



Determinants of intra-board behavioral integration in high-tech start-ups

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Abstract

The board of directors' behavioral dynamics can strongly influence an entrepreneurial firm's success. Drawing on the behavioral theory of corporate governance, this study identifies and tests factors that facilitate behavioral integration in boards of high technology start-ups. We unpack the black box of board behavior with primary data collected from a survey-based sample of 149 CEOs of Norwegian high-tech start-ups supplemented by quantitative archival information. We find that intra-board behavioral integration (i.e., board members' propensity to clearly understand one another's issues and needs, actively solve, and share relevant information and resources) is positively affected by greater levels of informal communication between CEOs and board members. Next, we find that inter-board trust (i.e., board members interact with absolute integrity, tell the truth at meetings, trust one another, and keep mutual promises) mediates this relationship such that higher levels of inter-board trust result in greater concordance between information communication frequency and inter-board behavioral integration. We then examine the role of an efficacious board chair who motivates and uses each board member's competence, formulates proposals for decisions and summarizes conclusions after board negotiation, and chairs board discussions without promoting their agenda, finding that efficacious board chair leadership moderates the relationship between informal communication frequency and intra-board trust. We discuss the implications of these findings for the theory and practice.

Keywords Board of directors · Board chair leadership · Trust · Behavioral integration · Corporate governance · Entrepreneurship

1 Introduction

The successful governance of an entrepreneurial firm is driven by strategic leadership from its top management team (TMT) and the board of directors (Daily et al., 2002; Garg & Furr, 2017; Luciano et al., 2020). Although a rich body of

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literature acknowledges the value of investigating TMT characteristics and dynamics to explain the effectiveness of entrepreneurial firms (e.g., Bjørnåli et al., 2016; Chen et al., 2010; Eisenhardt, 2013; Knockaert et al., 2015; Talaulicar et al., 2005), empirical assessments of board behavioral dynamics remain sparse (Audretsch & Lehmann, 2014; Garg, 2014; Vandembroucke et al., 2016). This research gap is surprising because the boards of directors play a more active role in newly founded companies (Aaboen et al., 2006; Bjørnåli, 2016). Further, the board of an entrepreneurial firm undertakes actions that drive growth, such as garnering alliances, developing and exploiting opportunities, orienting the firm toward innovation and change, mentoring the executive team, and stimulating technological innovation (Åberg & Torchia, 2020; Li et al., 2020; Roelandt et al., 2022). Early-stage entrepreneurial firms rely on board members' expertise to provide legitimacy and navigate risk and uncertainty in volatile environments (Zahra et al., 2009). However, little is known about how board directors' behavioral dynamics evolve and develop in early-stage entrepreneurial firms, including high-tech start-ups (Fiegenger, 2005; Huse et al., 2011; Machold et al., 2011; Zattoni & Pugliese, 2019).

This study advances our understanding of board behavioral dynamics in high-tech start-ups by exploring factors that facilitate intra-board behavioral integration—a meta-construct that comprises collaborative behavior and activities such as exchanges of timely and valuable information, knowledge, and joint decision-making among team members (Hambrick, 2007; Simsek et al., 2005). Behavioral integration is a relational governance mechanism (Rosenkranz & Wulf, 2019) that influences critical outcomes such as corporate entrepreneurship (Ling et al., 2008), organizational ambidexterity (Carmeli & Halevi, 2009; Venugopal et al., 2020), team learning orientation (Chiu et al., 2021), both spontaneity and creativity among members (Magni et al., 2009), and firm performance (Carmeli & Schaubroeck, 2006). Thus, behavioral integration among board members of high-tech start-ups may be particularly advantageous given that these firms operate in dynamic, high-velocity environments (Roelandt et al., 2022).

Drawing on the behavioral theory of corporate governance (Van Ees et al., 2009; Westphal & Zajac, 2013), we identify factors that facilitate behavioral integration among board members. In particular, we hypothesize that informal communication between the chief executive officer (CEO) and the board members will be an effective tool that will facilitate behavioral integration. We further identify the mediating role of board trust such that higher levels of inter-board trust result in greater concordance between information communication frequency and inter-board behavioral integration. We then examine the role of an efficacious board chair who motivates and uses each board member's competence, formulates proposals for decisions and summarizes conclusions after board negotiation, and chairs board discussions without promoting their agenda.

We test our hypotheses with primary data collected through surveys from 149 Norwegian high-tech start-ups, i.e., firms with ten or fewer years since founding (Sahut et al., 2021). As direct access to boardroom dynamics represents a serious challenge in corporate governance research (Leblanc & Schwartz, 2007; Lorsch, 2017), we use first-hand information from CEOs as a proxy to examine board dynamics, as practiced in extant research on high-tech start-up boards (e.g., Åberg

& Shen, 2020; Roelandt et al., 2022; Zattoni et al., 2015). We find that the informal communication frequency among the CEO and board members is positively associated with intra-board behavioral integration.

This study makes the following contributions to the corporate governance and entrepreneurship literature. First, we contribute to the literature on behavioral integration by improving our understanding of what facilitates behavioral integration in the boardroom, identifying the critical role of informal communication between CEO and board members, and trust among board members in this regard. In doing so, we penetrate the ‘black box’ of the boardroom to examine the processes and practices by which board members become behaviourally integrated (Watson & Ireland, 2021). Second, we respond to increasing calls to study the governance mechanisms of entrepreneurial firms. Extant research on governing boards’ value creation relies disproportionately on large-scale corporations (Clarysse et al., 2007) and examines only large-scale corporations or small and medium enterprises (Bonn & Pettigrew, 2009; Brunninge et al., 2007).

2 Background and hypotheses development

Boards of directors play a central role in the governance of entrepreneurial firms (Bjørnåli, 2016; Li et al., 2020). In fast-changing business environments such as early-stage, high-tech start-up firms, a board’s strategic involvement (Knockaert et al., 2015) is more pervasive than its pecuniary control or resource provision roles (Garg & Eisenhardt, 2017). Extant normative models of corporate governance that link board composition and structure to strategic decision-making without considering board behavioral processes are inadequate in entrepreneurial firms (Finkelstein & Mooney, 2003; Garg, 2014; Letendre, 2004). In line with proponents of the behavioral theory of the board (Pastra et al., 2021a), we argue that examining board dynamics can uncover the drivers of actual board behaviors that determine board involvement in strategy, and that explains variance in board effectiveness (McNulty & Pettigrew, 1999; Van Ees et al., 2009; Westphal & Zajac, 2013; Zahra & Pearce, 1989). In doing so, we focus on a crucial relational mechanism in the boardroom, i.e., intra-board behavioral integration.

Behavioral integration captures collaborative dynamics and collective interactions among team members captured by the ‘nature of the interactions among board members’ (Finkelstein & Mooney, 2003, p. 103). Many studies on behavioral integration were conducted within the context of top management teams (e.g., Lubatkin et al., 2006; Luo et al., 2018; Raes et al., 2013). Boards of directors commonly meet less frequently than TMT members; however, the board is a social entity that operates as a team. In fact, it is often categorized as a peripheral extension of the TMT (Vanaelst et al., 2006; Zhang et al., 2011) or simply labelled ‘supra-TMT’ in the upper-echelons literature (Finkelstein et al., 2009). However, beyond examining the role played by behaviourally integrated teams in shaping strategic outcomes and influencing performance (Bjørnåli et al., 2016; Carmeli, 2008; Chen et al., 2010; Tekleab et al., 2016), factors that facilitate behavioral integration have not yet been explored.

Examining antecedents of board behavioral integration in high-tech start-ups offers an opportunity to explore how and why some board dynamics develop and evolve in entrepreneurial firms and the importance of directors' behavioral aspects in shaping entrepreneurial firms' strategy process and governance. Below we identify determinants of intra-board behavioral integration in high-tech start-ups, arguing that behavioral integration is enhanced by focusing on governance aspects likely to influence the quality of interactions and joint decision-making. Specifically, we focus on aspects of CEO-board informal communication, assessing how intra-board trust may mediate informal communication and intra-board behavioral integration.

2.1 CEO-board informal communication and intra-board behavioral integration

One of the most important corporate governance topics is the relationship between the CEO and the board. However, the extant research fails to consider interactions between the CEO and board. Watson and Ireland (2021, p. 933) recently noted that “very few empirical studies have penetrated the ‘black box’ of the Boardroom and examined the complex Board/Management interactions that amount to Boards ‘doing’ strategy”. This is surprising since it has been over two decades since Westphal (1999) highlighted that encouraging cooperation between the CEO and board members increases board involvement. The social interaction view of CEO-board relationships emphasizes that micro-leadership, behavioral and cognitive processes should be examined to assess how strategic outcomes can be jointly constructed by top management team leaders and board directors (Georgakakis et al., 2022). Opponents of close ties between CEOs and board members argue that socialization between the two parties leads to passive board behaviors and ineffective governance. However, we hypothesize that the dynamics and turbulent nature of high-tech start-ups benefit from governance that prioritizes informal collaboration between the board and CEO, as opposed to only vigilance and control (Sundaramurthy & Lewis, 2003). Communication lies at the core of group dynamics (Smith et al., 1994), and we thus propose that encouraging informal communication between the CEO and board leads to a behaviourally integrated board.

Several factors suggest that frequent, informal communication, as opposed to formal meetings between a CEO and directors, will enhance behavioral integration. Many researchers raised concerns that since board members are required to meet only episodically (e.g., four times a year in Norway), directors cannot reach their full potential to contribute to effective governance. However, the solution is not to increase the number of formally required board meetings, as these meetings predominantly focus on routine tasks and do not facilitate meaningful collaboration exchanges. We suggest that efforts to facilitate spontaneous communication between a CEO and board members will allow the parties to embed themselves in an informal context in which they can openly and freely debate, discuss, and disseminate information. The more a CEO and directors interact informally, the greater the accuracy of knowledge regarding both parties' goals and expectations.

In high-tech firms, the CEO and board interdependently achieve legitimacy, which might ensure their survival (Bjørnåli & Gulbrandsen, 2010). A high-tech

firm's board relies heavily on the CEO to provide information about the firm's affairs and then processes this information to make accurate strategic decisions and implementation plans. As the firm grows, professional investors and experienced outside directors are recruited (Bjørnåli & Gulbrandsen, 2010; Clarysse et al., 2007). Actors who coach high-tech start-ups closely (e.g., university technology transfer officers) become privileged witnesses because they tend to be involved in the start-up process from the pre-founding stage until formal establishment (e.g., as a board member) (Vanaelst et al., 2006). Since these directors monitor the CEO and their executive team (Garg, 2014) and solve the firm's strategic issues (Knockaert & Ucbasaran, 2013; Knockaert et al., 2015), social interactions facilitate stronger relationships among them. Frequent, informal communication improves goal congruity, reduces asymmetries, and creates a clearer understanding of the firm's issues among directors (Smith et al., 1994). Disagreements can be mitigated through informal communication among board members, as opposed to a situation in which members do not communicate beyond board meetings. We thus argue that increasing the frequency of informal communication between a CEO and board members does not necessarily translate into friendships or an absence of board vigilance and accountability but rather contributes to board behavioral integration in new high-tech firms:

Hypothesis 1 Informal CEO-board communication is positively associated with intra-board behavioral integration.

2.2 The mediating role of board trust

Board trust refers to the degree of trust that directors share on a board. Trust has beneficial effects at multiple organizational levels (Fulmer & Gelfand, 2012), but research on trust as a process mechanism on a board has not advanced. Some evidence suggests that trust affects the nature of discussions during group meetings and relates positively to board task performance (Van Ees et al., 2009; Zhang, 2013). The importance of trust among board members cannot be neglected during the early stages of a firm's lifecycle, as in the case of high-tech start-ups, because volatile contexts require interdependencies and real-time decision-making among board members, necessitating working dynamics that allow them to use their knowledge and skills.

Similar to research on teams (Mathieu et al., 2008), we expect trust predisposes board members to solicit advice from each other, acquire relevant knowledge, cooperate, and exchange information. Trust also increases the reliability of knowledge shared among members, elevating the board's credibility. In a context of trust, members are more likely to share accurate information, develop confidence in each other, and avoid misconstruing facts (Zald, 1972), which improves the quality and quantity of board members' interactions. Interpersonal trust enhances knowledge sharing through coordination, transparency, and negotiability (Mooradian et al., 2006). By contrast, an absence of trust encourages defensive behaviors and creates difficulties in forming cooperative relationships because members become accustomed to low trust and thus avoid interdependence and information exchanges (Zald, 1972). Trust

creates willingness among board members to engage in interpersonal information-sharing and strive for quality decision-making (Talaucar et al., 2005), and it even smooths CEO successions (Schnatterly & Johnson, 2008). The quality of strategic decisions inside the upper echelons is enhanced by shaping a relational context of trust (Carmeli et al., 2012).

Informal communication between board members may add to formal information exchange, which often is not enough to cover all issues on the firm's agenda since there are only four meetings a year and time is limited. The frequency of information communication between board members and between the CEO and board chair may be conducive to trust since it makes them draw closer. Trust is primarily a psychological state (Costa et al., 2018; Fulmer & Gelfand, 2012) and an emergent state (Mathieu et al., 2008) that is being created due to reciprocity, cooperation, and mutual concern for each other (Pastra et al., 2021a, 2021b; Schabram et al., 2018). Executives and directors will feel confident in each other when they regularly communicate. We expect greater integrative behaviors on boards that are characterized by high trust, especially when trust is nurtured through informal communication. Thus, we hypothesize that trust among board members deters opportunistic behaviors and sustains goal congruity with the CEO:

Hypothesis 2 Intra-board trust mediates the relationship between informal CEO-board communication and intra-board behavioral integration.

2.3 The moderating role of efficacious board leadership

A board chair is a figurehead with, presumably, the greatest power and influence on the board (Åberg & Shen, 2020; Machold et al., 2011). Building on the resource-based perspective, many researchers thus assess the exclusive role of the board chair as a valuable resource that influences firm performance (Krause et al., 2016). A board chair contributes more resources in contexts characterized by environmental dynamics (Withers & Fitz, 2017), and a board chair's human capital can positively affect a firm's dynamic capability (Åberg & Shen, 2020). In particular, 'chairperson leadership is considered crucial in promoting directors' engagement in board processes and tasks' (Kanadli et al., 2018, p. 94). The board chair's role is, thus, crucial to facilitating behavioral integration in high-tech start-ups.

Kanadli et al. (2018, p. 94) defined an *efficacious* chair leadership as "a chairperson who has excellence in leading board discussions, motivating, using each board member's competency, formulating proposals for decisions, and summarizing conclusions after board negotiation may facilitate each director's engagement in board decision-making processes". We argue that effective board chair leadership allows for stronger relationships between CEO-board informal communication and board trust. By allowing informal interactions, a board chair can assess the alignment of a CEO's and board's interests and the degree of trust between them, and act to build greater trust; the board chair is best positioned to integrate knowledge and strive for engagement in the board (Machold et al., 2011). If board members operate within a climate of trust, the efficacious board chair's leadership will be an effective

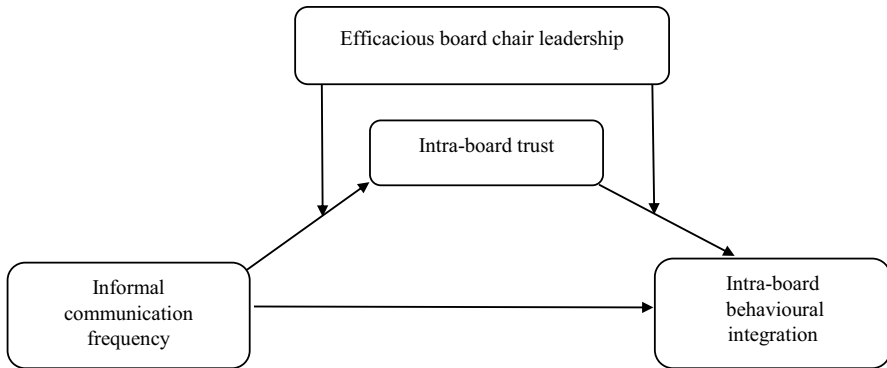


Fig. 1 Proposed conceptual framework

precondition to leveraging trust, promoting information-sharing, and encouraging the thorough decision-making needed for behavioral integration. Thus, we propose that efficacious board chair leadership positively moderates both the relationship between CEO–board informal communication interface and board trust and between board trust and board behavioral integration:

Hypothesis 3a Efficacious board chair leadership moderates the relationship between informal CEO-board communication and intra-board trust.

Hypothesis 3b Efficacious board chair leadership moderates the relationship between intra-board trust and intra-board behavioral integration.

Figure 1 depicts the proposed research model.

3 Methods

3.1 Context: Norwegian high-tech start-ups and corporate governance

We test our hypotheses in the context of the high-technology start-ups in Norway. As documented in several annual Global Entrepreneurship Monitor (GEM) surveys until 2013, the actual start-up rate in Norway is lower than in other European countries (Alsos et al., 2014). However, efforts such as Innovation Norway (2021) have improved the funding and other resources to the high-tech start-up community and contributed to fast-growing high-tech ecosystems in Oslo, Trondheim, Bergen, and other cities.

Early-stage entrepreneurial firms such as high-technology start-ups are essential because they play a critical role in the economy by creating jobs and raising economic welfare (Audretsch & Lehmann, 2014; Li et al., 2020). Bravo-Biosca and Westlake (2009) underscore the importance of smaller firms by showing that the

fastest growing firms would, after ten years, account for 50% of the total employment growth created by all new firms in the United Kingdom. In Norway, three percent of the fastest growing firms had, after ten years, generated 60% of the total employment growth of all new firms (Spilling & Berg, 2000). New and smaller firms are increasingly recognized as critical drivers of growth (Kuratko & Hodgetts, 1998; OECD, 2010).

Norway also provides a fascinating institutional context in which to explore corporate governance as board members in Norwegian firms are all non-executive and can delegate operational management to full-time executives (Huse, 2009; NUES, 2021). The country context hence provides a sample that is relatively homogeneous in terms of corporate governance, and thus measures of board behavior dynamics are likely to be more pronounced.

3.2 Study design and sample

To reduce extraneous variance, our sample comprises firms in the same industry and lifecycle stage. We included all start-ups in Norway aged 10 years or younger in two NACE categories: ‘high-tech, knowledge-intensive service’ and ‘high-technology manufacturing’. Complementary lists of research-based spin-offs, venture-capital-backed companies, and other high-tech firms (the latter from only the Mid-Norway region) captured the largest possible share of Norway’s high-tech start-up population of firms. All firms can be classified within these NACE categories.¹ The most significant proportion of the firms belongs to are in the ICT industry (44%), and the rest are in industries such as oil and gas, marine and maritime, measuring instruments, biotech, medical technology, and clean technology.

After selecting firms that satisfied the choice criteria, the sample comprised 761 firms. Consistent with calls to use surveys to assess actual board behaviors (Åberg & Shen, 2020; Clarysse et al., 2007), we sent structured questionnaires to CEOs of these firms. A total of 149 firms returned completed surveys. This 20% response is comparable to survey research conducted in small firms (Chandler & Hanks, 1994).

We used accounts from CEOs to provide information on board behaviors. CEOs represent accurate informants in this context because they commonly have the best knowledge of a start-up’s history, performance, process, and culture (Knockaert et al., 2015; Miller & Toulouse, 1986; Zattoni et al., 2015) and have direct contact with the board (Huse, 2007). Challenges in accessing the board room and observing board interactions have led to a black box problem (Leblanc & Schwartz, 2007; Lorsch, 2017). We, therefore, deemed first-hand information from CEOs a valid proxy for understanding board mechanisms rather than relying on information found in archives (Clarysse et al., 2007). The survey was pretested by interviewing twenty high-tech CEOs between 2014 and 2015 before data collection began in 2015. The

¹ We followed a classification provided by the Central Statistics Office. Codes for high-tech manufacturing are 21 and 26; for high-tech knowledge-intensive service are 59 to 63 and 72. Source 1: https://ec.europa.eu/competition/mergers/cases/index/nace_all.html. Source 2: https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf.

survey was reported to and approved by Norwegian Social Science Data Services and thus complies with ethics and personal data protection requirements.

We drew from three Norwegian databases—The National Registry, Proof Forvalt, and Purehelp—to corroborate information on CEO duality, firm age and size, and industry obtained from the questionnaire. We tested for differences between responding and non-responding firms on archival data variables (i.e., firm size, age, and sales volume). We had information on 46 companies that declined to participate. T-test results did not suggest statistically significant differences in mean values for sales volume and firm size but revealed differences regarding firm age. Taken together, our results suggest a probable response bias in that more mature companies were reluctant to participate in the survey, and thus our results pertain to younger high-tech firms.

3.3 Variables

3.3.1 Intra-board behavioral integration

The dependent variable, board behavioral integration, is adopted from Mooney et al. (2007). Using a Likert-type scale, respondents rated the degree of agreement with five statements: ‘board members are mutually responsible for decisions’, ‘board members have a clear understanding of the issues and needs of each member’, ‘board members help each other solve problems’, ‘board members share relevant information with each other’, and ‘board members share resources with each other’. The Cronbach’s alpha coefficient for this summed scale is 0.935, above the accepted value recommended by Hair et al. (2013).

3.3.2 Informal communication frequency

The independent variable is respondents’ reporting of informal communication frequency between the CEO and both board chair and board members (Smith et al., 1994), from very seldom to very frequent on a Likert scale. The Cronbach’s alpha coefficient is 0.8.

3.3.3 Intra-board trust

We follow Talaulicar et al.’s (2005) conceptualization of board trust, using four Likert-scaled items to capture the degree of trust among board members from a very small degree to a very large degree: ‘every board member is characterized by absolute integrity’, ‘one can assume that during board meetings everybody tells the truth’, ‘board member can be sure to trust each other’, and ‘board members can trust that mutual promises are kept’. The Cronbach’s alpha coefficient is 0.9.

3.3.4 Efficacious board chair leadership

We adapt Huse's (2007) scale to measure the degree to which board leadership is efficacious. Respondents utilize seven Likert-scaled items to report the extent to which the board chair was 'motivating and using each board member's competence', 'formulating proposals for decisions and summarizing conclusions after board negotiation', and 'chairing board discussions without promoting his/her agenda'. The interitem reliability was 0.878.

3.3.5 Control variables

We control for several variables that may influence the strength of relationships in the model, including industry, firm age (ln), size (ln), board size (ln), the proportion of insiders, CEO tenure, and CEO duality. Firm size is the number of full-time employment equivalents. Firm age is the number of years since the business was incorporated, and board size is the number of members. The proportion of board insiders is the ratio of board directors who are part of the top management team to the total board directors. Appendix 1 provides an overview of the variables.

4 Results

Table 1 shows descriptive statistics and correlations for all variables. The average firm age is about nine years, and the firm size is 16 employees. The average board has four directors.

Table 2 shows the hierarchical regression analysis results. Control variables are entered in the first block, followed by all other variables (i.e., informal communication frequency, board trust, and efficacious board chair leadership) in the second block. VIF values were below 10, which confirms that multicollinearity is not an issue. As shown in Table 2, Model 1 improves the control model and allows us to assess the first hypothesis: the relationship between informal communication frequency among the CEO and board members and intra-board behavioral integration ($\beta=0.638$, $p<0.001$), finding **support** for **H1**.

Model 2 regresses the variables on the mediator intra-board trust. We used regression-based path analysis, which enabled the estimation of indirect effects using unstandardized regression coefficients (Hayes, 2013). For mediation analysis, the relationship between the independent variable informal communication frequency and mediator (intra-board trust) is statistically significant ($\beta=0.541$, $p<0.001$). Model 3 shows that the correlation between the mediator and dependent variable intra-board behavioural integration is significant ($\beta=0.622$, $p<0.001$); with lower coefficient and significant level for informal communication frequency ($\beta=0.279$, $p<0.01$). The Sobel z-test is 5.650 ($p=0.001$) in **support** of mediation (**H2**). The value for the total effect is 0.616; the direct effect is 0.280, and the indirect effect is 0.336. This indicates that the indirect

Table 1 Descriptive statistics and correlation coefficients

	Mean	SD	1	2	3	4	5	6	7	8	9	10
(1) Intra-board behavioural integration	5.39	1.20	1.000									
(2) Firm size	15.59	3.497	-0.031	1.000								
(3) Firm age	8.60	3.48	0.004	0.832**	1.000							
(4) Board size	4.09	1.48	0.007	0.177*	0.097	1.000						
(5) Proportion of insider directors	0.49	0.35	0.120	-0.267**	-0.021	-0.378**	1.000					
(6) CEO tenure	6.74	4.30	0.085	0.232**	0.376**	-0.041	0.163*	1.000				
(7) CEO duality	0.13	0.29	0.151	-0.034	-0.133	-0.076	0.176*	-0.070	1.000			
(8) Frequency of informal communication	5.09	1.24	0.639**	-0.035	-0.033	-0.078	0.250**	0.098	0.189*	1.000		
(9) Efficacious board chair leadership	5.13	1.18	0.533**	-0.003	-0.051	0.235**	-0.124	0.000	0.100	0.463**	1.000	
(10) Intra-board trust	6.12	1.09	0.747**	0.065	0.102	0.122	-0.007	0.059	0.150	0.612**	0.494**	1.000

*p ≤ .05; **p ≤ .01

Table 2 Ordinary least squares regression models with unstandardized coefficients

Variables	Control model Intra-board behavioural integration	Model 1 Intra-board behavioural integration	Model 2 Intra-board trust	Model 3 Intra-board behavioural integration	Model 4 Intra-board trust	Model 5 Intra-board behavioural integration
Frequency of informal communication		H1: 0.638*** (0.074)	H2: 0.541*** (0.652)	0.279*** (0.071)	0.389*** (0.069)	0.240** (0.072)
Intra-board trust				H2: 0.622*** (0.080)	0.232** (0.071)	0.573*** (0.089)
Efficacious board chair leadership					H3a: -0.123*** (0.036)	0.157* (0.068)
Efficacious board chair leadership X frequency of informal communication						H3b: -0.006 (0.036)
Efficacious board chair leadership X Intra-board trust						
Firm age (ln)	-0.038 (0.296)	-0.008 (0.228)	0.025 (0.026)	-0.018 (0.023)	0.025 (0.026)	-0.019 (0.023)
Firm size (ln)	-0.028 (0.124)	-0.096 (0.096)	-0.023 (0.170)	-0.230 (0.154)	-0.023 (0.170)	-0.231 (0.155)
Board size (ln)	0.316 (.327)	0.301 (0.252)	0.184 (0.520)	0.038 (0.023)	0.184 (0.520)	0.033 (0.473)
Proportion of insiders	0.383 (0.379)	-0.098 (0.297)	-0.243 (0.263)	0.291 (0.236)	-0.243 (0.263)	0.298 (0.242)
CEO tenure	0.024 (0.031)	0.007 (0.024)	-0.004 (0.020)	0.011 (0.018)	-0.004 (0.020)	0.011 (0.018)
CEO duality	0.452 (0.414)	-0.048 (0.325)	0.122 (0.281)	-0.192 (0.255)	0.122 (0.281)	-0.191 (0.256)
Constant	-0.645 (0.709)	0.175 (0.353)	-0.279 (0.080)	0.020 (0.069)	0.294 (0.078)	0.182 (0.358)
F-value	0.691	11.509***	68.753***	90.201***	34.722***	47.701***
R ²	0.038	0.434	0.372	0.611	0.691	0.793
N	118	118	118	118	118	118

Standard errors are in parentheses. ***p < .001, **p < .01, *p < .05, [†]p < .1

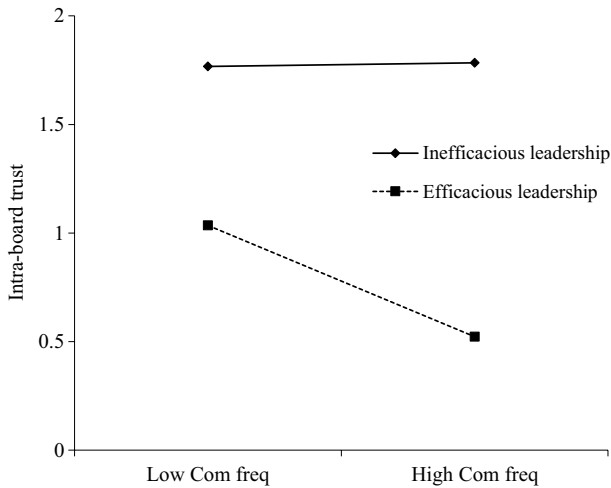


Fig. 2 Interaction of informal communication frequency (between CEO and board) and (in)efficacious board leadership on intra-board trust

effect of information communication frequency on intra-board behavioral integration (via intra-board trust) is larger than the direct effect.

The moderation is also significant ($\beta = -0.123$, $p < 0.001$) in Model 4, providing **support** for **H3a**. Model 5 regresses the variables on intra-board behavioral integration and shows that intra-board trust is correlated positively with intra-board behavioral integration ($\beta = 0.573$, $p < 0.001$), and efficacious board chair leadership correlates positively with intra-board behavioral integration ($\beta = 0.157$, $p < 0.01$). However, the interaction effect is non-significant ($\beta = -0.006$, $p > 0.10$), so **H3b** is **not supported**. Building on the mediation insights developed by Hayes (2013), we bootstrapped the results with 10,000 resamples. The findings are corroborated when the 95% confidence intervals (CIs) do not contain any zeros, and except for the nonsignificant moderator H3b, all the other CIs were within their limits.

Figure 2 illustrates the effect of the interaction on intra-board trust. Greater intra-board trust associates positively with lower informal communication frequency, contrary to expectations, and greater board chair involvement is also associated with less intra-board trust. These results suggest that boards are dissatisfied with the direction of the firm and that more active involvement from board chairs is a result of firefighting. Boards might also be discontent with the firms' situations, which require more involvement from board chairs. Greater involvement might also be caused by disagreements with the CEO, or perhaps the board initiated CEO succession discussions.

5 Discussion

Behavioral integration is well established as a meta-construct that describes the social and task interaction among team members (Simsek et al., 2005). There is considerable research on what behaviorally integrated teams do and ultimately, the

extent to which they affect organizational entrepreneurship and performance. Just as behavioral integration in teams explains variance in firm outcomes, we can similarly expect that a greater awareness of board behavioral integration in high-tech start-ups will improve our understanding of their performance and effectiveness. However, the specific mechanisms through which behavioral integration facilitates board outcomes are still largely unknown. Therefore, this study explores factors that may facilitate behavioral integration in boards of high-tech start-ups.

Exploring factors that facilitate behavioral integration among high-tech start-up boards is important for several reasons. First, high-tech start-ups operate in highly dynamic environments, confronting the liabilities of ‘newness and smallness’ (Stinchcombe, 1965), and are initially challenged by limited financing and inadequate skills (Clarysse et al., 2007; Huse, 2000). High-tech start-up boards thus face different and more demanding tasks across the entire value chain when compared with established firms’ boards, which are primarily limited to monitoring and provision of advice and resources (Huse, 2000). Board behavioral integration may render more accurate and deeper insights into board dynamics in entrepreneurial firms. Second, due to the ‘informal, loosely structured, and fluid’ nature of high-tech start-ups (Picken, 2017, p. 588), coupled with the uncertainty of their survival, boards are more empowered and active, with higher stakes than boards in large firms (Hambrick & Abrahamson, 1995). Thus, boards’ relational dynamics and behavioral exchanges have greater influences on organizational design (Garg & Eisenhardt, 2017), value creation (Bjørnåli, 2016), and strategy decision-making (Minichilli et al., 2012). Third, proponents of the behavioral approach argue that concentrating on board composition has led to less interesting, inconsistent, and ambiguous results, highlighting the need to focus on board process mechanisms to produce promising results (Hambrick et al., 2008; Huse & Zattoni, 2008; Leblanc & Schwartz, 2007).

This study advances the behavioral view of new high-tech firm governance by focusing on antecedents that increase intra-board behavioral integration. The intra-board trust constructs in the current study contribute to that gap (Pastra et al., 2021a). One exception besides Westphal (1999) is Schnatterly and Johnson (2008), who assess board outsiders as potential CEO candidates in high-tech firms, where trust plays a role in the process. Harris and Helfat’s (2007) call for research on internal board social capital, and the two constructs employed in the current study, relates to what Klarner et al. (2021) call ‘a board capability view’. However, it is unclear to what extent intra-board behavioral integration is a capability, even though it reflects an important collaborative decision-making capacity. Informal communication appears to capture components of what is typically measured when addressing what Klarner et al. (2021) call ‘board relationship-building capabilities’, and intra-board behavioral integration might capture what they call a board’s ‘integration capability’. Our findings show what role efficacious board chair leadership plays: that a savvy chair relates positively to intra-board trust but interacts negatively with greater frequencies of informal communication, suggesting that greater chair involvement may signal a type of firefighting. For practitioners, the most important implication is that informal interactions between CEO and directors are of utmost

importance. It not only fosters trust among board members but also contributes to achieving behavioral integrations among them.

6 Limitations and future research

Before concluding, we acknowledge the following limitations of this study. First, we employ a cross-sectional survey which may be subjected to common method bias. The cross-sectional analysis deters the generalisability of findings but is a critical step to advancing our understanding of board behavior. Although these results must be considered tentative findings, they nevertheless help researchers and practitioners better understand the behavioral dynamics of boards. Future research should test the evolution of board dynamics in entrepreneurial firms using longitudinal analyses. A second limitation is the small sample size of individual respondents as we required multisource data. Future research should seek responses from CEOs and board members to more closely gauge perceptions of behaviors and boardroom interactions. A third limitation is the potential for generalisability to country contexts outside Norway. It is well established that governance structures vary in different national contexts (Aguilera & Jackson, 2003; Pye & Pettigrew, 2005). Countries in Northern Europe are characterized by high levels of trust (Pastra et al., 2021b, p. 261), as “the capacity of citizens in Nordic countries to develop cooperative ties and establish trust is deep-rooted in their culture and history”. Future research should examine other national contexts. A promising path for future researchers is to also look at populations of non-tech start-ups and larger, more established firms. Finally, we only conjecture that board integration also leads to better performance. However, future research can test the drivers and consequences of behavioral integration simultaneously.

In sum, despite the methodological challenges in accessing the board room dynamics, we use primary survey data to identify factors that facilitate intra-board behavioral integration. We not only identify the role of informal communication in nurturing intra-board behavioral integration, but we also found that such informal communication relates positively to intra-board trust and that these two factors, in combination, cultivate intra-board behavioral integration. We also address the role that board leadership plays in these relationships, finding not only that efficacious board chair leadership relates positively to intra-board trust but that such leadership also relates negatively to informal communication frequency, suggesting that too much of both can be too much for the maintenance and development of intra-board trust.

Appendix 1: Description of variables

Variable (and source)	Item description	Coding
Board behavioral integration (Mooney et al., 2007)	To what extent do you agree with the following statements Board members are mutually responsible for decisions Board members have a clear understanding of the issues and needs of each member Board members help each other solve problems Board members share relevant information with each other Board members share resources with each other	Likert scale 1 (Completely disagree) 7 (Completely agree)
Efficacious board chair leadership (Huse, 2007)	Our board chair is especially skilled in Motivating and using each board member's competence Formulating proposals for decisions and summarizing conclusions after board negotiation Chairing board discussions without promoting his/her agenda	Likert scale 1 (To a very small degree) 7 (To a very large degree)
Informal communication (Smith et al., 1994)	How frequent is the informal communication between CEO and board chair CEO and other board members All board members	Likert scale 1 (very seldom) 7 (very frequent)
Board trust (Talaulicar et al., 2005)	To what extent do you agree with the following statements Every board member is characterized by absolute integrity One can assume that during board meetings everybody tells the truth Board members can be sure to trust each other Board members can trust that mutual promises are kept	Likert scale 1 (To a very small degree) 7 (To a very large degree)
Firm size	Number of full-time employment equivalents	Ln, continuous
Firm age	Number of years since the business was formally incorporated	Ln, continuous
Board size	Number of board members	Ln, continuous
The proportion of inside directors	Inside directors are board members who are part of the TMT. Variable is calculated as the number of insiders divided by board size	Continuous

Variable (and source)	Item description	Coding
CEO tenure	CEO's tenure in the firm	Continuous
CEO duality	CEO is also board chair	Dummy variable; 1 if CEO is also the chair of the board 0 otherwise

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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