Board IT governance in context: Considering governance style and environmental dynamism contingencies

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Abstract

We theorize that IT governance (ITG) by the board of directors (hereafter referred to as "board ITG") is most effective when there is a fit between the dynamics of the business environment and the governance style through which board ITG is delivered. Survey findings from 110 board members largely supported these assertions. Findings show that authoritative governance style and environmental dynamism represent important boundary conditions for the efficacy of board ITG to achieve performance gains. Research and practical implications are discussed.

Keywords:

IT governance, IS leadership, board of directors, firm performance, governance style, environmental dynamism

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Introduction

For better or worse, information technology (IT) impacts firm operations, strategies and outcomes. Good IT governance (ITG), that is planning and oversight of IT strategies and operations, can create value for firms (Weill & Ross, 2004). In contrast, poor ITG can lead to value destruction through innovation lag or lost opportunities, and increased exposure to IT risks. Many recent security breach incidents (e.g., Marriott, Equifax) serve as reminders to the need to improve ITG, if not for the sake of preventing harm, at least for the purpose of litigation risk reduction. IT can enhance or harm firm performance, and the effect varies from case to case, but ITG and its positive effects seem to be a ubiquitous matter (Wilkin & Chenhall, 2010).

ITG is the responsibility of a company's board of directors and top management team (IT Governance Institute, 2003). Much of the ITG research has focused on executive-level ITG (ITG exercised by the top management team), which is a relatively mature research area with already established main effects and boundary conditions. In contrast, much less is known about ITG exercised by the board of directors (hereafter referred to as board ITG), defined as "the board's actions to ensure that the organization's IT sustains and extends the organization's strategies and objectives" (Turel & Bart, 2014, p. 224). Research on board ITG has just come to light, and the focus has been mostly on the main effects of board ITG on outcome such as firm performance (Jewer & McKay, 2012; Turel & Bart, 2014). Board ITG actions include monitoring, advising, initiating and steering the needed planning, and providing access to external resources and knowledge related to IT initiatives (Nolan & McFarlan, 2005). We focus on board ITG because

the board of directors has a fiduciary duty to govern IT in order to create business value and mitigate IT-related risks and threats; and this responsibility is augmented after the passage of Sarbanes-Oxley and Dodd-Frank and in modern litigious environments (Bart & Turel, 2009, 2010; Janvrin & Mascha, 2014; Krishnan & Lee, 2009).

Importantly, empirical research shows that board ITG has a direct positive impact on firm performance (Jewer & McKay, 2012; Turel & Bart, 2014). Hence, board ITG is an important topic in IS leadership and IT business value research. However, gaps still exist regarding the effects of contextual factors on the impact of board ITG on firm performance and how such factors set boundary conditions for board ITG effects. Specifically, it is unclear under what conditions and in which business environments board ITG is more (or less) efficacious in driving performance gains. Although previous research has implied the importance of such contextual factors (Nolan & McFarlan, 2005; Jewer & McKay, 2012; Turel & Bart, 2014), empirical studies examining these factors are sparse. We are aware of only two such studies. First, Turel and Bart (2014) showed that the effect of board ITG on performance does not depend on the IT use mode of the organization (i.e., no moderation effect). Second, Turel, Liu, and Bart (2017) showed that authoritarian governance style weakens the translation of board ITG into firm performance. In this study, we seek to extend such perspectives and theorize and examine how two types of contextual factors might work in tandem to modulate the translation of board ITG into performance gains.

Specifically, rather than focusing on either environment-level factors (e.g., competition, regulatory pressures) or firm-level factors (e.g., IT use mode of the organization, governance style), we investigate how together (i.e., the interaction) of such factors can moderate the translation of board ITG into firm performance. The key firm-level factor we focus on is board

governance style. We extend Turel et al. (2017), which focused on authoritarian governance style, and examine authoritative governance style because authoritative supervision can be very impactful in some situations (Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987). By extension, we expect it to also be impactful in board-executive relationships. The environment-level factor we focus on is environmental dynamism. We do so because it is highly relevant for the effectiveness of leadership practices (e.g. Chakravarty, Grewal, & Sambamurthy, 2013; Jansen, Vera, & Crossan, 2009), ITG (e.g. Tiwana, Konsynski, & Bush, 2010), and IT business value (e.g. Melville, Kraemer, & Gurbaxani, 2004). Here, we expect environmental dynamism to influence (moderate) the efficacy of governance style to modulate the effect of board ITG on firm performance.

Understating such factors and their interactions is important because it can inform theory on board ITG and IS leadership and can also point firms to possible interventions that may increase the effectiveness of board ITG. To achieve this objective, this article addresses the following research question: can internal (within the organization; in our case board governance style) and external (environment-level; in our case environmental dynamism) contextual factors interact to strengthen or block the translation of board ITG into firm performance? That is, we aim at studying key boundary conditions for the effectiveness of board ITG in terms of its ability to improve firm performance.

To address this research question, we theorized on how such factors can affect the board ITG - firm performance association and collected survey data from 110 North American corporate directors. The findings show that (1) board ITG and authoritative governance style improve firm performance, and (2) the moderating effect of authoritative governance style on board ITG effect on firm performance is suppressed by environmental dynamism. The findings strengthen

confidence in the importance and relevance of board ITG for firm performance. They also contribute to the accumulation and extension of existing IS leadership and IT business value knowledge by showing the importance of considering internal and external contextual factors for understating the efficacy of leadership practices. Moreover, the findings enrich and advance the general IT management literature by using the fit and organizational ambidexterity perspectives, and by relying on a valuable perception of firm performance from the board. In the next section, we provide an overview of concepts upon which this study relies. Then, we present arguments in support of the hypotheses that answer the abovementioned research question. We next introduce the methodology, analysis and results section, and provide the discussion and conclusion sections.

Theoretical background

In order to set the theoretical background for this study we provide an overview of (1) ITG and board ITG, (2) board governance styles, (3) environmental dynamism, and (4) firm performance.

ITG and Board ITG

ITG is a key facet of corporate governance (Trites, 2004). It includes "the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives" (IT Governance Institute, 2003, p.10). It is the joint responsibility of executives and directors (IT Governance Institute, 2003), but each group operates differently to deal with this responsibility. Executives strategize, budget, execute, control, communicate, and report on IT plans, operations and projects (Wilkin & Chenhall, 2010). The board, in contrast, mostly monitors the planning and execution of IT-related plans and projects, advises executives regarding IT opportunities and threats, and provides executive with access to knowledge and resources in support of IT operations (Turel & Bart, 2014).

There is a common misperception among practitioners that IT is an operational matter that should be governed by executives and less so by the board (Bart & Turel, 2010). This is reflected by the sharp contrasts in ITG frameworks and structures between executives and the board. First, there are more ITG frameworks for executives than for the board. Executives can use many ITG frameworks such as COBIT (Control OBjectives for Information and Related Technology), ITIL (IT Infrastructure Library), CMM (Capability Maturity Model) and ISO/IEC 38500 (Standard for Corporate Governance of IT) to better control digitized business processes and improve their performance. These frameworks are very specific and detailed, and target at process improvement and operation excellence. Hence, they are not suitable for the board of directors who is absent from the day-to-day IT operations. Contrary to the popularity of ITG frameworks for executives, only few guidelines (e.g. the ones proposed by Canadian Institute for Chartered Accountants and ITGI) clearly delineate how boards should govern IT.

Second, there are more established ITG structures at the executive-level than at the board-level. More than 80% of Standard & Poor's 500 companies have CIO or CTO positions (Banker, Feng, & Pavlou, 2011). Furthermore, many government departments and companies have a Chief Information Security Officer (CISO) position or Chief Data Officer (CDO) which is independent from the CIO and is at the same level as the CIO (Earley, 2017; Hooper & McKissack, 2016). In contrast, as of 2018 only 4.4% of Standard & Poor's 500 companies had a board IT committee or a standalone board committee that deals with IT. In Standard & Poor's 500 companies, 15% of new board seats were filled by IT-savvy directors (Spencer Stuart, 2016) which equals to 1% of the total number of directors.

In the literature on ITG, we see similar contrasts. Most of past research has primarily focused on executives' ITG (e.g. De Haes, Van Grembergen, & Debreceny, 2013; Higgs, Pinsker, Smith, &

Young, 2016; Wilkin & Chenhall, 2010), and much fewer studies have focused on board ITG (Jewer & McKay, 2012) The limited number of studies that did focus on board ITG unanimously suggest that this practice improves firm performance and can do so in various settings and industry sectors (Jewer & McKay, 2012; Turel & Bart, 2014).

These studies also showed that some organizations are more prone than others to engage in board IT. Factors that increase board ITG include the IT use mode of organizations, overall importance of IT, board IT competency, board independence, and prior operational IT failures (Bart & Turel, 2010; Benaroch & Chernobai, 2017; Jewer & McKay, 2012). Firm age and board size have shown negative association with board ITG (Jewer & McKay, 2012). After the antecedents of board ITG are investigated, we take a step forward to examine the consequences of board ITG. In this study, we study the complex interacting effects of board ITG and two contextual factors on firm performance.

Board Governance Styles

Leadership is the process of influencing and facilitating others to understand and agree about what needs to be done and how it can be done effectively (Yukl, 2013, p. 3). IS leadership "sets directions, creates commitment, mobilizes institutional, political, psychological, and other resources, facilitates action, and adapts the IS unit to fit a changing environment such that it adds value and achieves shared objectives" (Karahanna & Watson, 2006, p. 172). Multiple studies have focused on IS leadership exercised by the CIO, CTO, Director of IT, Vice President of IT or IT managers. In this study, we extend IS leadership to the case of the board of directors and concentrate on board governance style which is defined as the strategies that the board uses in its interaction with the executives (Turel et al., 2017).

Effective leadership encompasses multiple key elements such as instrumental, relational, and motivational aspects (Yukl, 2009). We argue that board governance style is mainly about the relational aspect of board leadership. Boards can be viewed as leaders that need to influence and interact with executives which can be viewed as the board's agents. The interactions between boards and executives are important because they can (1) facilitate a better understanding by the board of IT directions, resources and gaps, (2) allow boards to clearly communicate their directives to top management, and (3) help executives to understand the board's requests and follow them.

Board governance style describes how boards govern IT, and specifically it captures the inter-group communication style through which boards direct and advise top management. Although board governance style is shown by a group, namely the board of directors, it can have a cross-level effects on executives and indirectly on employees and hence impact firm performance (Rousseau, 1985). Specifically, this style shapes the efficacy of board ITG to improve firm performance. Poor styles (e.g., being overly demanding) can inhibit the effects of board ITG on firm performance (Turel et al., 2017) while good styles (being supportive and advising) may amplify such effects. Variations in governance styles can also influence the amount of help and guidance the board provides to top management, the psychological wellbeing of executives, and the extent to which executives feel comfortable with, cooperate with, and understand the board's monitoring efforts. Therefore, board governance style is considered to be an internal contextual factor that can determine the success of board ITG.

In line with prior research (Turel et al., 2017), we argue that it is useful to adopt a parental supervision view of board governance styles. There are two reasons for adopting this view. First, the relationship between boards and executives often resembles the relationship between parents

and children. In these relationships, the board has punishment and reward capabilities (e.g., compensation, layoffs) that resemble the stirring capabilities that parents have over children. Second, board ITG practices are often forward-looking with implications to future plans and performance. The forward-looking nature of board ITG is similar to a parental supervision view which also tends to be forward-looking. Taking this view, we note that parental supervision styles vary on two orthogonal dimensions: demandingness and responsiveness (Baumrind, 1971). Applying these two dimensions to the board, there are two corresponding dimensions of board governance styles: monitoring and advising. The monitoring dimension represents demandingness in parental supervision styles, and the advising dimension represents responsiveness. Both monitoring and advising are prime responsibilities of the board (Davis, Schoorman, & Donaldson, 1997; Eisenhardt, 1989). Our focus on the distinction between monitoring and advising roles contributes to March's (1991) distinction between exploration and exploitation and as articulated by the organizational ambidexterity perspective by O'Reilly & Tushman (2004).

Being high or low on these two dimensions, namely monitoring and advising, produces four prototypical board governance styles: neglectful, permissive, authoritarian, and authoritative. Neglectful boards are low in both monitoring and advising roles; permissive boards concentrate on an advising role; authoritarian boards mainly perform a monitoring role; and authoritative boards engage highly in both monitoring and advising roles. Turel et al., (2017) empirically showed that authoritarian governance style can hurt firm performance. Extending this view, we examine a different governance style, and hence focus on authoritative governance style and examine how variations in it can influence firm performance in this study. Authoritative style is considered the best in terms of its ability to achieve developmental outcomes (Dornbusch, Ritter,

Leiderman, Roberts, & Fraleigh, 1987). Authoritative governance style is defined as board's high engagement in both monitoring and advising roles when interacting with executives.

Environmental Dynamism

Different environmental factors (i.e., factors external to the organization) impact firms. Environmental factors can influence leadership (Waldman & Yammarino, 1999), ITG (Tiwana et al., 2010), and IT business value (Melville et al., 2004). One of the most relevant factors is environmental dynamism (Simerly & Li, 2000), which describes the rate and the unpredictability of change in a firm's external environment (Dess & Beard, 1984). Dynamic environments are characterized by variations in customer preferences, frequent changes in competitor actions, and rapid advancements in technologies (Jansen, Vera, & Crossan, 2009). Environments can therefore be located on a continuum ranging from stable to dynamic.

Firms plan for and respond to dynamic changes imposed by the environment (Sadler & Barry, 1970). In dynamic environments, this can be challenging, and firm performance is not a simple reflection of how firms leverage on repetition of their existing routines and capabilities. External environmental changes are difficult for managers to plan for (Aldrich, 1979) and also result in managers' increased inability to assess accurately the state of the environment. This limits their ability to determine optimal alternatives that they can pursue (Milliken, 1987). Therefore, environmental dynamism is considered to be an external contextual factor that can determine the success of board ITG.

Organizational contingency theory has been used in corporate governance and ITG research (Strebel, 2004; Turel & Bart, 2014). Organizational contingency theory states that firms must constantly change in order to keep up with the uncertainty of environments (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Thompson, 1967). According to this theory, boards should

change their governance style and foci based on such contingency factors (Nolan & McFarlan, 2005). However, the fit between board governance style and the environment has not been studied. Achieving a proper fit between a firm and environmental contingencies and fit within a firm among structure, process, and technologies are important because they were associated with greater firm performance (Chandler, 1962; Robey & Sales, 1994).

It is worthwhile to note that environmental changes can lead to a higher probability of misfit between a the environment and the firm's existing routine, capabilities, strategies and structure (Anderson & Tushman, 1990; Sirmon, Hitt, & Ireland, 2007). This misfit usually explains poor firm performance (Jansen et al., 2009). As such, the environment is an important contextual factor that can influence firm performance (Child, 1972; Melville et al., 2004). We contribute to the fit perspective in organizational contingency theory by showing that board governance style should fit with the environment for better firm performance.

Firm Performance

Board ITG, board governance styles, and business environments can impact the business value of firms which is usually reflected in firms' overall performance. Firm performance means a firm's health along multiple dimensions (Zahra & Pearce, 1989) which can include financial, operational, social, relational and legal dimensions. The financial performance dimension focuses on firms' wealth maintenance and creation (Zahra & Pearce, 1989). This dimension has been linked to IT operations (Brynjolfsson, 1993; Brynjolfsson & Hitt, 1996). Many studies on IT value research have adopted this dimension (e.g. Bharadwaj, 2000; Santhanam & Hartono, 2003; Rai, Patnayakuni, & Seth, 2006) partly because it is easily quantifiable and more accessible.

Following this line of research, we focus on the financial performance dimension for two key reasons. First, many dimensions can eventually translate into firms' bottom-line and are hence reflected in financial performance (McGuire, Sundgren, & Schneeweis, 1988; Habbershon, Williams, & MacMillan, 2003). Second, it is easier for directors to observe and report on the financial performance as opposed to other dimensions because boards receive periodic reports about financial performance (Turel & Bart, 2014).

We note that financial performance can have different measures including accounting measures (e.g. Bharadwaj, 2000), stock measures (e.g. Banker et al., 2011), top management perceptions (e.g. Wu, Straub, & Liang, 2015), and the perception of the board (e.g. Turel & Bart, 2014). Research on board ITG has primarily focused on board members' perception. We adopt this measure here for four main reasons. First, the validity of such measures has been demonstrated (e.g. Turel and Bart, 2014; Turel et al., 2017). Second, boards are in a good position to assess financial performance, because boards have sufficient financial insight to judge the performance of the firm in relation to industry standards and other forms. Third, directors often face legal risks when disclosing actual financial performance regarding their firms. Fourth, perceptive financial performance measures can be advantageous compared to objective metrics especially if the source providing the information is well informed (e.g. Tallon, 2010). The advantage also stems from overcoming the "cooking" and strategizing that manifest in financial reports (e.g., deciding if an expense is deducted now or later on which can be approached differently in different firms).

Hypotheses

We integrate several theoretical perspectives to propose four hypotheses that explain how two factors, one internal and the other external, can moderate the translations of board ITG into firm performance. The proposed model is presented in Figure 1.

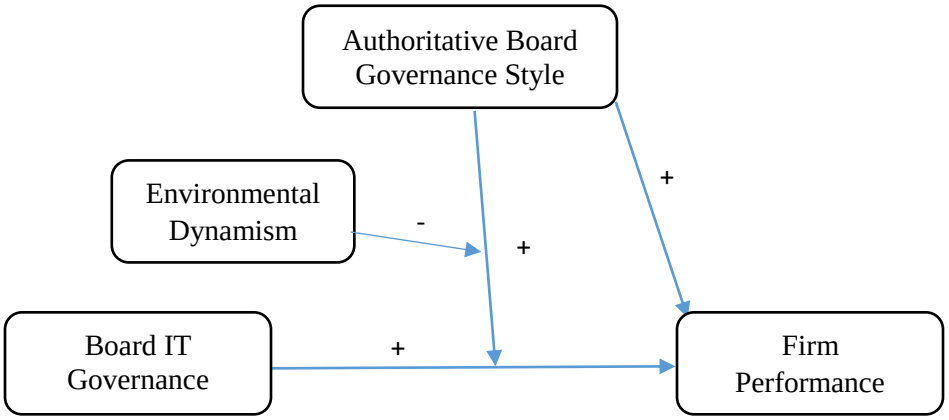

Figure 1: Research Model

According to the resource-based view (RBV) of the firm (Wernerfelt, 1984), firms hold organizational resources and capabilities that can allow them to achieve competitive advantage and, potentially improve firm performance. Board ITG is an IT capability that organizations possess because board ITG is valuable, imperfectly mobile, and heterogeneously distributed (Turel & Bart, 2014). Taking the RBV perspective, good board ITG can produce temporary and potentially sustained competitive advantage, IT-related performance gains, and superior firm performance. Specifically, board ITG can improve companies' performance through the following channels: providing access to external financial and IT resources which would not be available to the company otherwise, informing the company about best IT practices and trends based on sensing the business environment, and importing IT management knowledge and ideas

from other companies on which board members also serve (Turel & Bart, 2014). Such channels can help the company update IT resources, improve IT operation, and develop IT knowledge which can lead to a better position in the market and to performance gains (Wade & Hulland, 2004).

Board ITG can also be conceived as dynamic capability (Winter, 2003) which can contribute to sustainable competitive advantage and better firm performance (Eisenhardt & Martin, 2000; Pavlou & El Sawy, 2006; Teece, 2007). Dynamic capability is a type of organizational capability that regulates and reconfigures ordinary capabilities and needs to be performed by people at high levels of organizational hierarchy (Teece, Pisano, & Shuen, 1997). Board ITG is based on recognizable high-level routines and is performed by boards. It also affords reconfiguring lower-level capabilities (e.g., the board can change the structure of the IT department). Therefore, board ITG, as a type of dynamic capability can contribute to sustainable competitive advantages and better firm performance. Specifically, the board can serve as a "thermometer" that senses the firm and produces directives that improve the alignment between IT and the business; this can lead to performance gains (Chan, Huff, Barclay, & Copeland, 1997; Van Grembergen & De Haes, 2009). To replicate the effect of board ITG on firm performance in literature (e.g. Jewer & McKay, 2012; Turel & Bart, 2014; Turel et al., 2017), we posit that:

Hypothesis 1: Board ITG is positively associated with firm performance.

As shown in many leadership studies, IS leadership can motivate and encourage personnel to contribute to their firms' performance (Eom, 2015). Specifically, we argue when the board of director exercises leadership, the extent to which the board engages in an authoritative governance style may positively influence executives' behaviors which, in turn, lead to performance gains. The main reason for the effect is that boards play a balanced role in an

authoritative style. On the one hand, high monitoring levels can improve board oversight which can enhance performance (Hillman & Dalziel, 2003). On the other hand, responding to top management's questions and requests and advising them in a friendly manner (as opposed to commanding them) can motivate and help executives to act in the direction charted by the board (Westphal, 1999). That is, the dual emphasis on monitoring and advising can cultivate trust and increase the management's willingness to share information with the board (Boivie, Bednar, Aguilera, & Andrus, 2016). Sufficient strategic information, in turn can afford boards to make better and more informed decisions which can also contribute to improvements in firm performance.

From a psychological perspective, reactance theory (Brehm & Brehm, 1981) states that threats to one's freedoms lead to the perception of reactance which has a negative influence on attitudes and behaviors (Lowry & Moody, 2015). Applying reactance theory to board governance style, we suggest that authoritative governance style, compared with authoritarian style, gives freedom to executives which can minimize their resistance to board requests and initiatives. Furthermore, the responsiveness and supportiveness of the authoritative style increase firms' tolerance for experimentation and exploration endeavors of top management. This tolerance is crucial for innovation (Tian & Wang, 2011). Hence, an authoritative governance style can facilitate organizations' ability to innovate which, in turn, can lead to good firm performance. Taken together, we hypothesize that:

Hypothesis 2: The level of authoritative governance style by the board is positively associated with firm performance.

Leaders like CIOs can use their interpersonal attributes (e.g. political skills) to facilitate their influence on the executives' commitment to IT initiatives (Gerow et al., 2017). In a similar vein,

the board can use its interpersonal attributes (e.g. board governance styles) to facilitate the effect of board ITG. Turel et al., (2017) empirically showed that authoritarian governance style, a type of board governance style, can negatively moderate the effect of board ITG on firm performance. By extension, we argue that boards high in authoritative style are better poised to achieve performance outcomes.

An authoritative governance style manifests itself through a good balance in both monitoring and advising roles. Monitoring roles can reduce agency costs and, in this way, can ensure the productivity and effectiveness of top management' work (Fama, 1980) which translates board ITG decisions and efforts to firm performance. Advising roles can improve mutual trust and, hence, can strengthen the communication channels between the board and top management (Roberts & O'Reilly, 1974) which amplifies the effects of board ITG. In other words, board authoritative governance style can make board's involvement with IT more effective. As such, the same ITG directive from the board can be executed more successfully by executives when authoritative style is employed (e.g., when it is nicely requested and explained, when there is sufficient guidance and follow-ups, and when much support is provided by the board).

In contrast, low authoritative governance style can suppress the effectiveness of board ITG. Low monitoring signals to top management that the board does not care about the consequence of ITG. In this case, top management may not or may partially implement board's IT directives. Low advising can lead to trust reduction between the board and executives which may reduce the inputs the executives share with the board. This information flow reduction can too negatively affect firm performance. Simply put, if both monitoring and advising are at low levels, no matter how capable the board is to govern IT, the board's efforts are less impactful because there is low collaboration and trust between the board and top management. Taken together, we posit that

authoritative governance style can increase (or reduce) the effectiveness of board ITG efforts. Therefore, we hypothesize an interaction effect:

Hypothesis 3: The effect of board ITG on firm performance is moderated by the extent to which the board adopts an authoritative governance style, such that the effect is stronger for higher levels of authoritative governance style.

The enhancing effect of an authoritative governance style is based on the assumption that the business environmental is stable. When there are changes in the environment, executives like CIOs need to change their political, social, business and IT skill set to match the environment (Karahanna & Watson, 2006).

When the environment is changing, uncertainty and risks are increased (Dess & Beard, 1984; Duncan, 1972), data becomes ambiguous, information is inaccurate, knowledge is obsolete, patterns are not obvious, and the future is unpredictable (Eisenhardt & Bourgeois, 1988; Priem, Rasheed, & Kotulic, 1995). In dynamic environments, the alternatives and evaluation criteria by which to select alternatives are also unstable and unclear (Mintzberg, 1990).

To overcome these challenges, managers in such environments need to process larger amounts of information faster (Galbraith, 1973), to put more effort into developing novel solutions and responses, and to constantly scan the environment (Aguilar, 1967; de Hoogh et al., 2004; Hambrick, 1982). They must selectively allocate their attention, explore new opportunities, and develop new routines and creative strategies. They also need more time to innovate. Consequently, top management in dynamic environments tends to suffer from greater information processing burdens and to experience high levels of stress (Tushman, 1979). Its processes in dynamic environments become less prescribed, formalized, and more sophisticated (Lawrence & Lorsch, 1967).

Although boards can help set the supervision tone of ITG for a firm, in dynamic circumstances managerial expertise can matter more than the oversight provided by boards. Specifically, an authoritative governance style which includes strong monitoring facets may create misfit with executive management processes. This is because authoritative governance style may not allow sufficient latitude for top management to deal with changes; such latitude can be achieved through reduced monitoring (e.g., by employing permissive governance style). The strong monitoring of top managers and their performance is ineffective under dynamic environments and may even hurt the performance of top management; it can take away time that they could devote to dealing with dynamic changes in the environment. Simply put, when executives are busy working on boards' directives and producing obsolete and difficult to produce reports regarding their operations, they have heavy information processing burdens and less time to explore possible solutions and opportunities. If top management has more freedom to explore new areas and building new capabilities, it can reduce the risk of value erosion associated with firms' existing processes under environmental dynamism (Fleming, 2001). We hence posit that the influence of authoritative governance style in increasing the effect of board ITG on firm performance is diminished in dynamic environments, and we hypothesize a three-way interaction effect:

Hypothesis 4: Environmental dynamism will reduce the positive effect of authoritative governance style on the board ITG to performance link, such that this effect is stronger when environmental dynamism is low.

Methodology

Procedure

We invited five hundred directors who attended corporate governance training programs in Canada to participate in our ITG study. The study received ethics approval. We used a paper-based survey to collect data about the main constructs, control variables and descriptive variables. The survey did not ask for identifying information and asked respondents to focus on a single board on which they serve. We did not incentivize survey completion.

Sample

One hundred and ten board members (response rate of 22%) completed the survey. Respondents served on average on 2.0 boards (SD=1.3). The represented boards had on average a total of 9.8 directors (SD=4.6) and 7.8 outside directors (SD=5.2). The sample consisted of the following board roles: chair (14.5%), vice chair (12.7%), chair of a committee such as strategic planning (3.6%) and audit and finance (17.3%), and board member only (44.5%). The represented organizations were on average 45.9 years old, had average recent year sales of $370.1 million (SD=$886.1 million), an average of about 101-500 employees (less than 50 to over 10,000 employees), and spent $27.8 million on average (SD=$62.1 million) on IT in the most recent year. 37.2 % of the organizations had a CIO or CTO position. Industries of represented organizations varied with no dominant industry; i.e., very few firms in each industry category.

Survey

Constructs were measured on seven-point Likert scales and were adapted from existing validated measures. We pretested the survey with five board members for content validity and clarity and deemed it to be appropriate. We captured the dependent variable, firm performance, with items

from Turel and Bart (2014). This self-reported performance scale captures how directors perceive the financial performance of their organization. The independent variable was board ITG; we measured it with items from Jewer and McKay (2012). It is a focused measure that taps into ITG actions in which the board actively engages. We adapted the two contextual factors, authoritative board governance style and environmental dynamism, from Dornbusch et al. (1987) and Chakravarty, Grewal, and Sambamurthy (2013), respectively.

We included several control variables that may influence firm performance (Jewer & McKay, 2012; Mallette & Hogler, 1995; Shivdasani & Yermack, 1999; Turel & Bart, 2014; Zahra & Pearce, 1989): (1) firm size (number of employees), (2) board independence (the number of outside directors divided by the number of directors), (3) industry IT dependence, adapted from Kearns and Lederer (2004), and (4) proportion of sales spent on IT (IT expenses divided by total sales). Descriptive variables included board roles, industry, organization age, and number of boards a director serves on. Scales are given in the Appendix.

Analysis and Results

Preliminary Assessments

First, descriptive and reliability statistics based on SPSS 24 are given in Table 1. Scales were valid and reliable (all Cronbach's alphas, composite reliability and Square root AVE scores >0.7). Discriminant validity was supported with square roots of AVE being higher than other intra-construct correlations.

Table 1: Correlation Matrix, Descriptive and Reliability Statistics

	Constructs	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11
Main Variables	1. Board IT Governance	3.84 (1.35)	***0.82 (0.92) [0.91]***										
	2. Authoritative Style	4.78 (0.83)	0.21 *	***0.77 (0.74) [0.74]***									
	3. Environmental Dynamism	3.36 (1.10)	-0.03	0.05	***0.73 (0.71) [0.75]***								
	4. Interaction BITG x Auth	-	-0.08	-0.12	0.09	-							
	5. Interaction BITG x ED	-	0.02	0.12	0.06	-0.18	-						
	6. Interaction Auth x ED	-	0.12	0.07	-0.02	-0.22 *	0.10	-					
	7. Three way Interaction	-	-0.24 *	-0.28 **	0.10	0.10	-0.14	0.25 **	-				
	8. Firm Performance	5.07 (1.03)	0.41 **	0.33 **	0.07	0.01	0.09	-0.07	-0.39 **	***0.80 (0.82) [0.83]***			
Controls	9. Industry IT Dependence	5.25 (1.47)	0.30 **	0.08	0.25 **	0.07	0.00	0.11	-0.10	0.24 *	***0.87 (0.86) [0.86]***		
	10. Firm Size (No. of Employees Scale)	2.95 (1.61)	0.25 **	-0.09	0.08	-0.10	0.17	0.03	-0.10	0.12	0.34 **	-	
	11. Percent of IT Expense of Sales	0.09 (0.08)	0.11	0.15	0.05	0.13	-0.01	0.08	0.08	0.13	0.28 **	-0.07	-
	12. Percent of Outside Directors	0.75 (0.32)	0.17	0.04	-0.06	0.08	-0.04	0.04	0.13	0.07	0.10	0.13	0.30 **

*p<0.05; **p<0.01; Notes: (1) Square root of AVE, (α) and [CR= Composite Reliability] scores are bolded and italicized on the diagonal, for multi-item constructs. (2) ED= Environmental Dynamism, BITG=Board IT governance, and Auth= Authoritative Governance style.

Second, the possible existence of major common method variance (CMV) was examined with the common latent factor technique (MacKenzie & Podsakoff, 2012; Podsakoff, MacKenzie, & Podsakoff, 2012). This factor was added to a confirmatory factor analysis (CFA) model in AMOS 24. The CFA model was then estimated with and without the common latent factor, and the differences in loadings were found to be negligible and below the 0.2 cutoff. Hence, we concluded that our data does not include a major CMV component.

Third, in further support of convergent and discriminant validities, a CFA model was fit to the data, and produced good fit indices (χ^2/ df ratio = 1.33, CFI = 0.96; IFI = 0.96; RMSEA = 0.055 with P-close=0.357; and SRMR = 0.069).

Model Estimation and Results

Analyses were performed using hierarchical regression in SPSS 24. The standardized coefficients and explained variances are given in Table 2. Model 1 examined control variable effects. Only industry IT dependence was marginally significant ($p<0.1$), demonstrating that in our sample firms that were in industries which are IT-dependent performed better than others. Model 2 added the three main effects, namely environmental dynamism, board ITG and authoritative governance style of the board. Both hypothesized effects (H1 and H2) were significant. Model 3 accounted for three two-way interaction effects, but none was significant. Hence H3 was not supported. Model 4 was the full research model which accounted for the three-way interaction effect.

The results lend support to Hypotheses 1, 2 and 4, but not Hypothesis 3. They show main effects of board ITG and authoritative governance style on firm performance, and that the effect of authoritative governance style on the board ITG-firm performance association depends on (is suppressed by) the dynamism in the firm's environment. The results also show that control variables explained 6 % of the variance in firm performance. Board ITG and authoritative governance style in model 2 explain additional 19% in this variance for a total of 25%. The interaction terms explained additional 7% in the variance for a total of 32%.

Table 2: Results

		Model 1	Model 2	Model 3	Model 4
Controls	Percent Outside Directors	0.02	-0.02	-0.02	0.03
	Percent IT expense of Sales	0.07	0.04	0.04	0.06
	Firm Size	0.05	0.03	0.02	0.01
	Industry IT Dependence	0.20	0.09	0.10	0.07
Main and Interaction Effects	Environmental Dynamism		0.04	0.03	0.07
	H1: Board IT Governance		0.33**	0.34**	0.29**
	H2: Authoritative Style		0.25**	0.25**	0.18*
	BITG x ED			0.07	0.03
	Auth x ED			-0.13	-0.05
	H3: BITG x Auth			0.04	0.06
	H4: BITG x Auth x ED				-0.27**
	R Square	0.06	0.25	0.27	0.32
	Sample Size (n)	110	110	110	110

(1) * p<0.05; ** p<0.01; *** p<0.001, (2) ED= Environmental Dynamism, BITG=Board IT governance, Auth= Authoritative Governance style

Deeper Exploration of the Three-Way Interaction

The three-way interaction is plotted in Figure 2, following (Dawson & Richter, 2006)[1]. The difference between line 1 slope and line 2 slope (t-value for slope difference is -1.82, p=0.07), the difference between line 1 slope and line 3 slope (t-value for slope difference is -2.06, p=0.04), the difference between line 4 slope and line 2 slope (t-value for slope difference is 2.40, p=0.02), and the difference between line 4 slope and line 3 slope (t-value for slope difference is 2.51, p=0.01) are all statistically significant. However, the difference between line 1 slope and line 4 slope, and the different between line 2 slope and line 3 slope are not statistically significant. Line 2 and 3 have highly positive slops, whereas line 1 and 4 have pretty flat or negative slops.

[1] We used tools in http://www.jeremydawson.co.uk/slopes.htm for plotting and path comparisons.

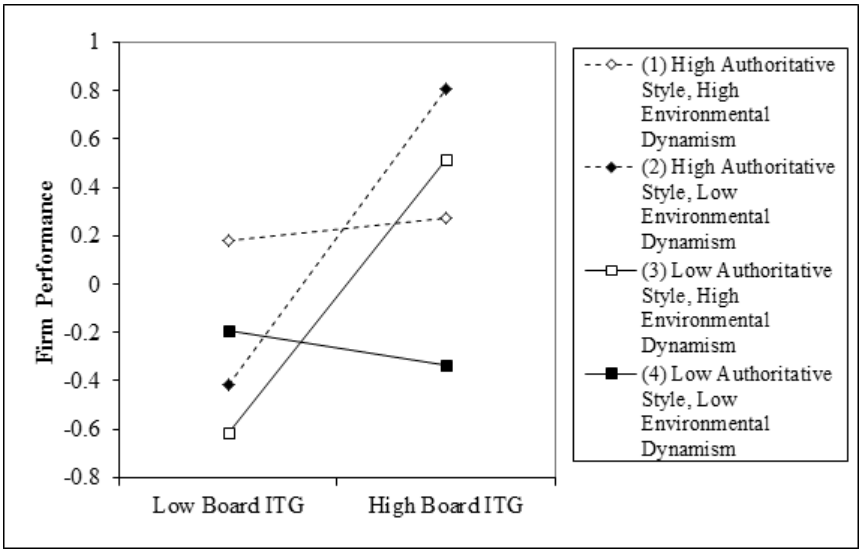

Figure 2: Interaction between board ITG and authoritarian governance style

Hence, board ITG produces stronger performance gains in two situations: (1) when boards are authoritative in their governance style and the environment is stable (line 2), or (2) when they engage a less authoritative governance style and the environment is dynamic (line 3). When board governance style is authoritative and the environment is dynamic (line 1), board ITG has almost no effect on firm performance; and when authoritative style is low and the environment is stable, board ITG has a slight negative effect on performance (line 4).

Discussion

This study sought to find key boundary conditions for the effect of board ITG on firm performance, in terms of interaction between internal (governance style) and external (environmental dynamics) contextual factors. The findings strengthen confidence in the importance and relevance of board ITG for firm performance as demonstrated in prior research (Jewer & McKay, 2012; Turel & Bart, 2014). They also contribute to the accumulation and extension of existing IS leadership knowledge by showing that under certain conditions board ITG may not contribute to firm performance gains. Specifically, the findings show that

environmental dynamism suppresses the influence of authoritative governance style on the effect of board ITG on firm performance. That is, while authoritative governance style is valuable and positively affects performance, it does not serve boards of firms in dynamic environments well. All hypotheses except H3 (moderation effect of authoritative governance style on the board ITG→ performance association) were supported. We speculate, in retrospect, that H3 was not supported because the hypothesized effect in H3 depends on the level of environmental dynamism. The results of model 3 show no significant moderation effect of authoritative governance style at average levels of environmental dynamism. Model 4 shows that this moderation effect is stronger when environmental dynamism is low.

Theoretical Implications

First, this study adds to the body of knowledge regarding IS leadership. Past research has mostly examined IS leadership exercised by CIOs or similar positions (e.g., Elenkov, Judge, & Wright, 2005; Ensley, Hmieleski, & Pearce, 2006; Zhu, Chew, & Spangler, 2005). The findings of this study extend IS leadership to the case of the board of directors. The board is the leader of CIOs and other executives; therefore, its governance styles represent an important area in IS leadership research. Since the board has overall responsibility for the firm and its decisions are strategic in nature, this study also contributes to IS strategic leadership (Karahanna and Watson, 2006). Compared with authoritarian governance style's negative effects in Turel et al. (2017), authoritative governance style can be regarded as a good style, however, we also argue and show that environmental dynamism needs to be taken into account to fully understand the effectiveness of board IS strategic leadership.

Second, this study contributes to this emergent dialogue on board ITG. Relatively little is known about how board ITG impacts firm performance; calls have been issued to conduct board ITG

research (Nolan & McFarlan, 2005). Though studies are beginning to come to light, insufficient attention has been given to possible contextual factors that affect this association; attention is particularly lacking regarding the interaction of contextual factors. Existing studies have implied that the effect of board ITG is persistent across different organizations and industries (Jewer & McKay, 2012; Turel & Bart, 2014). However, our research shows the importance of considering some contextual factors.

Specifically, our findings show that boards should develop capability and knowledge to govern IT. Additionally, they should consider their styles to deliver ITG practices and should pay attention to conditions in the external environment. Firms with highly authoritative boards are likely to have stronger performance gain when competing in a stable environment. Dynamic environments suppress the effect of authoritative governance style on performance. In other words, the same governance style can have opposite effects (positive and negative) depending on environmental dynamism. This behooves boards to be more attuned to the environment and avoid employing a single and constant governance style. The findings also extend knowledge regarding corporate governance by pointing to board practices and considerations that may apply to other issues the boards govern. Extending our findings to other areas of governance (e.g., audit), though, requires further research.

Third, in line with IT business value research (Melville et al., 2004), we point to two contextual factors that affect firm performance. While, authoritative governance style is an internal factor, environmental dynamism is an external factor. Considering Figure 2, board ITG can produce performance gains when one contextual factor is low and the other is high (lines 2 and 3). When both are high, board ITG has almost no effect on performance (line 1); and when both are low, board ITG has a slight negative effect (line 4). The findings show the importance of considering

multiple contextual factors simultaneously. This is also a more realistic and complete picture for firms because they rarely operate in a single contextual dimension. Such inter-moderator effects are largely overlooked in current ITG research and should be explored in future studies. Although environmental dynamism is a well-known contextual factor, the interaction of environmental dynamism and other contextual factors, beyond the one we studied here, is another interesting extension of our study.

Fourth, the findings also extend knowledge and contribute to the fit perspective in organizational contingency theory (Chandler, 1962). We show that governance style should fit with the environment for performance gains. Specifically, when authoritative style fits with the environment, it is fruitful to performance; when it does not fit well, it is less useful. The fit here is a type of “soft” fit compared with structure fit and process fit. It is difficult to change organizational structure and processes to fit with the environment given structural "inertia" (Hannan & Freeman, 1984). In contrast, it should be easier to change governance style to fit with the environment. Boards only need to change their ways to interact with executives to do so. Therefore, governance style fit as a "soft” fit can be amended rapidly and frequently. When there are environmental changes, firms can achieve governance style fit faster than process fit and structural fit. This proposition, however, merits future research.

Fifth, the results of this study relate to March’s (1991) distinction between exploration and exploitation. The monitoring role can drive exploitation, namely building on the stability and repetition of existing organizational routines, capabilities and knowledge. The advising role, in contrast, encourage exploration including the development of new interpretations, novel responses, and creative solutions. Authoritative governance style can therefore help maintain a good balance between exploration and exploitation. Dynamic environments, though, require

firms to focus more on exploration in which case the advising role is more helpful. As such, permissive, rather than authoritative, board governance style would fit with firms' exploration needs in such environments. When firms are ambidextrous (O'Reilly & Tushman, 2004) and need both exploration and exploitation, an authoritative governance style is needed to increase fit. This idea represents another interesting research direction.

Implication for practice

Based on the findings, we recommend boards consider environmental dynamism and shifts in it (e.g., through annual surveys) as an input for their selection of governance style. We also recommend that governance style is something that the board should actively consider and amend rather than just accept it as the results of traits and preferences of board members. Such changes can be initiated by either board members or executives. As demonstrated here, governance style can be a strategic tool for the board to help executives to better execute the board directives regarding IT (and perhaps other directives) and achieve better performance.

It is well-accepted that both monitoring and advising roles of the board are important to a company; therefore, boards should avoid adopting a *neglectful* style. In contrast, an *authoritative* governance style can help a company achieve significant performance gains in a stable business environment. However, when there are significant changes and uncertainties in the external business environment (e.g., new entrants, disruptive technologies, changes in competitors' behaviors, and changes in customer demands), the board should ideally be more *permissive.* It can adopt and demonstrate that style by having more tolerance and by providing more guidance and advice to executives while putting less emphasis on immediate monitoring.

Limitations and future research

Several limitations that point to future research are noteworthy. First, our study was cross-sectional and did not consider time effects. It is possible that boards changes governance styles when the environment changes. Future longitudinal designs may be used for examining possible changes of board governance styles over time. This, however, does not change the relevance of our findings and recommendations because these are based on the current state of affairs.

Second, this study examined two specific contextual factors. These factors have unique features: one is about the board and the other is about the environment. The effects we observed may not be generalized to other possible contextual factors. We hence call for future research to examine combinations of different contextual factors (e.g., other governance styles, executive-level factors). This would expand the understanding of the effects of multiple contextual factors and set boundary conditions of the effects of board ITG.

Third, we used board members to represent views regarding an organization. While they are generally knowledgeable regarding corporate governance (Bart & Turel, 2010; Turel & Bart, 2014) and our sample largely included experienced board members, their perceptions may be biased. Hence, future research can benefit from considering both board and executive respondents and the use of objective measures (if available). Such objective measures may not be available (like in our study) because many board members are not willing to report actual financial results or their firm identities given the legal risks they face and the fierce competition for the firms (Bart & Turel, 2010; Turel & Bart, 2014).

Conclusion

This study illustrates the importance of considering the multi-faceted contexts in which firms operate for better understanding when board ITG efforts are needed and what governance style

can improve the efficacy of such board ITG efforts. We specifically show that environmental dynamism interacts with authoritative governance style to influence the translation of board ITG efforts into performance gains. While this represents first strides toward understanding the effects of complex contexts on the efficacy of board ITG to drive performance gains, we call for future research to further study boundary conditions including interactions of other facets in the environment that can improve the translation of board ITG efforts into performance gains.

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Appendix – Scales

Table A1: Measurement Instrument

Construct	Measurement Items
Please select one organization on which you are currently serving as a board member, the one you are most familiar with, and refer to it in all of the following questions in the survey.	
Board IT Governance (Jewer and McKay, 2012)	Please indicate the extent to which the board is involved in the following activities: (1= To a very small extent, 7= To a very large extent) - Monitors that IT delivers against the strategy through clear expectations and measurement - Performs IT governance assurance and self-assessment - Identifies possible IT threats and opportunities critical to the future of the organization - Shapes the business/strategic alignment - Advises during major IT decisions
Firm performance (Turel & Bart, 2014)	Please state your level of agreement with the following statements: - What is the relative "performance standing" of the organization in its industry (i.e., compared to competitors)? (1= Significantly below, 7=Significantly above) - The Board's satisfaction with the organization's current financial performance. (1= not at all satisfied, 7=Extremely satisfied) - My satisfaction with the organization's current financial performance. (1= not at all satisfied, 7=Extremely satisfied)
Authoritative Governance Style by the Board (Dornbusch et al., 1987)	In the organization… (1=strongly disagree, 7=strongly agree) - the board tells management that the board is always willing to help. - as a response to good performance, the board gives management more freedom to make decisions. - as a response to poor performance, the board offers help.
Environmental Dynamism (Chakravarty et al., 2013)	Please state your level of agreement with the following statements regarding the industry or market in which your organization operates: (1=strongly disagree, 7=strongly agree) - A lot of user firms join and/or leave our marketplace. - Our competitors' behaviors exhibit a lot of variability. - We are often surprised by our customers' behavior. - There are frequent changes in the technical knowledge base of our environment.
Controls	

Construct	Measurement Items
Industry IT dependence (Kearns & Lederer, 2004)	To what extent would you consider organizations in your industry to: (1= To a very small extent, 7=To a very large extent) - be dependent on IT for their operations? - be dependent on IT for strategic advantage?
Organization Size	Approximately how many employees does the organization have? (from less than 50 to over 10,000)
Ratio of outside directors	the number of outside directors divided by the total number of director in an organization - How many directors are on the board? - How many outside directors are on the board? (Outside directors are those members on the board who are not employed as part of the organization's management team, their subordinates, relatives, or managers of the organization's subsidiaries. Also these directors are not members of the organization's immediate past management team.)
Ratio of IT spending from sales	IT expenses divided by total sales - Total $ spent last year on Information Technology (IT) (Millions $; e.g., for 10,000,000, put in 10): - Recent year sales (Millions $; e.g., for 10,000,000, put in 10):
Descriptive Variables	
Board Role/s	What are your current board title(s) in this organization? Please select as many as apply: - Chair, Vice Chair, Chair – Audit and Finance Committee, Chair – Governance and Nominating Committee, Chair – Human Resources and Compensation Committee, Chair – Strategic Planning Committee, Chair – Other (please specify in the box below), Board Member (only)
Number of Boards a Director serves on	How many boards do you currently serve on – including this one? _____boards
Age of firm	When was the organization (the one you refer to) founded? _____
Industry	Please pick from the list below the industry which best describes the market in which this organization operates: - Advanced technology, Agriculture, Bank and savings, Chemicals, Construction and building, Consumer products, Government corporation, Ecommerce, Education, Electronics, Energy/ utilities, Entertainment/hospitality, Forest and paper products, Healthcare products/ Pharmaceutical, Other