan and Amason (2007, p. 741) explain its definition:

> Behavioural integration [...] refers to the extent to which team members engage in mutual and collective interaction. Such interaction has three elements: (1) quantity and quality of information exchange, (2) collaborative behaviour, and (3) joint decision-making (Hambrick, 1994, p. 189).

In our study, we investigate the TMT in the view of upper echelons theory by studying the behavioural integration of TMT in NTBF.

Corporate Governance Theory

Corporate governance is the view of how firms are controlled or directed (Huse, 2007). It describes the monitoring, controlling and incentives of the TMT (Williamson, 1984). Said differently, the theory describes how a firm's stakeholders, shareholders and managers interact in a firm situation and create value. Here, we use Huse's (2007) definition on corporate governance: "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).

When investigating the corporate governance and board involvement in NTBFs, the service role of the board – their contribution with network, information, consulting and connection to external parties (Huse and Rindova, 2001) – is the most important aspect in our study. Whether the board has a service role towards the TMT, can positively affect the firm's performance (Kim, Burns and Prescott, 2009). For smaller NTBF, with a management that might be inexperienced, a board with an active service role can be essential for survival (Bjørnåli, Knockaert and Erikson, 2015).

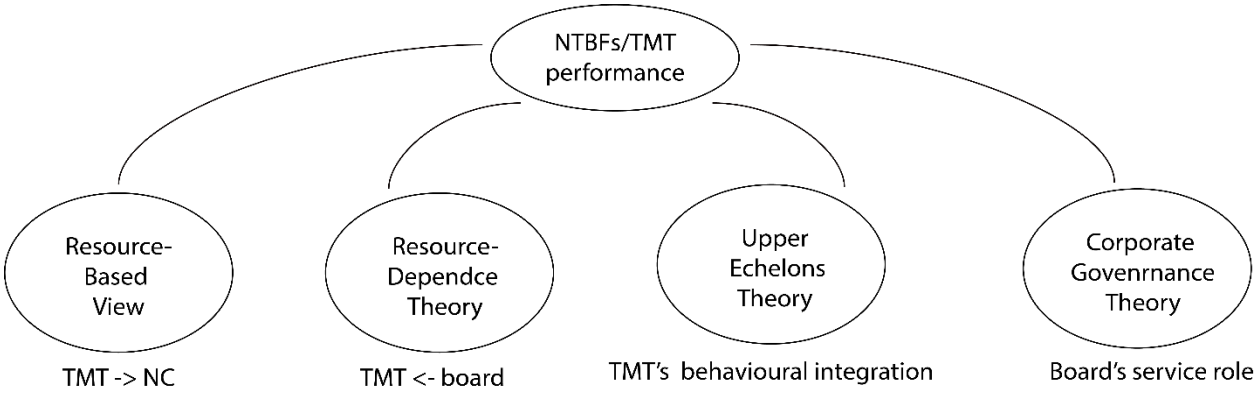

Figure 1 - Theoretical frameworks used.

Development of Hypotheses

Network Capabilities and Top Management Team's Effectiveness

As described above, there is little argue that networks are needed in business development. In the entrepreneurial setting, many researches have studied networking. Examples of today's studies regard the network characteristics in new ventures (Grandi and Grimaldi, 2003), how networks create *born globals* (Oviatt and McDougall, 1994; Coviello, 2006), and how new ventures use networks to affect the output of the business' innovation (Ahuja, 2000). Some of the studies have investigated what kind of teams are best capable of building strong strategic alliances in NTBFs (Eisenhardt and Schoonhoven, 1996; Grandi and Grimaldi, 2003), while other studies examined how the board may help in the networking process (Bjørnåli and Erikson, 2010; Huse and Rindova, 2001). These studies affirm that networks are critical, and that by developing networks, new ventures may increase the chances of survival (Mort and Weerawardena, 2006). However, how the development of networks and relations occurs in NTBF, and how the TMT and board interact in this development, is yet an unstudied topic. In addition, little attention is addressed to the activities performed within the firm regarding the TMT's NC.

NC are the factors that describe how managers and leading parties in firms connect with external parties. NC includes four components: coordination, relational skills, partner knowledge and internal communication (Walter, Auer and Ritter, 2006; Spithoven and Knockaert, 2011). *Coordination* is the management's and firm's capability to organize and connect with other actors – both companies and individuals. *Relational skills* are the management's ability to maintain and adapt different relationships. *Partner knowledge* is the information about external

parties and possible sources to resources, obtained by the TMT, employees and other people connected to the firm. Partner knowledge refers to both suppliers and customers, but also competitors. The last component is *internal communication* between firm members.

With this definition of NC, Walter, Auer and Ritter (2006) investigate how new ventures communicate with external actors, and how the ventures use networks to gain resources. Their findings proved that NC affect the performance of the firm. When Gulati, Nohria and Zaheer (2000) investigated networks for businesses, their conclusion was that the biggest source for inimitable resources for value creating is located in the firm's network. In addition, network and strategy are often closely connected in entrepreneurial teams (Lechner and Dowling, 2003).

New resources can only be obtained through use of other resources (Eisenhardt and Schoonhoven, 1996), and networks function as a source to resources. Therefore, the mentioned NC components can be considered as resources in ventures. In the classic resource-based view, resources can be either tangible or intangible (Wernerfelt, 1984), and the components of NC can be viewed as parts of a firm's intangible resources. These components, or intangible resources, is something that everybody in a venture can contribute with, thus leverage the firm's potential. Walter, Auer and Ritter (2006) support this view, and claim that NC is an organizational-wide feature. This means that those who are closely connected to the firm can contribute, and all these people are sources to resources.

One of Davidsson and Honig (2003) findings is that people with previous contacts and connections have greater chances as entrepreneurs than those without. This is something Grandi and Grimaldi (2003), and Eisenhardt and Schoonhoven (1996) agree upon. One of the latter's findings is that "Firms with top management teams that were large, experienced, and well-connected through former employers and high-level previous jobs formed product development alliances at higher rates" (Eisenhardt and Schoonhoven, 1996, p. 146). In Birley's (1985) research on new ventures' use of networks, her findings support that entrepreneurs rely on their network as a source to the necessary assets for the firm. In addition, Beckman, Burton and O'Reilly (2007) find that TMTs with well-developed networks have higher probability to obtain venture capital. This leads us to the first hypothesis:

Hypothesis 1: *Increased network capabilities in the top management team positively affect the top management team's effectiveness in new technology-based firms.*

Top Management Team Behavioural Integration and Effectiveness

The research on how TMTs in organizations collaborate, and how this collaboration affects the firm's performance, has been explored by several scholars (Boone and Hendriks, 2009), and the interest for understanding how TMTs work and lead organizations has increased (Carmeli and Schaubroeck, 2006). Therefore, the composition of teams in different ventures and industries has been widely studied. Smith et al. (1994) found that the performance of the TMT in the firm is positively affected by social integration, and this was positively affected by informal communication. Teams that have more and better sharing of information and knowledge, have better teamwork and function as one unit in their work (Carmeli and Schaubroeck, 2006). This leads them to have a common responsibility for the decisions in the firm or venture, and, as a result, they have higher level of behavioural integration (Hambrick, 1994).

The upper echelons theory postulate that TMT's actions in the firm affect the performance of the firm. In Hambrick and Mason's (1984) first presentation of the theory, different characteristics of the upper echelons are presented as factors affecting the outcome of the management's decisions in the organization. One of the findings to Mooney, Holahan and Amason (2007) is that in firms with less behavioural integration, the cognitive conflict easier leads to affective conflict. Explained differently, discussions and conflict regarding views of how to perform tasks can lead to personal and social conflicts – conflicts where feelings control more than reason. In these situations, the effectiveness of the TMT may be impaired (Ensley, Pearson and Amason, 2002). On the TMT level, several researchers argue that behavioural integration affect the TMT's decisions, and that behavioural integration increases the positive outcome from situations where fast response is critical for firm survival (Carmeli and Schaubroeck, 2006). This is something Carpenter (2002) also discuss. He finds that the TMT's characteristics can be "reflected" in the firm's performance, "but only after taking into account the TMT's strategic and social context" (Carpenter, 2002, p. 276). Carmeli and Schaubroeck's (2006) findings show that "more behaviourally integrated TMTs were perceived to reach better quality strategic decisions than less behaviourally integrated TMTs" (Carmeli and Schaubroeck, 2006, p. 448). The discussed arguments leads us to the following hypothesis:

Hypothesis 2: *Increased top management team behavioural integration positively affects the top management team's effectiveness in new technology-based firms.*

Moderation Effect of Top Management Team Behavioural Integration on Network Capabilities

While the behavioural integration could contribute to increased team performance, the need for networks and contacts with external parties is just as important in a business (Håkansson, 1982). In TMTs where the communication is more fluent, sharing of potential external contacts and networks might occur faster, giving the potential for higher benefit of these networks (Grandi and Grimaldi, 2003). Weerawardena et al. (2007) propose that the owner-manager's network capabilities are positively related to internationalization, which further contribute to the company's growth. Polonsky et al. (2010) claim that relationships are personal, and that a manager that is hired or engaged in a new firm would bring in his or her contacts. Hence, with high behavioural integration, it is expected that the NC in the firm could be improved.

Thus, the TMT's networking in NTBFs is expected to give better results when the team members have higher behavioural integration. Therefore, our next hypothesis is as follows:

Hypothesis 3: *Top management team behavioural integration positively moderates network capabilities in new technology-based firms, such that top management team behavioural integration reinforces the relationship between network capabilities and top management team's effectiveness.*

Board's Service Role and Top Management Team's Effectiveness

The service role of the board is essential in NTBFs (Kim, Burns and Prescott, 2009; Zhang, Baden-Fuller and Pool, 2011), and boards with higher service involvement contribute more with advice and counsel (Knockaert and Ucbasaran, 2011). In addition, more experienced and recognized board members can reduce the liability of newness in new firms (Hillman and Dalziel, 2003). In the research on board members, scholars support that *outside board members* would be beneficial for the effectiveness of boards (Dalton et al., 1998). Members of the board without current, past professional or personal associations with the firm, are called outside board members (Zahra, Neubaum and Huse, 2000). Outside board members attribute often with expertise and counsel (Dalton et al., 1998), and reduce the resource gap in the TMT (Dalton et al., 1998; Bjørnåli and Gulbrandsen, 2010).

For firms in the early stages, the need for an effective board, and a board that guide and coach the TMT, could be crucial for survival (Knockaert, Bjørnåli and Erikson, 2015). For TMTs with a strategically involved board, the decision-making is more shaped in the context of strategy, and "strategically involved boards affect TMT capabilities, particularly the speed and breadth

of TMT strategic actions" (Kim, Burns and Prescott, 2009, p. 370). Consequently, the effectiveness of the different decision-making processes increases, and the TMT will assumedly be more effective. Thus, our next hypothesis is as follows:

Hypothesis 4: *Increased board service role positively affects the top management team's effectiveness in new technology-based firms.*

Moderation Effect of Board's Service Role on Network Capabilities

We continue and build further on Walter, Auer and Ritter's (2006) assumption that network capabilities is an organization-wide feature, and involve the board of directors as a part of the organization. In accordance with the resource dependence theory, the board of directors help to reduce the dependency of external resources (Minichilli, Zattoni and Zona, 2009), e.g. through networks and contacts (Hillman and Dalziel, 2003).

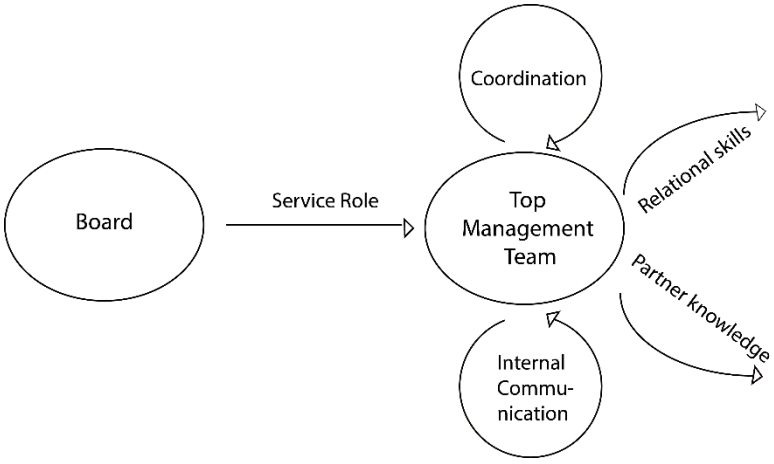

Figure 2 - Relation between the board, TMT and NC components

In the board's service role, the process of building and maintenance of network is regarded crucial (Huse and Rindova, 2001). By including established contacts, and existing networks, the board members can act as strategic contacts to the environment (Bjørnåli and Gulbrandsen, 2010). In addition, with higher reputation that boards often add to firms, wider networks can appear for the firms (Lechner and Dowling, 2003).

Based on the arguments above, ventures are expected to engage new directors because of a desire to reduce dependency on environmental parties, especially through these directors' network. In addition, by increasing the board's service role, we also expect the board to have a higher grade of complementary involvement towards the TMT (Knockaert, Bjørnåli and Erikson, 2015), and positively influence the networking activities in the firm. Hence, our last hypothesis is put forward:

Hypothesis 5: *Board's service role positively moderates network capabilities in new technology-based firms, such that the board's service role reinforces positive relationship between network capabilities and top management team's effectiveness*.

Below all the hypotheses are illustrated in one model.

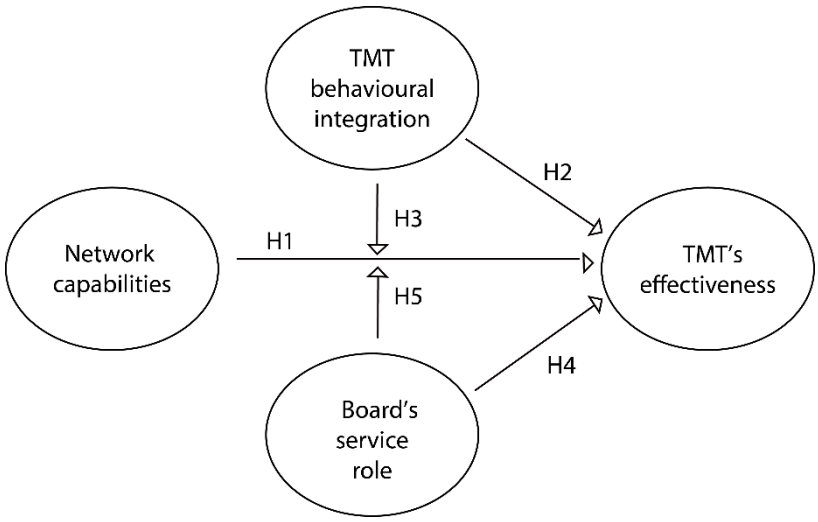

Figure 3 - Structure model of the hypotheses and their relationships

Method

Study Design and Data Collection

In order to investigate our hypotheses, a quantitative method was used in the research. The data was collected during the spring term 2015 using paper and electronic surveys sent to CEOs of new technology-based firms. In total, 265 companies were contacted, and 54 filled surveys were collected.

The survey included 45 questions of broad range and it was designed by post.doc. Ekaterina S. Bjørnåli at NTNU's Department of Industrial Economics and Technology Management. The full list of questions can be found in Appendix B. In the design process, Ekaterina S. Bjørnåli also consulted other international researchers with expertise in the field, and asked for feedback about the content and relevance of the survey's questions. The survey was additionally thoroughly pretested in the author's project thesis before the main data collection process. The feedback from the pre-tests was used in modifying some of the questions, thus minimizing social desirability *bias* (Tourangeau, Rips and Rasinski, 2000). The feedback also helped to clarify questions that could be ambiguously interpreted. Some of the questions in the survey were descriptive, but most of them used a Likert seven-point scale from 1 (completely disagree) to 7 (completely agree). In addition, some questions were reversed in order to decrease the biases of the responses (Friedman, Herskovitz and Pollack, 1993). Common method bias was also limited by including more independent variables in the research with small ($\rho \leq .30$) bivariate correlation (Siemsen, Roth and Oliveira, 2010).

Companies that were eligible for the study were established within a period of one to 15 years, and had to fit in the definition for NTBFs. Ventures from different industries were chosen. Other parameters that varied were development stage, number of employees, and number of TMT and board members. Representatives from the different geographical regions of Norway were included.

The CEO, who is in charge of managing the company and leading the TMT's activities, was targeted to fill the survey. The reason for the choice of this person is because he or she possesses broad knowledge of the company's culture, process, performance and history (Miller and Toulouse, 1986) and has direct communication with the board (Huse, 2007). It is also preferable to ask other TMT members, but this involves certain challenges. For instance, strict regulations regarding privacy in Norway could have resulted in even less informants participating in our

survey. In addition, having only one instead of multiple informants may help to attract more companies to participate in a study (Glick et al., 1990). Another reason was due to time restrictions for this particular study. Fortunately, a study from Atuahene-Gima and Murray (2004) provides empirical evidences that individual answers are reliable concerning group phenomena.

Confidentiality of the answers was assured for all the participants, and only the authors of this thesis and their supervisor had access to the data. The survey was reported to and approved by the Norwegian Social Science Data Services Company.

Besides pre-testing the questionnaire in several rounds, the main process of data collection took around three months to complete. Two sources were used in order to acquire data. FORNY, the programme of Research Council of Norway that supports commercialisation of R&D results, provided a list of 311 ASO companies. ASO companies were originated from the Norwegian universities and public research institutes. Different sectors and geographical regions in Norway are included in FORNY base. In that way, the FORNY sample is considered as a representative subsample of high tech companies in an early stage (Knockaert, Bjørnåli and Erikson, 2015), and they fit well in this research context, as mentioned in the introduction chapter. The second source was the Norwegian Venture Capital Association (Norsk Venturekapitalforening or NVCA) that provided a list of 161 high-tech firms. The two lists were merged and the duplicates in both lists were excluded. From the remaining 302 companies, 37 were excluded because of the following reasons: they went bankrupt, were a sole proprietorship, merged with other companies, did not have any sales or buying activities in at least three years (called ”living deads”), represented a department from an overseas company, or did not fit in the other characteristics of NTBSs.

In the first step, we sent a survey package containing an invitation letter with a questionnaire to all companies – 265 letters in total. A few days later, an e-mail was sent to the company’s CEO referring to our survey package. One or two weeks afterward, a personal call was made to all CEOs. As follow-up steps, an additional e-mail reminder followed by a personal call if no answer was received during a timeline of two weeks. Another two weeks later, the last round of telephone calls were made to those who did not reply. In total, 245 companies were approached by using either mail, e-mail or phone because some letters and e-mails had delivery failure.

Eventually, 36 CEOs completed the questionnaires resulting, in a response rate equal to 13.8 per cent. This rate is a bit lower than normal response rate for small and middle-sized companies (Gabrielsson, 2007); however, we tried our best to reach the CEOs. ASOs who acquired FORNY grants are often asked to participate in different studies, and one or more parallel surveys might have distracted the companies from participating in our survey. It is also important to remember that the research was constrained in time. Collected questionnaires were combined with the twelve questionnaires that were gathered by the authors in connection to the project thesis autumn 2014. Further, 10 more questionnaires were provided by the project supervisor, Ekaterina S. Bjørnåli, in order to increase the response rate.

Received survey answers were double-checked with secondary data sources. Four different databases provided accounting information, information on the TMT and board, and company's contact information: Brønnøysund Register Centre, forvalt.no, purehelp.no and proff.no. Company websites were also used, if they existed, in case of data ambiguity or if the answers in the questionnaire were missing. We experienced a few times that databases contained a number of mistakes and out-dated information. Sometimes, data did not match between different databases, and in those cases, we used forvalt.no's information.

All the questionnaires were manually inspected to ensure validity. Two of the questionnaires were excluded because they were missing too many variables. Two 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. They had to be excluded, thus giving a final sample consisting of 54 responses.

Statistical utility SPSS 22.0 was used for the analysis. The data were coded into SPSS software program by the authors, and were controlled for mistypes by the supervisor. This helps to minimize data mistakes due to users and the response bias (Hair, Babin & Anderson, 2010). Of the 54 companies in the sample, six were excluded by SPPS from the sample when the multiple regression were applied, because no missing values for the variable values used are allowed in SPSS.

Measures and Techniques

Several statistical measurements were used for the data analysis. The first one is Pearson correlations. Table 1 presents all correlation coefficients and shows several interesting relations between the variables, but only those correlations that are relevant for the research questions are discussed in this thesis. Variance inflammation factors (measure of multicollinearity) are

presented as well. Three different regression models are presented further, with details and argumentation for choice of control, independent and dependent variables. ANOVA results are discussed and presented in Table 3 (in Appendix A) with parameters of goodness of fit, which are R squared and adjusted R squared. This table also shows significance level for the three regression models. Table 2 presents an overview over the regression models, their unstandardized regression coefficients, B, and standard deviations. All the significant regression effects are emphasized in Table 2 based on the significance level (from 0.5 to 10 per cent). The interaction plots are illustrated in Figure 5 and Figure 6. Summarized results are followed by the conceptual model in the end of the chapter.

Dependent Variable

TMT's effectiveness. Firm performance is a term that is "not clearly defined and may be assessed differently by different stakeholders" (Rasmussen et al., 2012 p.37). One constraint in the sample was that it contained companies with characteristics of a broad range: some of them were just one years old, while others had been up to 15 years in business. Some companies had only one employee, but others 70 employees. As it was mentioned in the theory section, different variables could have been used in order to measure firm performance, e.g. the increase in sales volume or revenue, number of employees, international activities, or number of patents filed, but they fit badly in this research context. We therefore chose to use TMT's effectiveness, which Erikson, Leunbach and Ricciardi (2015) proposed to use in an entrepreneurial context. Several studies have confirmed that it is the best independent variable that could be chosen (Bjørnåli, in press; Baron and Markman, 2003; Zahra and Covin, 1993; Pearce and Sims, 2002). Cronbach's alpha was equal to .745, which is above the accepted value of .6 (Hair, Babin & Anderson, 2010).

CEOs were asked to grade the executive judgement of the overall effectiveness in terms of quantity and quality (Erikson, Leunbach and Ricciardi, 2015) by the criteria: "the amount of work the team produces", "the quality of work the team produces" and "overall evaluation of the team's effectiveness" (de Jong and Elfring, 2010). These variables are perceptual as they evaluate the CEO's perception towards his or hers TMT's performance. Regardless, studies by Chandler and Hanks (1993) show that perceptual variables provide high correlation with the objective measures in new venture performance. Furthermore, Lyon, Lumpkin and Dess (2000) note that variables of this type provide high levels of validity and reliability in entrepreneurial studies.

Independent and Moderator Variables

Network capabilities variable was used as an independent variable. This variable consisted of four groups of questions related to NC (Walter, Auer and Ritter, 2006; Spithoven and Knockaert, 2011):

- *coordination activities* presented by questions like "we analyse what we want to achieve with each partner"
- *relational skills* as "we discuss regularly with our partners about how we can support each other's success"
- *partner knowledge* e.g. "we know our partners' products / services / methods"
- *internal communication* by "in our company, information is rarely exchanged spontaneously" (the last item is coded reversely)

The Cronbach's alpha for this summed item had acceptable value of .783 (Gliem and Gliem, 2003).

TMT behavioural integration. This variable consists of three types of questions (Mooney, Holahan and Amason, 2007):

- *joint decision-making* by the TMT, presented with questions as "TMT members have mutual responsibility for decisions"
- *collaborative behaviour* in the TMT with questions as "we share resources with each other"
- *information exchang*e with the question "we share relevant information with each other"

Cronbach's alpha was equal to .885.

Board service role. The CEO was asked to evaluate strategic decisions that the board has made regarding the company in the last two years (or less for the younger companies). We considered this measure as the most appropriate proxy for the board's service role in our context due to its questions containing "quantity of ideas," "quality of solutions," and "level of creativity and innovation" (Simsek et al., 2005), which all are important in the NTBF's context. Cronbach's alpha was equal to .886.

Control Variables

The characteristics of the 48 firms, used in the multiple regression, are presented in Table 1. A group of variables, which were not the main focus in the examination, called control variables,

were included in all the regression models. Control variables are kept constant in order to minimise their effect on the analysis and exclude undesirable interactions described further.

Sector. The firms could position themselves within nine different types of industries: eight companies were from oil and gas; twelve from ICT; two from medical technology and biomedicine; two from biotechnology and food technology; three from maritime, offshore and aquaculture; one from ICT and health; six from renewable energy and four from environmental technology. Those who did not belong to any of these could choose category "other", and there were ten of them. Figure 4 has an overview of the industry distribution for the 48 companies that were used in regression analysis. Most of the companies belonged to the ICT and oil and gas industry, which reflects the largest high technology sectors in Norway, where the most ASOs are formed (Bjørnåli, 2009).

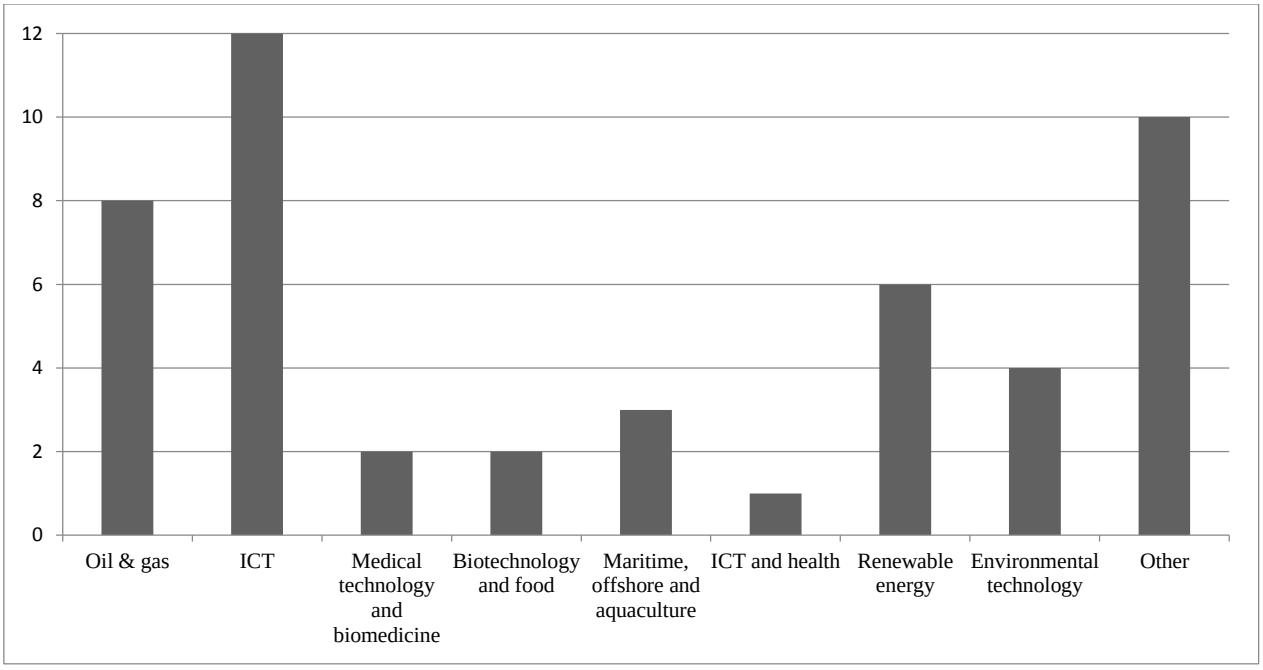

Figure 4 - Distribution of the NTBFs participating in the regression analysis by sector

Firm age. Expertise that is needed from TMT and through board's service role varies for young and mature companies (Hambrick and Mason, 1984), therefore this variable was controlled. The average value for company's age was equal to 8.52, but varied significantly from one to 15 years. There were two reasons why we included a broad range of companies with different ages: in order to increase the sample size, and because it takes a long time before ASOs acquire growth and become international (Bjørnåli and Aspelund, 2012). In addition, it takes many years to get over the liability of newness for a new company, and thus the role of board may be critical for younger companies (Hillman and Dalziel, 2003).

Number of full-time employees (FTE) registered at the end of 2014. TMT's network capabilities and service role of the board may vary for the different firm sizes (Zahra and Pearce, 1989). The mean FTE value was equal to 10.88, but values varied significantly from one (only CEO) to 70 employees, and therefore contributed to high values for standard deviation (see Table 1).

Venture capital (VC). This variable showed whether company gathered venture capital or not. VC variable was important to control since companies who raised venture capital might have a board that is more actively involved in solving strategic questions (Gabrielsson and Huse, 2002). In the sample, 42 per cent of the companies received venture capital.

Board size. CEO was asked to specify number of board members. 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 4.21.

Outsiders (Number of outside board members). This variable could affect board's service role (Haynes and Hillman, 2010; Dalton et al., 1998; Bjørnåli and Gulbrandsen, 2010) and thus should be controlled. The average number of outside board members was 2.58.

TMT's *size*. The number of people involved in a strategic decision-making. According to Smith et al. (1994), this variable can have an impact on TMT behavioural integration. The average value for TMT's size was 3.35.

Firm stage. This categorical variable was presented by four stages: early, commercialization, growth and maturity stage, where the growth stage was used as a reference. This variable was controlled as TMT in small high-tech firms faces different strategic challenges in their development stages (Kazanjian, 1988). In addition, according to Bjørnåli and Gulbrandsen (2010), board members often contribute with their knowledge in the early stages of company's development. The idea that firms uses the board in a different way during various stages is also studied in the view of resource dependence theory, e.g. by Zahra and Pearce (1989) and Bjørnåli and Gulbrandsen (2010). They proposed that the stage of the firm could affect the necessity of a board as an action to reduce environmental dependency. This is something Lynall, Golden and Hillman (2003) support, and they find that the need for a board in the view of resource dependence theory is greater in the entrepreneurial stage of a venture's life cycle. Most of the companies, 71 per cent of the sample, were either in early or commercialization stage, thus not reaching sustainable revenues, e.g. the maturity stage. Only 8 per cent had reached the maturity stage.

Other Parameters

In the sample, 78 per cent of the companies reported that they already had a product that is developed, 70 per cent has a prototype that works, 67 per cent have at least one patent and 83 per cent had finished the proof of concept. These results are not surprising as new tech-based firms are expected to have high level of innovative activities (Bollinger, Hope and Utterback, 1983).

Results

Our hypotheses were tested through three different models by using hierarchical *multivariate regression*. This method is best suited for discovering relations between dependent and independent variables. A *t-test* 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.

Six variables were centred in SPSS before they were included in the regression models in order to decrease unwanted multicollinearity effects in the regression (Hayes, 2013). These were TMT effectiveness, NC, TMT behavioural integration and board's service role, in addition to two interaction terms, between NC and TMT behavioural integration and between NC and board's service role.

Pearson correlations, presented for the 48 companies in Table 1, showed relations between dependent and independent variables that were significant on a .01 level: r = .530 for TMT's effectiveness and NC, r = .486 for TMT's effectiveness and TMT behavioural integration, and r = .483 for TMT's effectiveness and service role of the board. These variables were further examined with the help of regression models. None of the other independent variables had correlation values over .6, which means that mulitcollinearity is unlikely to be present.

Variance inflammation factors (VIF), another indicator of multicollinearity effects, had to be investigated as several variables can be correlated since this could create misleading regression results (Field, 2007). All the VIF values laid between 1 and 3, and none of the variables had VIF values over 4.7. This means that multicollinearity effects were unlikely to be present as the accepted threshold is 10 (Kutner et al., 2005). R^2 parameter, a measure of how well data fit in a statistical model, was over .6 for model 2 and 3. As R^2 is often criticized for being a lesser choice in explanation of the variables in the model, the *adjusted* R^2 values were included (Eikemo and Clausen, 2007).

Three different regression models were used, and their ANOVA results are presented in Table 3 in Appendix A.

Table 1 - Descriptive statistics with Pearson correlations, mean values and standard deviations.

		Correlations																	
	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	FTE 2014	1																	
2	Firm age	0.112	1																
3	Commercialization stage	-.341*	-0.200	1															
4	Early stage	-0.021	-0.123	-.542**	1														
5	Maturity stage	0.268	.389**	-0.255	-0.193	1													
6	ICT sector	0.127	0.149	-0.098	-0.159	-0.174	1												
7	Biotech sector	0.082	-0.121	0.035	0.096	-0.063	-0.120	1											
8	Oil & gas sector	0.095	-0.099	-0.151	0.205	0.067	-0.258	-0.093	1										
9	Cleantech sector	-0.100	0.145	-0.121	0.122	0.031	-.296*	-0.107	-0.229	1									
10	Other sectors	-0.141	-0.131	.299*	-0.162	0.107	-.408**	-0.147	-.316*	-.363*	1								
11	TMT's size	.696**	-0.108	-.285*	0.063	0.130	-0.105	0.230	0.156	-0.019	-0.109	1							
12	Board size	.368**	0.013	-0.108	-0.034	0.010	-0.174	-0.035	0.015	0.162	0.024	.421**	1						
13	Venture capital	.309*	-0.127	-.286*	0.201	0.051	-0.195	0.035	0.076	.399**	-0.239	0.224	.403**	1					
14	Outside board members	0.183	-0.051	-0.238	.289*	-0.015	-0.224	0.051	0.239	0.124	-0.111	0.269	.559**	.377**	1				
15	NC	0.102	-0.220	0.148	-0.139	0.048	-0.056	0.048	0.084	-0.093	0.045	0.182	-0.041	0.062	0.162	1			
16	TMT beh. integration	0.055	-0.020	0.167	0.027	0.225	-.291*	-0.078	0.021	0.119	0.182	0.030	0.148	0.186	0.273	.413**	1		
17	Board's service role	-0.031	0.148	0.021	0.169	0.111	0.009	-0.074	-0.027	-0.021	0.062	-0.059	0.081	0.221	.338*	0.218	.311*	1	
18	TMT's effectiveness	0.113	-0.100	0.029	0.074	0.261	-0.090	0.181	0.118	-0.072	-0.026	0.111	-0.002	0.177	.353*	.530**	.486**	.483**	1
Statistics	Mean value	1.88	8.52	.42	.29	.08	.25	.04	.17	.21	.33	3.35	4.21	.42	2.58	5.26	5.73	4.45	5.51
	Standard deviation	11.81	3.51	.50	.46	.28	.44	.20	.38	.41	.48	1.51	1.25	.50	1.73	.71	.90	1.28	.77

* $p < .05$

** $p < .01$

Model 1 had only control variables (F-value = 1.731, $p < .1$, adjusted $R^2 = .168$). This model showed that having outside board members contributes to increased TMT's effectiveness ($p < .1$). Maturity stage is also important with regards to TMT's effectiveness ($B = 1.328$, $p < .05$). This means that full-grown companies have more effective TMTs than those who are in their growth stage.

Independent variables were added to Model 2: NC, TMT behavioural integration and board's service role. This regression model showed improved results (F-value = 2.94, $p < .005$, adjusted $R^2 = .398$). Maturity stage showed again a significant impact on the TMT's effectiveness relative to the reference variable, the growth stage ($B = .832$, $p < .1$), even though the significance level was weaker. NC had a positive effect on TMT's effectiveness ($B = .314$), and board's service role had a positive effect ($B = .168$), both significant at level $p < .1$. TMT behavioural integration showed a positive effect on the TMT's effectiveness ($B = .168$), but this effect was not significant. Hence, Hypothesis 1 is supported, Hypothesis 2 is not supported and Hypothesis 3 is inconclusive.

In Model 3, the moderation effects of TMT behavioural integration and board's service role on NC was studied, and this model showed even further improvement (F-value = 3.641, adjusted $R^2 = .693$, $p < .001$). The relationship between NC and TMT's effectiveness became stronger and more significant ($B = .584$, $p < .005$). Board's service role showed higher outcome on TMT's effectiveness ($B = .228$, $p < .05$). TMT behavioural integration did not show any significant impact once again, but this time it showed a negative B coefficient on the TMT's effectiveness ($B = -.040$). As well as in the previous two models, maturity stage had an impact on TMT's effectiveness ($B = .814$, $p < .1$) compared to the growth stage, thus showing robustness. Interaction term of NC with board's service role contributed positively to the TMT's effectiveness ($B = .221$, $p < .05$). Interaction between NC and TMT behavioural integration affected negatively the TMT's effectiveness ($B = -.554$, $p < .05$). Hence, the Hypotheses 1, 4, 5 are supported, Hypothesis 3 is inconclusive while Hypothesis 2 is not supported.

Table 2 - Regression results. The first number in table is B-coefficient and the number in parenthesis is the standard deviation value.

Dependable variable = TMT's effectiveness	**Model 1** *(only control variables)*	**Model 2** *(with independent variables)* *Independent variables* = (NC, TMT behavioural integration, board's service role)	**Model 3** *(with interaction terms)* *Independent variables* = (NC*TMT behavioural integration, NC* board's service role)
Dependent variable			
TMT's effectiveness			
Independent variables			
NC (H1)		.314† (.156)	.584*** (.173)
TMT behavioural integration (H2)		.168 (.201)	-.040 (.140)
Board's service role (H4)		.168† (.071)	.228* (.088)
Interaction terms			
NC*TMT behavioural integration (H3)			-.554* (.225)
NC*board's service role (H5)			.221* (.090)
Control variables			
FTE2014	.002 (.015)	.004 (.013)	.007 (.012)
Firm age	-.028 (.036)	-.034 (.033)	-.019 (.031)
Commercialization stage	.625† (.324)	.158 (.317)	.357 (.308)
Early stage	.334 (.335)	.120 (.323)	.236 (.296)
Maturity stage	1.328* (.491)	.832† (.453)	.814† (.414)
ICT sector	.316 (.321)	.268 (.278)	.308 (.256)
Biotech sector	.447 (.566)	.814 (.497)	.743 (.455)
Oil & gas sector	-.015 (.330)	.161 (.289)	.164 (.266)
Cleantech sector	-.113 (.335)	.067 (.295)	.100 (.280)
TMT's size	.032 (.111)	-.028 (.097)	-.023 (.094)
Board size	-.186 (.119)	-.081 (.106)	-.040 (.097)
Venture capital	.267 (.281)	.003 (.257)	.059 (.235)
Outside board members	.230** (.080)	.104 (.075)	.034 (.073)
Constant	-.379 (.670)	.070 (.630)	-.140 (.585)
R Square	.398	.603	.693
Adjusted R Square	.168	.398	.503
ANOVA F	1.731	2.940	3.641

† p <.1
* p < .05
** p < .01
*** p < .005

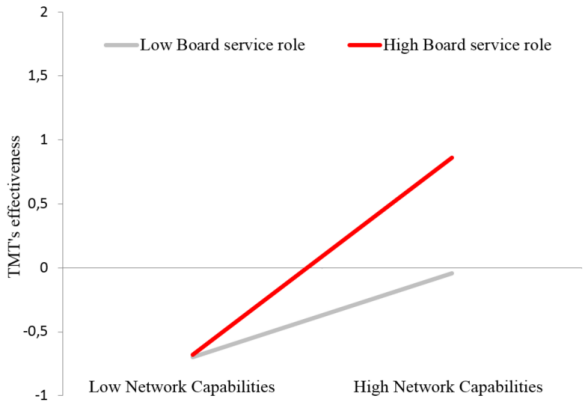

Figure 5 - The interaction between board service role and network capabilities.

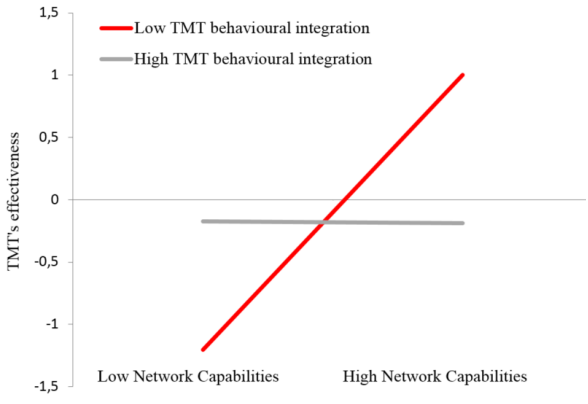

Figure 6 - The interaction between TMT behavioral integration and network capabilities.

The interaction terms showed significant impact, and we have therefore chosen to visualise them. The plot in Figure 5 visualises interaction between board's service role and NC and its effect on the TMT's effectiveness. Interaction between TMT behavioural integration and NC and its effect on TMT's effectiveness, is plotted in Figure 6. Moderation, dependent and independent variables were centred before the plots were made.

In order to better understand the result regarding Hypothesis 2, we also performed another multiple regression test to see whether any curvilinear relationship exist between TMT behavioural integration and the TMT's effectiveness. The results of this test showed an U-inverse significant effect ($B = .215$, $p < .005$). This means that the TMT's effectiveness increase when the TMT behavioural integration increase, but at one point, start to decrease when there is too much behavioural integration. Hence, the TMT behavioural integration needs an optimal value to be able to affect the TMT's effectiveness in the best way.

After the hypothesis test was performed, a t-test for the *non-responsive bias* was carried out where we compared which companies agreed to respond to the survey with those who rejected our invitation. A total of 46 companies were on the list of those who denied participating. The three compared parameters were *number of employees*, *firm age* and *sales volume*. Test outcomes indicated no statistically significant difference in the mean values for sales volumes or number of employees. However, the test identified significance in firm's age, which means that our results pertain to younger NTBFs. This indicates that it could probably exist a response bias in term of age as tests shows that companies that were older were less likely to participate.

The results of our hypotheses are summarized and visualized in the figure below.

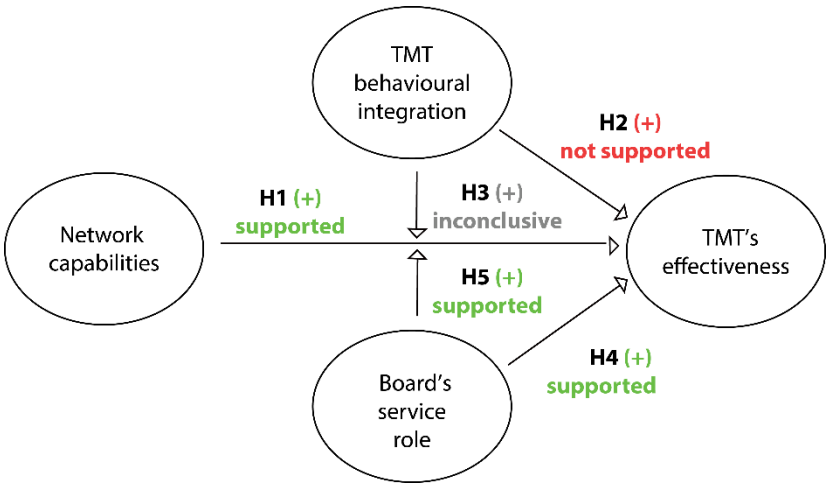

Figure 7 - Structure of the five hypotheses with conclusions. Expected signs of hypotheses are presented in parenthesis.

Discussion

In this paper, we aimed to shed light on the topic of TMT's performance in NTBFs by combining NC, TMT behavioural integration and the board's service role. Research regarding the role of new ventures' boards and their contributions for NTBF's growth and performance is still limited (Bjørnåli and Aspelund, 2012; Bjørnåli and Gulbrandsen, 2010). Zhang, Baden-Fuller and Pool (2011) give us some insight in the topic, and find that cooperation between a venture's TMT and its board is important regarding the chances of firm's success. However, they did not investigate how the collaboration takes place or how it affects the different procedures in the firm. We remind that in our study, the performance is defined as CEO's perception regarding the effectiveness of the TMT. Previous researches have investigated several topics that we explored here, but few have combined the different aspects into entrepreneurship research. Fundamental frameworks used in this study were resource-based view and resource dependence theory. They were used to explaine relations between the TMT and the board and provided understanding in the networking aspects of these relationships. Corporate governance theory provided insights in the service role of board. Upper echelons theory and behavioural integration were also applied on the TMT level in order to study if it had any direct or moderating impact on TMT's effectiveness.

As explained above, this research is a response to the call from Pye and Pettigrew (2005) and Zona and Zattoni (2007) for investigation on the board processes. When it comes to TMT processes, we respond to the call from Bjørnåli (2015). The results of our study therefore contribute to an increased understanding of how the internal collaboration in the firm affect the TMT's effectiveness. This was done both in the view of the board's service role and TMT behavioural integration, as well as through the network capabilities in the TMT.

The main results show that (1) increased NC in the TMT leads to higher effectiveness in the TMT, (2) increased board's service role increase the TMT's effectiveness, and (3) increased board's service role positively moderates the NC in the TMT, such that the board's service role strengthens the relationship between network capabilities and TMT's effectiveness. This implies that the board's service role serves as a catalyst between TMT's network capabilities and TMT's performance. However, surprisingly, it was not supported that increased TMT behavioural integration positively relates to TMT effectiveness. In addition, our work did not conclude about the hypothesis whether increased TMT behavioural integration would positively affect the relationship between NC and the TMT's effectiveness.

Network Capabilities and Top Management Team's Effectiveness

As it was predicted, increased network capabilities positively affect the TMT's effectiveness. To be able to increase the performance of the firm and being able to grow, the access to resources is essential (Eisenhardt and Schoonhoven, 1996), and through networks these resources can become more available (Gulati, Nohria and Zaheer, 2000). The process of building strategic networks and obtaining new partners has previously been found highly important for NTBFs (Eisenhardt and Schoonhoven, 1996; Grandi and Grimaldi, 2003), which our study also confirms.

There are several possible reasons for why increased NC can affect TMT's effectiveness. With closer relationships and access to necessary resources held by other parties, the relative speed of growth might be higher. This may increase the performance and the effectiveness of the TMT. In addition, when expanding their network, TMT would get the potential of identifying the point of access to other needed resources. Hence, this can provide a possibility to engage new additional contacts. As a result, NC could also affect the strategy of resource collection. This supports the view that strategy and network are closely connected (Lechner and Dowling, 2003).

Board's Service Role and Top Management Team's Effectiveness

Our research shows that the importance of board of directors' service role is underestimated in NTBFs. We argue that it is rather important, as some previous qualitative research also have confirmed (Kim, Burns and Prescott, 2009; Zhang, Baden-Fuller and Pool, 2011). We expect that the experience and knowledge obtained in the board would be valuable in the strategic decisions for the firm, which would probably also increase the speed of the decision-making (Kim, Burns and Prescott, 2009). Having board members with various experience and an external view of the firm, new ideas and ways of performing different activities could improve the effectiveness of the TMTs' work. The fact that the board is not participating in the venture's daily activities, could make it easier for them to obtain a balanced view of the different situations that new ventures face. On that account, the board members could better understand the venture's needs.

Concerning the resources needed in the early stages (Eisenhardt and Schoonhoven, 1996), the board's contribution and supplement to the TMT's existing resources would also be a good explanation for the increased effectiveness and performance of the firm (Dalton et al., 1998; Bjørnåli and Gulbrandsen, 2010; Lynall, Golden and Hillman, 2003; Minichilli, Zattoni and

Zona, 2009). Our results also showed support for our project thesis' findings. There we had a proposition that boards in early-stage firms should not only control the business, but also conduct their work with more service involvement (Fedorova and Aadland, 2015). The master thesis' results also confirm that agency theory provides insufficient explanation for the board's role in early-stage firms. The boards in NTBFs should focus on a service role to enhance the TMT's effectiveness, and get stronger involvement firm activities than agency theory suggests.

Moderation Effect of Board's Service Role on Network Capabilities

Our investigation also reveals that board with a service role positively affects the firm's NC. With more board involvement, contributing with advices, contacts, guidance and strategy discussion, the firm's NC could increase and positively affect the TMT's effectiveness. Especially, we think that bringing in new contacts and relationship (Polonsky et al., 2010) will help the firm in its resource exploration, and that the board's "vouch" for the firm will reduce the firm's liability of newness (Hillman and Dalziel, 2003). Having a board with a higher service role involvement, the firm will obtain resources and reduce the dependency of external parties. The firm will also receive valuable experience in partner knowledge and relational skills that could positively affect the its effectiveness.

Our findings are in the line with previous research, and add to the theories regarding the importance and effect of the board's involvement in network and relationship building, e.g. Bjørnåli and Erikson (2010) and Huse (2007).

Top Management Team Behavioural Integration and Effectiveness

The hypothesis on whether behavioural integration positively affects the TMT's effectiveness was not supported. Several previous researchers have discovered the importance of behavioural integration, so the results regarding this hypothesis should be handled with care as our study is of explorative nature. We used construct originally applied to large corporations with larger TMT size, which turned out to be of lesser importance for NTBFs. A similar construct, *cohesion*, "how much personal chemistry exists among team members" (Bjørnåli, Knockaert and Erikson, 2015, p.5), may be a more appropriate measure for new ventures. Both Bjørnåli, Knockaert and Erikson (2015) and Ensley, Pearson and Amason (2002) showed that cohesion is beneficial for team performance in new ventures.

Our results show that the TMT behavioural integration should preferably have an optimal value, since too much behavioural integration appears to influence TMT's effectiveness negatively.

One other explanation could be that the business culture in Norway is different compared to other countries. For instance, the *power-distance* is low in the Norwegian context (Sørnes et al., 2004). Low power-distance is characterised by being inclusive in opinion exchange and discussions, and this might be time-consuming for the parties involved. In "too democratic" environments where TMTs have complex tasks, the joint decision-making can become an obstacle for effective management.

Moderation Effect of Top Management Team Behavioural Integration on Network Capabilities

Regarding our last hypothesis, the findings surprisingly show that the TMT behavioural integration negatively moderates the network capabilities in NTBFs. There can be several explanations to this. With higher and better team communication, the need for external network might decrease as the needed resources could be inside the TMT already, and appear with better communication. In addition, with more collaborative behaviour and joint decision-making, group-thinking effects could appear (Rousseau, Aubé and Savoie, 2006). In addition, self-efficacy could lead to reduced pursuit for external resources, thus reducing the network capabilities. This is something (Grandi and Grimaldi, 2003) explain in their findings. They discuss that for teams with higher "completeness", the look for outside agents or parties could be assumed as an excess activity.

Another explanation could be on the level of internal contact and social relations in the firms. The amount of communication, as one of the elements in behavioural integration, could inhibit the focus on external actors or parties. With increased and formalized communication, the time and resources that the TMT have might be tied up, and in this way decrease the focus on other important activities. Smith et al. (1994) found that team members' communication could impose a cost for the firm, and that time spent on communication could delay decision-making in these firms. This could be crucial for new firms, and as Smith et al. (1994) states, the vitality could be even higher in high-velocity environments, which NTBFs are a part of.

An interesting observation were made about mature firms. They showed a robust significant effect on TMT's effectiveness compared to growing companies. This is not the focus of our study, but we suggest that this happens due to the fact that younger NTBFs have less stability, higher uncertainty (Sørheim et al., 2011) and thus have not yet established productive routines that would give a potential for better management (Stinchcombe, 1965).

Conclusion

New technology based firms face many severe resource constraints during their early development stage, and, in accordance with the resource-based view, the process of obtaining these resources occurs through use of other tangible and intangible resources. NC could be a part of the intangible resources as they can contribute in accessing new resources through networks. The importance of well-developed NC is crucial as networks could reduce the time to obtain important resources (Walter, Auer and Ritter, 2006).

The research performed in this study showed a significant positive effect of increased NC on the firm's performance. Firms can increase their networks through the firm's stake- and shareholders, like board members, and our study confirmed that boards influence the effect of NC on TMT's performance. One explanation of this finding is that the board could have a more distant view on the different issues and strategic questions in the firm, and thus help the TMT with new insights and knowledge. The direct impact of the board's service role, as strategic advisors and being a "door-opener", showed a positive effect on TMT's effectiveness. Boards with service role contribute in a higher manner than those boards that do not engage in a service role. We therefore propose and advocate that NTBFs should seek board members that engage through a service role with their expertise, contacts, experience and advice. With our results, it appears that the board's role and importance in NTBFs are underestimated in entrepreneurship research, and thus deserves more attention.

Further, using upper echelons theory in NTBFs context, we predicted that TMT behavioural integration, which includes information exchange, joint decision-making and collaborative behaviour, would have a positive impact on the TMT's performance. However, our findings were inconclusive regarding that hypothesis. When it comes to the direct effect of TMT behavioural integration on the TMT's effectiveness, the results were not supported. One explanation proposed is that too much behavioural integration can increase the internal communication, which slows down the decision-making process and results in lowering firm performance. However, an inverted U-shape relation was discovered between TMT behavioural integration and effectiveness, which means that TMT should seek an optimal value of behavioural integration as too low or high values decrease the TMT's performance.

Limitations, Future Research and Implications

Our study investigate NTBFs in Norway, which might not necessarily be representative for other countries, as Norwegian corporate culture is dissimilar from others. It is therefore recommended to conduct similar studies in other countries. Further, our study is cross-sectional, thus it is also recommend taking a longitudinal approach. As we study impacts on TMT effectiveness, it would be interesting to investigate how CEOs perception towards TMT's effectiveness alters, and also to explore how team dynamics changes over time. Especially companies in their early stage would be interesting to follow over time and see how NC – TMT – board relationships evolve.

In our data collection, we acquired a smaller sample than recommended for quantitative studies (Green, 1991). However, in one study, we found support for the sample size that we obtained. Tabachnick and Fidell (1989) suggest that as a rule of thumb it should be at least five, but preferably 20 cases per independent variable, but others researchers recommend a higher number of the sample. Having said that, it is not rare that studies of NTBFs in small countries have small samples ($N \approx 60$) (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). In addition, in terms of sample's properties, there were too many variations, e.g. number of employees, firm's age, different stages of company's development, and different sectors. High deviations can contribute to misleading regression results as they might contain outliers (Ben-Gal, 2005). Although our results seems to be robust against above-mentioned threats, the use and interpretation of our results should be handled with care. As the sample size was limited, it is recommended to duplicate the study including a larger population.

Firm performance is a variable that is hard to find a measure for. CEOs were asked to rate their TMT's performance, thus a perception variable was used. Perception variables, as mentioned in the methodology part, can be quite effective, but can suffer from one-response bias. Unfortunately, we did not have possibility to ask the rest of the TMT or the board members in each company, due to similar reasons as for CEO surveys, e.g. time constraints and willingness of the firms to participate. Nevertheless, it is recommended to include the rest of the TMT and the board members in future research. It will be useful to compare those answers in order to see how often TMT and board members agree, and whether their answers diverge significantly from the CEOs' thoughts.

The t-test for the non-responsive bias showed that there were differences in the firm's age of participants and non-participants, and the results showed that the more mature firms refrained to respond. One explanation is that these companies might have the perception of being "too mature", and thus unsuitable for the study. In future research, we suggest that elder NTBFs should be targeted, and researchers should try to find out which relations concern them.

When it comes to an explanation of the hypotheses, the findings are clear on the need for further investigation, especially the contradictory hypothesis and the inconclusive one. At first, we call for further research investigating how TMT behavioural integration could affect the TMT's effectiveness. Especially would the investigation on whether "too much" behavioural integration could negatively affect the TMT's effectiveness be interesting. TMT behavioural integration also showed negative impact on the relations between NC and TMT's effectiveness. Even if we make suggestions why this is the case (too formal communication and reduced need for external resources), we would like researchers to further study this phenomenon. There are some indicators that NC interferes with TMT behavioural integration, but a more nuanced picture (i.e. separate analysis of each NC components) would probably give us better answer, and it is recommended to do this in future research.

Our findings show that investigation on the effect of behavioural integration on NC and TMT effectiveness deserves a greater focus. Topic about moderation role of board should also be explored further. We challenge scholars to study the board's role more, and explore the different effects of the service role's components: as advisory, strategic and networking (Huse, 2007).

Our study contributes on TMT-board level of entrepreneurial studies. Few other researchers have taken this approach. A new research could study ASOs separately from non-ASO and treat them as different subgroups of NTBFs, and try to find if any particular differences exist.

This study provides different practical implications for entrepreneurs, board members and top management teams. If board members do not participate actively in the firm's activities, our study suggests that they should take initiatives in order to increase their service role. Different studies recommend regular meetings with the TMT members, contribution to common 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). With this approach, the board would serve as a catalyst and help the TMT to leverage on their NC, which in turn will contribute to TMT's performance.

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Appendix A

Table 3 - Models summary and ANOVA results.

Model		1	2	3
R Square		.398	.603	.693
Adjusted R Square		.168	.398	.503
Std. Error of the Estimate		.701	.597	.542
Change Statistics:	R Square Change	.398	.204	.090
	F	1.731	2.940	3.641
	Sig.	.099*	.005**	.001***
	F Change	1.731	5.318	4.278
	Sig. F Change	.099	.004	.024

* p < .1, ** p < .005, *** p < .001

Appendix B

Survey questions

I. What role do you have in the firm? ❑$_1$ CEO ❑$_3$ If other, please specify ……

Do you wish that we send you a summary of our research results? ❑$_1$ Yes ❑$_2$ 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 patent was filed (or year it is planned to be filed)	❑$_1$ Yes → Year: …….	❑$_2$ No
Proof of concept was done (or year it is planned to be completed)	❑$_1$ Yes → Year: …….	❑$_2$ No
Prototype that works in a realistic environment exists (or year planned)	❑$_1$ Yes → Year: …….	❑$_2$ No
The first product (or service) was developed (or year planned)	❑$_1$ Yes → Year: …….	❑$_2$ No

A3 In which phase of the firm's life cycle is your firm now? **(**Tick <u>one</u> box**)**

❑$_0$ *Early stage*: We evaluate commercial opportunity and strengthen our intellectual rights. We apply for a patent or try to protect technology that forms the basis for future product/service.

❑$_1$ *Development phase*: We are developing product/service, which degree is introduced in the market to limited. Reveneus are very low.

❑$_2$ *Start-up-/introduction phase*: Our product/service is gradually being introduced in the market. Our firm is characterized by creativity and project management.

❑$_3$ *Growth phase*: Our firm grows fast and investments may be necessary for further development. Our product/service can be introduced in several markets, and the sales are increasing.

❑$_4$ *Maturity phase*: The sales are flattening out. Our firm has reached all potential customers in the aimed markets. Administrative routines and procedures are well-developed.

A4 How has your company grown over the past years?

	2012	2013	2014	Estimate for 2015
Number of full-time equivalents				
Number of patents				
Number of products and/or services				
Sales				
% foreign sales				
% R&D expenses				

A5 When and how much has the firm possibly received as the financial capital from the following:	Has received capital	Year	Amount
Family	❑$_1$	…..	…..
Seed fund	❑$_1$	…..	…..
Private investors (not family)	❑$_1$	…..	…..
Large industrial actor(s)	❑$_1$	…..	…..
Venture capital investor(s)	❑$_1$	…..	
Other, specify_____	❑$_1$	…..	…..

A5a Has your firm had **international** activities? ❑$_1$ Yes ❑$_2$ No

A5b In which country, and when (if possible to date), did your firm make the first strategic agreement or first sale outside your country?

	❑1 Agreement Country …… Year……	❑2 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
• market expansion														
• new product introduction														
• new service offering														

Part B. About top management team

B1 How long has the CEO been working in the firm? _____ years

B2 Is the CEO also: ❑1 Board chair ❑2 Board member ❑3 No

B3 How many members are in your **top management team (TMT)**? _____members

B4 How many members are in your **board of directors**? _____members

B5 How many TMT members are also **simultaneously** board members? _____members

B6 How many membership changes occurred in the TMT since the firm was established? …….

B7 How (dis)agree are you?	Totally disagree						Totally agree
• When someone criticized team members, it feels like a personal insult	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• This teams successes are my successes	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• When I talk about this team, I usually say «we» rather than «they»	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• I am very interested in what others think about my company	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• When someone praises this company, it feels like a personal compliment	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• If a story in the media criticized the company, I would feel embarrassed	❑1	❑2	❑3	❑4	❑5	❑6	❑7

B8 How strongly do members of the top management team (dis)agree with each other about:	We strongly disagree						We strongly agree
• the best way to maximize the firm's long term profitability?	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• what the firm's priorities should be?	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• the best way to ensure the firm's long-run survival?	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• which organizational objectives should be considered most important?	❑1	❑2	❑3	❑4	❑5	❑6	❑7

B9 Our TMT members represent a variety in the:	To small degree						To large degree
• Functional background (sales, finance, accounting etc.)	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Industrial background (different industries, sectors etc.)	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Education background (various universities, disciplines)	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Personality (various degrees of creativity, action-oriented)	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Age	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Previous experience of starting up ventures	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Management experience	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• International experience (worked abroad, of foreign origin)	❑1	❑2	❑3	❑4	❑5	❑6	❑7

B10 Our TMT members:	To very little extent						Very extensively
• can obtain information about the industry from our network faster than competitors can obtain the same information	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• have a professional relationship with someone influential in the industry	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• have engaged with someone influential in the industry in informal social activity (e.g. playing tennis)	❑1	❑2	❑3	❑4	❑5	❑6	❑7

B11 Please indicate to what extent top managers at your firm have utilized personal ties, networks and connections during the past three years with:	To very little extent						Very extensively
Customers	❑1	❑2	❑3	❑4	❑5	❑6	❑7
Suppliers	❑1	❑2	❑3	❑4	❑5	❑6	❑7
Competitors	❑1	❑2	❑3	❑4	❑5	❑6	❑7
Distributors	❑1	❑2	❑3	❑4	❑5	❑6	❑7
Trade associations and/or Governmental support	❑1	❑2	❑3	❑4	❑5	❑6	❑7
Government officials on local/regional or national level	❑1	❑2	❑3	❑4	❑5	❑6	❑7
Universities and R&D institutes	❑1	❑2	❑3	❑4	❑5	❑6	❑7

B 12 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 analyze what we would like and desire to achieve with each partner	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we match the use of resources (e.g. personnel, finance) to the individual relationship	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we inform ourselves of our partners' goals, potential and strategies	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we judge in advance which possible partners to talk to about building up relationships	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we appoint coordinators who are responsible for the relationships with our partners	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we discuss regularly with our partners how we can support each other in our success	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we have the ability to build good relational skills with business partners	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we can put ourselves in our partners' position	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we can deal flexibly with our partners	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we almost always solve problems constructively with our partners	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we know our partners' markets	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we know our partners' products/procedures/services	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we know our partners' strengths and weaknesses	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• we know our competitors' potentials and strategies	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• TMT members have regular meetings for every project	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• TMT members develop informal contacts among themselves	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• In our organization, communication is often across project and subject areas	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• TMT members do given intensive feedback on each other	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• In our organization, information is rarely spontaneously exchanged	❑1	❑2	❑3	❑4	❑5	❑6	❑7

B13 Team members:	Totally disagree						Totally agree
• are mutually responsible for decisions	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• have a clear understanding of the issues and needs of each member	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• help each other solve problems	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• share relevant information with each other	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• share resources with each other	❑1	❑2	❑3	❑4	❑5	❑6	❑7

B14a Please indicate to what extent you agree with the following statements:	Totally disagree						Totally agree
• My team copes with change very well	❑1	❑2	❑3	❑4	❑5	❑6	❑7

• My team changes behaviour to meet demands of the situation	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• My team is highly effective	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• My team faces new problems effectively	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• My team works on important problems	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• My team does very good work	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Every TMT member is characterized by absolute integrity	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• One can assume that during TMT meetings everybody tells the truth	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• TMT member can be sure to trust each other	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• TMT members can trust that mutual promises are kept	❑1	❑2	❑3	❑4	❑5	❑6	❑7

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	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• The quality of work the team produces	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Your overall evaluation of the team's effectiveness	❑1	❑2	❑3	❑4	❑5	❑6	❑7

Part C. About board of directors

C1 How long has the board chair been involved with the firm's board? _____ years

C2 How many board meetings with members physically present were held in?: 2012 ___, 2013 ___

C3 How many members have the following background: __ Venture capital investors

__ outside directors (not TMT members or employees)
__ experts in law, financing, sales etc.
__ represent large industrial partner
__ politicians, academics or other society engaged persons

C4 How frequent is the informal communication between:	Very seldom						Very frequent
• CEO and board chair	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• CEO and other board members	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• All board members	❑1	❑2	❑3	❑4	❑5	❑6	❑7

C5 To what extent do you agree with the following statements:	Totally disagree						Totally disagree
• Every board member is characterized by absolute integrity	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• One can assume that during board meetings everybody tells the truth	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Board members can be sure to trust each other	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Board members can trust that mutual promises are kept	❑1	❑2	❑3	❑4	❑5	❑6	❑7

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?	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• what the firm's priorities should be?	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• the best way to ensure the firm's long-run survival?	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• which organizational objectives should be considered most important?	❑1	❑2	❑3	❑4	❑5	❑6	❑7

C7 Board members:	Totally disagree						Totally disagree
• are mutually responsible for decisions	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• have a clear understanding of the issues and needs of each member	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• help each other solve problems	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• share relevant information with each other	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• share resources with each other	❑1	❑2	❑3	❑4	❑5	❑6	❑7

C8a When have the firm possibly recruited a prestigious (high-status) director? Year: …… ❑2 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	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Experience as an executive as vice president or above	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• A degree from an elite educational institution	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Social connections	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Industry experience	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• An outside director is associated with high status institution(s) and/or organization(s)	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Financial experience	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Start-up experience	❑1	❑2	❑3	❑4	❑5	❑6	❑7

C9a Mark to what extent the board carries out the board role, and how effective the board performs the board role	The board **carries out** this role to a… very small extent / very large extent							How **effective** is the board in this role? highly ineffective / highly effective						
BOARD ROLES	1	2	3	4	5	6	7	1	2	3	4	5	6	7
The board provides advice on:														
• management issues (e.g. organizational structure or company strategy)														
• financial issues (e.g. leverage or relationships with banks and other financial institutions)														
• technical issues (e.g. new technologies or products)														
• market issues (e.g. entry in new industries or consumer behaviour)														
• legal issues and taxation														
The board provides:														
• linkage to important external stakeholders (banks, financial institutions, customers, public authorities, et.)														
• the firm with external legitimacy and reputation														
The board is actively involved in:														
• promoting strategic initiatives														
• long-term strategic decision-making														
• implementing long-term strategic decision-making.														
• monitoring that all internal behaviors are adequately controlled														
• defining behavioral guidelines for team members														
• supervising the CEO														
The board:														
• controls that the activities are well organized														
• develops plan and budgets														
• is informed on the financial position of the company														
• actively monitors and evaluates strategic decisions														
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														
• quality of solutions														
• level of creativity and innovation														
C9c 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							

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	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• have a professional relationship with someone influential in the industry	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• have engaged with someone influential in the industry in informal social activity (e.g. eating a dinner together)	❑1	❑2	❑3	❑4	❑5	❑6	❑7

Part D. About firm external environment

D1 How predictable the firm's competitive environment had been over the previous three years in the following six aspects:	Very predictable						Highly unpredictable
• product and/or technology development	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• market demand	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• customer needs and buying behavior	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• competitors' actions	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• availability of needed talent	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• goals and actions of alliance partners	❑1	❑2	❑3	❑4	❑5	❑6	❑7

D2 Please indicate the extent to which the government and its agencies had provided support to the firm over the previous three years in the following areas:	Almost no support						Much support
• implementing policies and programs that had been beneficial to the firm's operations	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• providing needed technology information and technical support	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• playing a significant role in providing financial support	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• helping the firm obtain licenses for imports of technology and/or manufacturing and other equipment.	❑1	❑2	❑3	❑4	❑5	❑6	❑7

D3 To what extent do you agree with the following:	Strongly disagree						Highly agree
• Demand for industry products and services is declining	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Products become obsolete quickly in target markets	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Our customers have very different product requirements	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• Our customers' buying habits are different for all our products	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• The nature of the competition in our target markets varies from one product line to another	❑1	❑2	❑3	❑4	❑5	❑6	❑7

Part E. About interactions between TMT and board

E1 How strongly do members of the TMT and 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?	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• what the firm's priorities should be?	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• the best way to ensure the firm's long-run survival?	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• which organizational objectives should be considered most important?	❑1	❑2	❑3	❑4	❑5	❑6	❑7

E2 To what extent do you agree with the following statements:	Totally disagree						Totally disagree
• TMT/board members are characterized by absolute integrity	❑1	❑2	❑3	❑4	❑5	❑6	❑7

• One can assume that during the common meetings everybody tells the truth	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• TMT and board members can be sure to trust each other	❑1	❑2	❑3	❑4	❑5	❑6	❑7
• TMT and board members can trust that mutual promises are kept	❑1	❑2	❑3	❑4	❑5	❑6	❑7