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## Antecedents and Consequences of Board IT Governance: Institutional and Strategic Choice Perspectives

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### Abstract

*In spite of the potential benefits of board IT governance and the costs of ineffective oversight, there has been little field-based research in this area and an inadequate application of theory. Drawing upon strategic choice and institutional theories, we propose a theoretical model that seeks to explain the antecedents of board IT governance and its consequences. Survey responses from 188 corporate directors across Canada indicate that both board attributes and organizational factors influence board involvement in IT governance. The results suggest that proportion of insiders, board size, IT competency, organizational age, and role of IT influence the board's level of involvement in IT governance. The responses also indicate that board IT governance has a positive impact on the contribution of IT to organizational performance. Overall, the results support the integration of strategic choice and institutional theories to explain the antecedents to board IT governance and its consequences, as together they provide a more holistic framework with which to view board IT governance.*

**Keywords:** *IT Governance, Board of Directors, Corporate Governance, Strategic Choice Theory, Institutional Theory, Contribution of IT to Organizational Performance.*

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# Antecedents and Consequences of Board IT Governance: Institutional and Strategic Choice Perspectives

## 1. Introduction

The practitioner and academic literature has paid increased attention to the practice of information technology (IT) governance by boards of directors. However, it seems that many corporate boards do not explicitly practice a formalized style of IT governance, and of those that do, many face significant challenges. The potential impact of ineffective IT governance is clear, with organizations spending an increasing amount on IT, with a median level of spending on IT hitting 1.8 percent of revenues for organizations in the US (Computer Economics, 2010), and a large percentage of these IT investments failing to deliver their intended return. Recently, studies have suggested the need for effective board-level IT governance in order to realize value from IT (e.g., Andriole, 2009; Buckby, Best, & Stewart, 2005; IT Governance Institute, 2003; Nolan & McFarlan, 2005; Trites, 2004).

In spite of the increased recognition of the potential benefits of board IT governance in the literature and the well known issues with IT failures, there appears to have been little field-based research conducted in this area, and little application of theory to examine board IT governance. Specifically, the relationship between board IT governance and IT value has not been empirically evaluated. Drawing upon two complementary perspectives – strategic choice and institutional theories – we propose a theoretical model that seeks to explain the antecedents of board IT governance and its consequences.

The theoretical model has three premises. First, based upon strategic choice theory, we suggest that board attributes – proportion of insiders, size, and IT competency of directors – reflect the potential level of IT strategic judgment of a board, and also influence a board's potential involvement in IT governance. Second, we suggest that it is insufficient to simply examine the influence of individual board member attributes on board IT governance, because this approach does not consider institutional pressures. Therefore, based upon institutional theory, we propose that organizational characteristics – size, age, and role of IT – also influence a board's involvement in IT governance. Third, based upon the argument from strategic choice theory that organizational strategy impacts firm performance, and that board involvement improves organizational strategy, we propose that the extent to which IT contributes to firm performance is a function of the level of board involvement in IT governance.

To explore the proposed model, we first conducted interviews with corporate directors to examine the theoretical premises, and used the interview results to develop the survey instrument. We then executed an online survey to explore the model across a larger number of boards.

We first define board IT governance and discuss the characteristics of IT that distinguish it from boards' other governance responsibilities. We then overview the applicable IT governance literature with a focus on the role of the board in IT governance and highlighting the gap between practice and theory. Next, we describe, in general, strategic choice and institutional theories, and follow with the research model and propositions. We then present the methodology, which includes the data collection process, the development of measures and the validation process, and the examination of the model using multiple regression. Finally, we discuss the findings and propose the contributions of the research.

## 2. Board IT Governance Defined

According to a number of researchers, there remains limited understanding of the role of the board in IT governance (e.g., De Haes & Van Grembergen, 2005; Huff, Maher, & Munro, 2006; Jordan & Musson, 2004; Trites, 2004). The situation is confounded by the lack of one generally accepted definition for IT governance (De Haes & Van Grembergen, 2005; Simonsson & Johnson, 2005). Van Grembergen and De Haes (2009) present one of the most recent definitions:

*Enterprise governance of IT is an integral part of enterprise governance and addresses the definition and implementation of processes, structures and relational mechanisms in the organization that enable both business and IT people to execute their responsibilities in support of business/IT alignment and the creation of business value.*

This research adopts one of the most widely cited definitions:

*IT governance is the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives (IT Government Institute, 2003, p.10).*

These definitions are similar in terms of substance; however, we adopt the definition of the IT Governance Institute because this definition specifically delineates IT governance as a responsibility of both the board of directors and executive management. This is important because most IT governance research has not focused on how the board is involved and has instead focused on executive management's use of organizational structures and the contingencies that influence the choice of structure (Brown & Grant, 2005). There is an important distinction between IT governance and IT management – IT governance is the responsibility of the board, and the implementation of IT governance mechanisms in the organization is the responsibility of executive management, as a part of IT management. This distinction can impact research agendas and the use of research results.

### 3. Corporate Governance vs. IT Governance

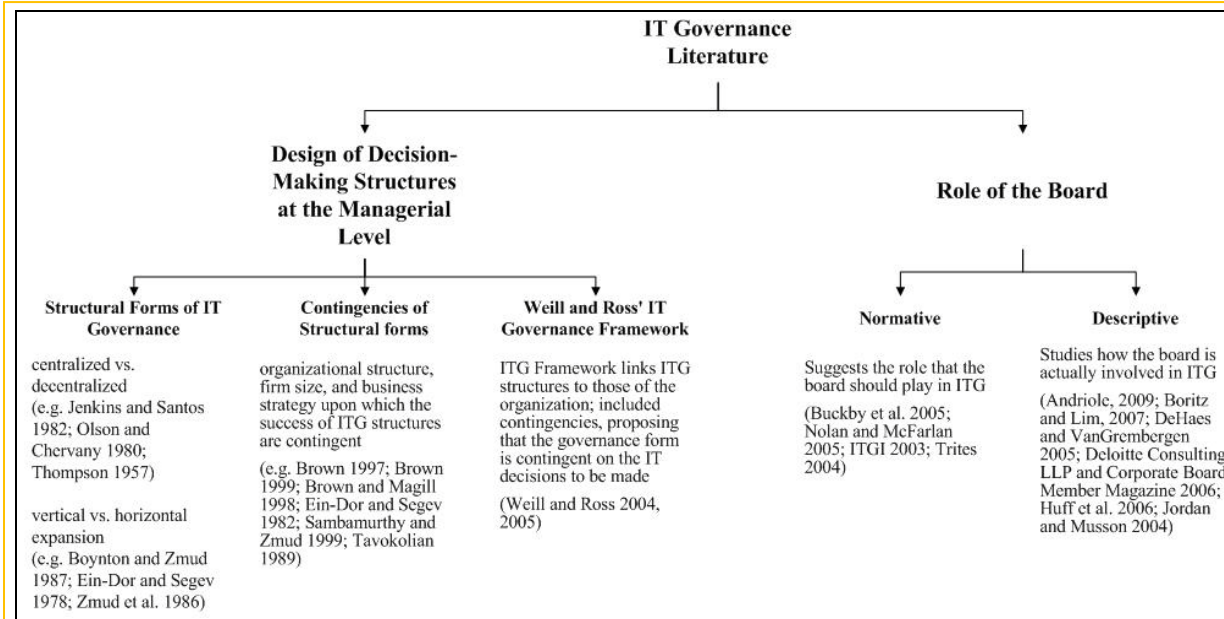
Most regard the key role of the board as the separation of oversight from management decision making, thus assuring stakeholders that the organization is using its resources as intended.

There are many empirical studies on the antecedents and consequences of board involvement in corporate governance (e.g., refer to LeBlanc, 2003, and Appendix B for an extensive summary of the literature); however, it is not sufficient to assume that these are the same for IT governance because of the differences between IT and other areas of an organization traditionally governed by the board. In particular, the pervasiveness, complexity, and rapidly changing nature of IT have changed the knowledge and experience required to govern an organization (Weill & Ross, 2004). Furthermore, IT may also require domain-specific knowledge and experience required for its governance and for understanding the impact of IT on the business operational and strategic goals. Thus, the inherent differences between IT and traditional areas of corporate governance suggest the need to better understand board IT governance.

### 4. Literature Review – IT Governance

The overall scope of IT governance is situated at multiple layers in the organization – at the management level, and at the strategic level where the board is involved (De Haes & Van Grembergen, 2008b). Accordingly, as shown in Figure 1, the IT governance literature can be classified into two separate streams. The first focuses on the design of decision-making structures at the managerial level, while the second focuses on the role of the board.

The first stream – which focuses on the design of decision-making structures at the managerial level – appears to be the predominant line of research in the literature. In a general review of IT governance (Brown & Grant, 2005), we identified three categories focusing on the design of decision-making structures of IT governance: (1) IT organizational structures (centralized vs. decentralized and horizontal vs. vertical); (2) contingencies of these IT governance structures; and (3) Weill and Ross' IT governance framework (2004), which is an extension of the other two categories.



**Figure 1. Review of IT Governance Literature**

The second stream of research – focusing on the role of the board in IT governance – can be classified as either normative or descriptive. The normative literature (Buckby et al., 2005; Nolan & McFarlan, 2005; IT Government Institute, 2003; Trites, 2004) advocates the importance of the board’s role in IT governance, while the descriptive literature studies how boards are actually governing IT (refer to Table 1).

**Table 1. Summary of Descriptive Studies of the Board’s Role in IT Governance**

	<b>Research Question</b>	<b>Data Collection</b>	<b>Sample</b>	<b>Findings</b>
Jordan and Musson (2004)	How are boards dealing with IT governance?	Interview	13 board members (with positions on 60 boards).	Knowledge of IT poor Limited experience in e-commerce e-commerce ventures primarily reviewed and implemented by consultants, not the board.
De Haes and Van Grembergen (2005)	Can IT governance be deployed using a mixture of structures, processes, and relational mechanisms?	Interview, review of reports	1 organization (Belgian Financial Group) Interviewed IT and business managers, CIO, IT governance project manager, member of the board, executive committee.	Executive Committee reports to the board monthly on major events and projects IT Strategy Committee consists of three board members; however, it “did not enable a more thorough and ongoing involvement of boards in IT governance” (p. 5). The “Board works at a very high, strategic level and they are consequently not the steering power for IT or IT governance” (p. 5).
Huff et al. (2006)	How are boards dealing with IT governance?	Interview	17 board chairs, board members and 17 CIOs in the same medium to large companies (half financial services and half primary resources).	IT attention deficit in boards CIOs think that boards should pay more attention. Boards pay attention to IT Risk. Half of financial service firms and no primary resources companies pay attention to other IT governance topics. None of the companies have board-level committees. CIOs do not support board-level committees.

<b>Table 1. Summary of Descriptive Studies of the Board's Role in IT Governance (cont.)</b>				
	<b>Research Question</b>	<b>Data Collection</b>	<b>Sample</b>	<b>Findings</b>
Deloitte Consulting LLP and Corporate Board Member Magazine (2006)	Is the board involved in IT Strategies?	Survey	455 directors at \$1B public companies worldwide (out of 10,000 surveys).	Overall think IT strategy and implementation is important to the success of the company 13.8% of boards completely and actively involved in IT. 66.5% think IT should be discussed at the board level. 56.4% of boards have 3 or more members knowledgeable in IT (only 8% of boards have no members with IT knowledge).
Andriole (2009)	Do boards of directors govern IT?	Survey	More than 50 CIOs and CTOs.	Boards do not participate nearly enough in major technology decisions, are out of the loop on technology issues, and are missing opportunities to optimize operational and strategic technology investments.
Parent and Reich (2009)	How can boards of directors govern IT risk?	Interviews, review of reports	17 interviews at 6 firms.	Suggest areas that should be considered by directors to govern IT risk such as IT compliance risk, infrastructure risk, project risk, business continuity risk, and information risk.
Bart and Turel (2010)	The extent to which the IT governance questions proposed by the CICA were being used in practice.	Survey	94 Directors.	Board members ask only about 44.4% of the 27 CICA IT board governance questions. Suggested that board members may simply not be paying sufficient attention to the governance of IT in their organizations due to lack of knowledge or education.

As Table 1 shows, a review of the descriptive literature revealed very few studies concentrating on how the board is actually involved in IT governance. Although the number of studies is relatively small, the consensus is that boards are not fulfilling their IT governance duties effectively. The studies imply that a gap exists between the normative and descriptive research, with the board's involvement in IT governance in practice falling well short of the level of involvement proposed in the literature. In addition, the review of the literature did not find any empirical studies examining the antecedents or consequences of board IT governance.

## 5. Theoretical Background

We have focused on the institutional and strategic choice perspectives as a way of theorizing about board IT governance. The theories operate under different, partially-overlapping theoretical assumptions, and thus, each theory gives a limited explanation of the whole phenomenon of the antecedents to board IT governance and its consequences. Together, they provide a more holistic framework with which to view board IT governance.

### 5.1. Strategic Choice Theory

Strategic choice theorists focus on organizational actors and the role that they play in organizational change, instead of focusing solely on change as a passive environmental selection process, which is the focus of institutional theory (Child, 1997). Strategic choice theorists propose that structural determinism (i.e., institutional theory) is inadequate because it ignores the influence that leaders of organizations may have on the design and structure of organizations.

### 5.2. Institutional Theory

Institutional theorists emphasize "environmental norms and the weight of firm history as explanations of organizational actions" (Judge & Zeithaml, 1992, p. 769). Institutional theorists, thus, view

organizational behavior as “the product of ideas, values and beliefs” – institutional pressures – and propose that “organizational behaviors are responses to not only market pressures but to institutional pressures” (Greenwood & Hinings, 1996, p. 1025).

### 5.3. Integration of Theories

We propose that strategic choice and institutional theories offer complementary views of why boards decide to become involved in the governance of IT. Proponents of these theories have noted the need to apply both theories together to understand organizational behavior and that one of these theories – either a purely deterministic or non-deterministic perspective – would be insufficient for explaining organizational behavior (e.g., Hitt & Tyler, 1991; Oliver, 1991). “The major criticisms of institutional theory have been its assumptions of organizational passivity and its failure to address strategic behavior and the exercise of influence in its conceptions of institutionalization” (Oliver, 1991, p. 173). Furthermore, strategic choice theory has evolved from its original conception of decision-makers’ choice to extend to the environment within which the organization is operating, thus, viewing organizational structure and design as a factor of both characteristics of decision-makers’ and environmental conditions.

Institutional and strategic choice theories have primarily been applied in the context of organizational structures. We found one study that applied these theories together in the context of corporate governance (Judge & Zeithaml, 1992). According to Judge and Zeithaml (1992), a board’s response to an environment depends on the institutional pressures an organization faces and the strategic judgment of top management. Strategic choice theory also offers a view of the consequences of board IT governance. This theory has been applied in the context of the performance outcomes associated with corporate governance (Judge & Zeithaml, 1992); however, our review of the literature did not find any studies that directly applied this theory to examine the performance outcomes of board IT governance.

## 6. Theoretical Model and Propositions

In the next few sections, this paper discusses the theoretical model and propositions, which Table 2 shows. The model proposes how the exercise of strategic choice and institutional forces impact the antecedents and consequences of board IT governance.

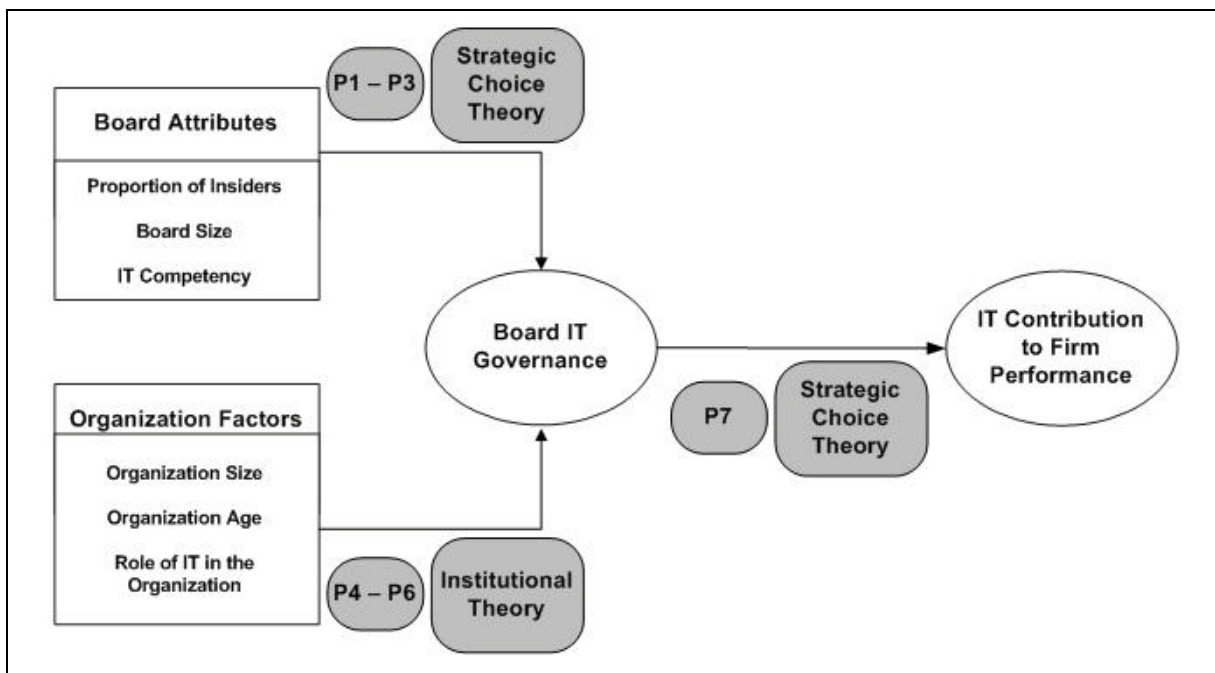


Figure 2. Theoretical Model: Antecedents and Consequences of Board IT Governance

## 7. Antecedents to Board IT Governance

### 7.1. Board Attributes and Board IT Governance

As noted above, the model uses strategic choice theory to propose relationships between board attributes and board IT governance. Although prior research has not applied this theory to IT governance, strategic choice theory would suggest that board composition may influence the boards' fulfillment of different roles.

Board attributes refer to characteristics of the board: the proportion of insiders to outsiders, board size, and the IT competency of directors. We discuss each of these characteristics and the proposed relationship with board IT governance in turn.

We refer to inside directors as those members of the board who are employed as part of the organization's management team, their subordinates, relatives, or managers of the organization's subsidiaries. Also, these directors could be members of the organization's immediate past management team (Cochrane, Wood, & Jones, 1985).

The proportion of inside directors appears to have been one of the most commonly studied variables in the corporate governance literature. There has been increasing pressure for boards to decrease their proportion of insiders based on the idea that the interests of insiders are aligned with those of management, while those of outsiders are aligned with stockholders. Thus, whereas insiders may be more likely to pursue strategies consistent with maximizing the size and diversity of the firm, outsiders may be more likely to pursue strategies consistent with maximizing the long-run profitability of the firm (Hill & Snell, 1988). Extensive prior research finds evidence consistent with this argument (see Hermalin & Weisbach, 2003). However, many boards still have inside directors with, on average, inside directors making up 25 percent of board membership (University of Southern California Center for Effective Organizations and Heidrick & Struggles, 2007). In fact, there is some empirical and theoretical research supporting the desirability of inside directors on boards (e.g., Klein, 1998; Bhagat & Black, 2002; Hermalin & Weisbach, 1988; Mace, 1986).

These studies focus on the proportion of insiders as proxies for board processes, and the relationship between these proxies and some other measure, such as financial performance, instead of directly examining the relationship between proportion of insiders and governance involvement. We found three studies that explore the construct of board involvement directly in empirical studies and examine the relationship between proportion of insiders and governance. However, these studies yield mixed results. For example, Judge and Zeithaml (1992) and Baack (2000) find a negative relationship between insider representation and board involvement. Whereas Westphal (1999) find that insiders can increase board involvement by raising the frequency of advice and counsel interactions between CEOs and outside directors.

It remains unclear what impact the proportion of insiders has on board involvement in governance. However, using strategic choice theory as the lens through which to study this relationship draws attention to the relevance of information for the exercise of strategic choice and points to the necessity of securing relevant information that is not ambiguous. We propose that insiders have relevant knowledge of IT and business activities that allow them to notify the board about organizational issues that necessitate board IT governance. Therefore, we propose that:

**Proposition 1:** *Insider representation is positively related to board IT governance.*

Board size is another of the most commonly studied variables in the corporate governance literature. While board size has been the subject of extensive research, we only found one study in the literature that directly studies the relationship between board size and board involvement in corporate governance. In that study, Judge and Zeithaml (1992) find a negative relationship between these variables.

Strategic choice theory focuses on management’s perceptions of environmental conditions and its ability to make decisions that cope with those conditions (Miles & Snow, 1978). Therefore, with respect to IT governance, strategic choice theory would suggest that the degree and type of board involvement will depend on the ability of the board to work together to effectively debate and discuss the organization’s IT. Therefore, we propose that:

**Proposition 2:** *Board size is negatively related to board IT governance.*

This research defines IT competency as the extent to which a board has IT expertise and uses IT governance mechanisms to govern IT. It is suggested that, while IT expertise and IT governance mechanisms are separate, both are required for IT competency.

Expertise refers to “the characteristics, skills, and knowledge that distinguish experts from novices and less experienced people” (Ericsson, 2006). Previous studies of boards’ IT governance have suggested that boards may be falling short in their IT governance responsibilities because of an IT knowledge deficit (Bart & Turel, 2010; Huff et al., 2006).

The second component of board IT competency is IT governance mechanisms. It is suggested that IT governance mechanisms increase the capacity of the board to acquire, interpret, and disseminate information, thus, increasing the ability of the board to govern IT. At the managerial level, it has been suggested that IT governance can be enacted using a variety of IT governance mechanisms – structures, processes, and relational mechanisms (e.g., De Haes & Van Grembergen, 2005, 2008a; Peterson, 2003; Weil & Ross, 2004). Table 2 outlines examples of IT governance mechanisms.

**Table 2. IT Governance Mechanisms<sup>1</sup>**

Structures	Roles and responsibilities, IT organization structure, CIO on Board, IT strategy committee, IT steering committee
Processes	Strategic Information Systems Planning, Balanced (IT) Scorecards, Information Economics, Service Level Agreements, COBIT and ITIL, IT alignment / governance maturity models
Relational Mechanisms	Active participation and collaboration between principle stakeholders, Partnership rewards and incentives, Business/IT co-location, Cross-functional business/IT training and rotation

There have been a number of IT governance mechanisms recommended for the board, including: forming an IT Strategy Committee, engaging outside experts, reviewing and critiquing IT strategy projects and IT security practices, holding sessions with the CFO, and holding executive sessions with committee members (IT Governance Institute, 2003; Nolan & McFarlan, 2005).

In this study, we examined how director IT competency, including IT expertise and IT governance mechanisms, influence IT governance. According to strategic choice theory, external constraints (environmental determinism) are insufficient for explaining decision-makers’ capacities for exercising choice, and one must also consider the characteristics of the decision-maker (action determinism), because predetermined mind-sets could limit the range of strategic choices recognized and considered by decision-makers (Whittington, 1988). In summary, board decisions are strategic in nature, and when faced with such decisions, decision-makers typically perceive only selected alternatives and adopt a simplified model of the situation that is largely shaped by their prior knowledge and experience (Geletkanycz & Hambrick, 1997). This research suggests that IT governance mechanisms increase information sources, thereby enabling directors to obtain more IT information both inside and outside of the organization, and thus, increase the board’s capacity to govern IT. Therefore, we propose that:

**Proposition 3:** *IT competency is positively related to board IT governance.*

<sup>1</sup> Adapted from Peterson (2003).



## 8. Organization Factors and Board IT Governance

This research uses institutional theory to propose relationships between organizational factors and board IT governance (Figure 2).

While we have not found any studies using institutional theory to examine IT governance at the board level, we did find two studies that use institutional theory to examine IT governance at the organizational level<sup>2</sup>. These studies argue that removing the assumption of rationality (followed by much of the research) and using institutional theory as a new lens through which to view different IT governance modes has the potential to offer new insights into understanding the drivers of governance. Jacobson (2009) suggests that "Examining institutional pressures and context can illuminate how IT governance is actually done. A much more dynamic picture is likely to emerge of IT governance in a context that both enables and constrains action". Similarly, Boubaker and Nyhrinen (2008) propose that institutional pressures play a role in determining the IT governance mode.

We propose that, in addition to rational pressures, institutional factors – referred to in this study as organizational factors – have an influence on board involvement in IT governance. Organizational factors refer to the size of the organization, the age of the organization, and the role of IT in the organization. We discuss each of these factors in turn.

The relationship between organization size and board involvement does not appear to have been studied with respect to IT governance; however, it has been studied with respect to corporate governance (e.g., Baack, 2000; Judge & Zeithaml, 1992). Judge and Zeithaml (1992) examine the relationship between the structural differentiation of organizations and board involvement in corporate governance. This is relevant because larger organization size has been suggested to be associated with increased structural differentiation (Blau, 1970). Judge and Zeithaml (1992) find that increased differentiation is negatively associated with board involvement. They use institutional theory to explain the relationship between differentiation and board involvement and suggest that "an organization's level of diversification will be negatively associated with board involvement because isomorphic pressures should be more diffuse for diversified firms than for non-diversified ones" (Judge & Zeithaml, 1992, p. 773). This research uses organization size as a proxy for level of differentiation, and, thus, views larger organizations as more differentiated. Therefore, we propose that:

**Proposition 4:** *Organization size is negatively related to board IT governance.*

It has been suggested that organizational processes reflect the practices at the time of founding because the organization adopts the predominant practices in that time. Furthermore, since organizational processes change slowly, many of the practices remain unchanged from the time of organization founding (Eisenhardt, 1988; Stinchcombe, 1965; Tolbert & Zucker, 1983).

Stinchcombe (1965) first discusses this concept. He suggests that "the organizational inventions that can be made at a particular time in history depend on the social technology available at the time" (p. 153). He finds that organizations that were formed at one time typically have a different social structure from those formed at another time. More recent studies have also found a relationship between time of founding and organization structure (e.g., Eisenhardt, 1988; Tolbert & Zucker, 1983). According to this view, board activities, and thus, board IT governance, reflect a pattern of doing things that evolve over time and become legitimated within the board and the organization. Board activities are then resistant to change even in the face of major changes in the organization, such as the emergence of the strategic importance of IT. This research proposes that the institutional perspective holds and a board's current practices reflect those at the time of founding. Therefore, we propose that:

**Proposition 5:** *Organization age is negatively related to board IT governance.*

The normative IT governance literature recommends a view of board involvement contingent on characteristics of the organization and its use of, and dependence on, IT (IT Governance Institute,

<sup>2</sup> The authors would like to thank one of the reviewers for referring us to these two studies.

2003; Nolan & McFarlan, 2005). In a recent survey of directors, Bart and Turel (2010) find tentative support for the possibility of such a contingency-based view of IT governance based on the role of IT in the organization. Since institutional theory would suggest that industry norms influence organizational processes through isomorphism (DiMaggio & Powell, 1983), and organizations with a high reliance on IT would likely be operating in an industry that also relies highly on IT, the industry norm would likely be higher board involvement in IT governance. Therefore, we propose that:

**Proposition 6:** *Overall role of IT in the organization is positively related to board IT governance.*

## 9. Consequences of Board IT Governance

As Figure 2 shows, we use strategic choice theory to develop Proposition 7 regarding the relationship between board IT governance and the contribution of IT to firm performance.

It has been argued that the management of IT, not just the quantitative investment in IT, can impact performance (Mata, Fuerst, & Barney, 1995; Byrd & Turner, 2001; Chatterjee, Richardson, & Zmud, 2001). There is empirical evidence showing that the quality of the IT department can impact firm performance (Bharadwaj, 2000; Byrd & Turner, 2001; Santhanam & Hartono, 2003) and that CIO strategic decision-making authority influences the contribution of IT to firm performance (Preston, Chen, & Leidner, 2008). Based on this research and strategic choice theory, we theoretically derive the argument that the extent to which IT contributes to firm performance is a function of the level of the board's involvement in IT governance. We did not find an empirical study directly examining the consequences of board IT governance during the literature review; however, evidence from a recent study on the relationship between proxies for board IT governance and firm performance suggests that a positive relationship exists (Boritz & Lim, 2007). In fact, there is empirical support for a positive relationship between board involvement in corporate governance and financial performance (Judge & Zeithaml, 1992) and between proxies for board involvement in governance and firm performance (refer to Zahra and Pearce, 1989, for a review).

According to strategic choice theory, organizational strategy and its processes affect firm performance (Miles & Snow, 1978). It has been argued that increased board involvement improves organizational strategy and its processes by "forcing managers to check their assumptions and do their homework before advancing strategic proposals", and by "helping to challenge narrow thinking, escalating commitment, and weak analysis" (Judge & Zeithaml, 1992, p. 775). In fact, boards have the latitude to promote and provide oversight of strategic proposals, including IT proposals, that add value to the organization. Furthermore, there is some research indicating that when boards provide richer information, management is more likely to engage in behaviors that are consistent with stockholders interests (Richardson, 2000). Therefore, we propose that:

**Proposition 7:** *Board IT governance is positively related to the contribution of IT to firm performance.*

## 10. Methodology

To test the model, we conducted interviews and a survey. Since the model comprises measured and latent variables, we first conducted exploratory factor analysis (EFA) on the latent variables to analyze the sets of items that measure those constructs<sup>3</sup>. Next, we used ordinary least squares multiple regression to analyze the results. Each of these procedures is reported below.

### 10.1 Data Collection

We first conducted 10 in-depth interviews with corporate directors to probe how they govern IT, what influences their involvement in IT governance, and what have been the performance consequences. The 10 directors interviewed were on a total of 47 boards, with each director on an average of five

<sup>3</sup> EFA is useful for data reduction by condensing the information contained in a number of original variables into a smaller set of new, composite dimensions, with a minimum loss of information (Hair, Anderson, Tatham, & Black, 1998). EFA based on the Maximum Likelihood Extraction method, combined with varimax rotation was used for each of the latent variables.

boards. The boards were from a variety of industry sectors, with banks, savings, and other financial institutions representing the largest proportion of the sample. Additionally, the directors interviewed had an average of 13 years' experience on boards, and most, seven out of the 10, identified themselves as having no prior experience working in an IT role or in the management of IT in an organization. Each interview took an average of 75 minutes to complete and consisted of an in-depth discussion of one IT governance decision and/or incident with which the director was involved while serving on a board, and a semi-structured questionnaire to discuss IT governance on all of the boards of which the director was a member.

We used the results from the interviews, combined with findings in the literature, to create a survey to assess broad relationships between the antecedents and consequences of board IT governance. We paid specific attention to the interviews to develop measures for the constructs where measures have not been developed in past literature, namely board IT governance and IT competency. We used the transcribed interviews to augment the questions for the IT governance and IT competency constructs in the survey. The intention was to ensure that the components of board IT governance and IT competency provide an adequate coverage of the constructs. The interview phase provided some preliminary evidence to justify the next phase of research – investigating the propositions in a more quantitative fashion.

We pre-tested the survey and redesigned it to address the comments of the pre-test participants<sup>4</sup>.

We then administered an electronic survey to the approximately 3,200 members of the Institute for Corporate Directors (ICD), and received 193 responses. It is difficult to determine the response rate because the survey was limited to respondents who were currently serving on a board of directors (self-identifying). The ICD's Director of Communication indicated that 83 percent of the members classify themselves as a director; however this does not necessarily mean that a member is currently serving on a board. Therefore, a conservative estimate of the response rate would be 7 percent (193 out of 2,656 members – 83 percent of 3,200 members). However, it is likely that the response rate is higher, as not all of the 2,656 members that classify themselves as directors were currently serving on a board. A survey of directors on IT governance in the professional literature reported a response rate of 0.046 percent (Deloitte Consulting LLP and Corporate Board Member Magazine, 2006). Appendix A provides an overview of the general characteristics of the 188 responses to our survey that were included in the final analysis<sup>5</sup>. Due to lack of information on non-respondents, it was not possible to test if the responding group differed from the non-respondents.

Since directors often serve on more than one board, they were asked to respond for the board of the largest organization they served. The responses were from many different industries, with no industry representing more than 11.2 percent of the sample. The largest percentages of respondents were from energy/utilities (11.2 percent), other service company (10.1 percent), other financial services companies (7.4 percent), insurance (6.9 percent), and advanced technology (6.4 percent). In addition, no one ownership type dominated the responses. Ownership of the organizations was almost evenly divided among non-profit (27.7 percent), privately (30.9 percent) and publicly (27.7 percent) held companies, with the rest of the responses from governmental organizations (13.3 percent).

We also asked the respondents to identify some information about themselves. We first asked respondents to identify their current role(s) on the board. Please note that the total percent is greater than 100 because respondents were able to select multiple roles on the board. Notably, 46.3 percent of the respondents indicated that they were outside directors. This reflects guidelines in the literature that recommend that board composition consist of a large proportion of outside directors. In addition,

<sup>4</sup> Pre-testing of the survey was conducted with two corporate directors, two leading researchers in IT governance, and an expert in survey design. During the pre-test, participants were asked to respond to the survey questions and give feedback on any of the items and any other issues they wished to share. The pre-test revealed comments on the survey layout, wording of the questions, and length of the survey.

<sup>5</sup> Of the 193 responses to the survey, four responses were omitted because they contained few or no answers to the survey questions. One additional response was deleted because multiple regression of board attributes and organization factors on board involvement in IT governance revealed that the response was an influential outlier. Multiple regression is highly sensitive to such responses, as they can overstate the coefficient of determination, give erroneous values for the slope and intercept, and lead to false conclusions about the model.

only 0.5 percent and 2.1 percent were CTOs and CIOs, respectively. This reflects the small proportion of CTOs and CIOs that sit on boards (e.g., Burson-Marsteller, 2005).

It seems reasonable to assume that most of the respondents were familiar with their board's approach to governance because 78.4 percent of the respondents had served for more than two years on the board for which they were answering the survey. Most of the respondents identified themselves as having little or no experience working directly in IT (less than two years) (66.8 percent). This relatively low level of director experience in IT roles is indicative of what has been found in previous studies (e.g., Burson-Marsteller, 2005; Huff et al., 2006). Finally, the respondents were split between those who had no or less than two years experience in the general management of IT (48.4 percent) and those who had two or greater years of this type of experience (51.6 percent).

### 10.2. Measures

The measures were derived from a combination of prior work, the IT governance literature, this study's theoretical model, and our interview findings. The definitions of the constructs and their corresponding references are in Table 3. Refer to Appendix B for the survey questions for the measured variables and for a list of the items for each construct resulting from EFA.

	<b>Construct</b>	<b>Definition of Construct</b>	<b>Translation of Construct to Items</b>	<b>Theoretical References</b>
<b>Board IT Governance</b>	Board IT Governance	The degree to which the board is involved in IT governance activities.	EFA extracted one factor for board IT governance.	Adapted from Nolan and McFarlan's contingency model of board IT governance (2005), and guided by results of this study's interviews with directors, and studies in the literature that directly measure the construct of board involvement in empirical studies (Judge & Zeithaml, 1992; Johnson, Hoskisson, & Hitt 1993; Westphal, 1999; Baack, 2000).
	Proportion of Insiders <sup>6</sup>	Number of inside directors divided by the total number of directors on the board.		Common measure from the literature (see Johnson et al., 1993).
	Board size <sup>6</sup>	Total number of directors.		Common measure from the literature (see Johnson et al., 1993).
<b>Board Attributes</b>	IT Competency	Extent to which a board has IT expertise and uses IT governance mechanisms to govern IT.	EFA extracted: (1) A three-factor model for IT expertise – internal knowledge, external information, and experience and training. (2) A two-factor model for IT governance mechanisms - internal activities, and external activities.	(1) IT expertise scales adapted from Basellier, Benbasat, and Reich (2003) (2) IT governance mechanisms adapted from the literature (e.g., De Haes & Van Grembergen, 2005, 2008a, 2008b; IT Governance Institute, 2003; Nolan & McFarlan, 2005; Peterson, 2003; Weil & Ross, 2004)

<sup>6</sup> The proportion of insider and board size variables were transformed by taking their natural log. This logarithmic transformation was performed to adjust for the nonlinearity between the dependent and independent variables and, thus, to ensure that the regression of assumption of linearity was not violated.

**Table 3. Constructs and Items in Theoretical Model (cont.)**

	Construct	Definition of Construct	Translation of Construct to Items	Theoretical References
<b>Organization Factors</b>	Organization Size	The number of employees in the organization.		Common measure from the literature (see Judge & Zeithaml, 1992).
	Organization Age	Number of years since the organization was founded.		Common measure from the literature (see Judge & Zeithaml, 1992).
	Role of IT	The degree to which the organization has strategic or operational reliance on IT.	EFA extracted factors that are consistent with those proposed by Raghunathan et al. (1999). EFA extracted: (1) A three-factor model for strategic reliance on IT - managerial support, differentiation, and enhancement. (2) A one-factor model for operational reliance on IT.	Raghunathan, Raghunathan, and Tu (1999)
<b>IT Contribution to Firm Performance</b>	IT Contribution to Firm Performance 7	Self-report of the degree to which IT contributes to: return on investment (ROI), sales revenue increase, market share increase, cost savings, operating efficiency, process improvement, and customer satisfaction.	EFA extracted two-factors: (1) external performance metrics (consisting of sales revenue increase, market share increase, customer satisfaction, ROI), and (2) internal performance metrics (consisting of process improvement, operating efficiency, and cost savings) .	Preston et al. (2008)

The measured variables – proportion of insiders, board size, organization size, and organization age – are based on common measures in the literature (see Table 3) and require little comment; however, further discussion of the latent variables follows. EFA indicated that there was strong convergent and discriminatory validity in the data with the items included in each scale having moderate to very high factor loadings (all above 0.537). This indicated that the scales were measuring the intended concepts. In addition, reliability analysis (Cronbach’s alpha) tended to indicate excellent reliability (0.692 to 0.943), thus suggesting that the items in each scale reflected the same construct.

### 10.3. Board IT Governance

We reviewed the more general corporate governance literature to provide insight on how to measure board involvement in governance. Interestingly, prior research has seldom directly examined how

<sup>7</sup> Examination of the survey data revealed that there was a large percentage of answers of “not applicable” for the operational performance variables for non-profit and government organizations. Therefore, these organizations were eliminated from this analysis and only privately held and publicly traded organizations were included (comprising 110 responses) in the analysis of the consequences of board IT governance.

<sup>8</sup> Since multiple regression requires one dependent variable, an overall operational performance measure was computed by summing the standardized scales of the external and internal performance dimensions.

boards conduct corporate governance. We found four studies that have explored the construct of board involvement in corporate governance directly in empirical studies (Judge & Zeithaml, 1992; Johnson et al., 1993; Westphal, 1999; Baack, 2000). Building upon these studies and guided by the interviews we conducted, this research measures board IT governance using actual directors' behaviors and actions in IT strategic decision making and oversight of IT. By using objective criteria for measuring board involvement, this model examines what is happening at the board level, rather than relying exclusively on proxy variables (e.g., board size or proportion of insiders) as indicators of what might or could be happening. As can be seen in Appendix B, the EFA extracted one factor for board IT governance.

#### 10.4. IT Competency

Although we found no measures of IT competency in the context of board IT governance in the literature, there are several measures that provided a starting point. Basellier et al. (2003) developed IT expertise scales for business managers, and we used these IT expertise scales as a basis for the measure of IT expertise of directors in this research. IT governance research has also pointed to the presence of IT governance mechanisms such as structures, processes, and relational mechanisms as imperative to the proper governance of IT. Most of this research has focused at the managerial level; however, several studies have also been conducted at the board level (e.g., Boritz & Lim, 2007; De Haes & Van Grembergen, 2005). We added to and modified the IT expertise and IT governance mechanisms measures in the literature to ensure that all measures were appropriate for the board of directors in the context of providing IT governance.

Using EFA, we made iterative modifications to the items to measure IT expertise. Any items that did not have strong convergent and discriminate validity were deleted from the EFA until satisfactory levels were reached. The final three-factor model – internal knowledge, external information, and experience and training – is presented in Appendix B<sup>9</sup>.

Using EFA, we also made iterative modifications to the items to measure the level of IT governance mechanisms present on the board. As with the IT expertise construct, we deleted from the EFA any items that did not have strong convergent and discriminate validity for the IT governance mechanisms construct until satisfactory levels were reached. The final two-factor model – internal activities and external activities – is presented in Appendix B<sup>10</sup>.

#### 10.5. Role of IT

EFA of the role of IT revealed factors that are consistent with those proposed by Raghunathan et al. (1999) (Appendix B). Just as in Raghunathan et al. (1999), we found that the items comprising the operational reliance on IT capture the importance of the organization's current systems to the achievement of its current operations. Additionally, the three factors – managerial support, differentiation, and enhancement – comprising the strategic reliance on IT represent three ways that new IT can have a future role in an organization.

#### 10.6. IT Contribution to Firm Performance

Since many of the respondents are from non-public organizations, this research uses primary (subjective) sources of operational performance data. The operational performance measure used in this research is a self-report of the degree to which IT contributes to seven operational performance measures that Preston et al. (2008) derived in previous research. The two-factor measure represents two dimensions of IT contribution to firm performance. The first factor captures the external performance metrics, and the second factor captures the internal performance metrics (Appendix B).

<sup>9</sup> The first factor, internal knowledge, captures the extent to which board members are knowledgeable about IT policies, performance, budget, or other information within the organization. The second factor, external information, focuses on the extent to which board members are knowledgeable about information outside of the organization or technology, in general. The third factor, experience and training, consists of the extent of experience and training of directors on the board.

<sup>10</sup> The first factor, internal activities, captures the structures, processes, and relational mechanisms that involve activities that include the consideration of IT inside the boardroom. The second factor, external activities, refers to the processes that occur outside of the boardroom.

## 11. Data Analysis

Table 4 shows that five of the propositions were supported, one proposition was not supported, and one proposition had a contradictory finding<sup>11</sup>.

**Table 4. Summary of Survey Findings**

	Proposition		Findings and Direction	Conclusion
Antecedents to IT Governance	1	Proportion of Insiders → Board IT Governance	** (negative)	contradictory
	2	Board Size → Board IT Governance	* (negative)	supported
	3	IT Competency → Board IT Governance	** to *** (positive)	supported
	4	Organization Size → Board IT Governance	not significant	not supported
	5	Organization Age → Board IT Governance	** (negative)	supported
	6	Overall Role of IT → Board IT Governance	* to *** (positive)	supported
Consequences of IT Governance	7	Board IT Governance → Contribution of IT to Firm performance	*** (positive)	supported

Note: + p < .1, \* p < .05, \*\* p < .01, \*\*\* p < .001

Table 5 provides the Pearson bivariate correlations for the antecedents and consequences of IT governance. Board IT governance demonstrated bivariate correlation with all of the independent variables except for proportion of insiders and number of directors, indicating that these constructs appear to be important in understanding board involvement in IT governance.

**Table 5. Correlation Matrix**

	Insid	NoDir	ExpF1	ExpF2	ExpF3	MecF1	MecF2	OrelF1	SrelF1	SrelF2	SrelF3	Perf
NoDir	-.435**											
ExpF1	.021	-.068										
ExpF2	-.011	.011	.014									
ExpF3	-.105	.256**	-.004	.044								
MecF1	-.223*	.132	.611**	.127	.270**							
MecF2	.104	.032	.325**	.210*	.103	-.008						
OrelF1	-.120	.084	.260**	-.137	-.071	.202*	.073					
SrelF1	.026	.031	.220**	.006	-.157	.151	.267**	.284**				
SrelF2	-.117	.059	.354**	.160	.244**	.359**	.150	.348**	-.004			
SrelF3	-.081	.060	.229**	.016	-.061	.293**	-.067	.409**	.001	-.002		
Perf								.410**	.210*	.485**	.086	
ITG	-.163	.009	.641**	.293**	.239**	.577**	.422**	.190*	.307**	.326**	.182*	.447**

Legend: Insid = Proportion of Inside Directors, NoDir = Number of Directors, ExpF1 = IT Expertise Factor 1, ExpF2 = IT Expertise Factor 2, ExpF3 = IT Expertise Factor 3, MecF1 = IT Mechanisms Factor 1, MecF2 = IT Mechanisms Factor 2, OrelF = Operational Reliance on IT Factor, SrelF1 = Strategic Reliance on IT Factor 1, SrelF2 = Strategic Reliance on IT Factor 2, SrelF3 = Strategic Reliance on IT Factor 3, Perf = Contribution of IT to Performance, ITG = IT Governance.

\* Correlation is significant at the 0.05 level (2-tailed).  
 \*\* Correlation is significant at the 0.01 level (2-tailed).

We used ordinary least squares hierarchical multiple regression to analyze the antecedents and consequences of board IT governance. We performed regression diagnostics to assess the model's adherence to the regression assumptions and to identify any data problems. The analysis showed

<sup>11</sup> Regression diagnostics were performed to assess the model's adherence to the regression assumptions and to identify any data problems. The analysis showed that the model supported the assumptions that underlie multiple regression such as linearity, independence of errors, homoscedasticity, and normality of residuals. Furthermore, the analysis of the data problems focusing on the distance, leverage, and influence indicated that there were no problems present.

that the model supported the assumptions that underlie multiple regression such as linearity, independence of errors, homoscedasticity, and normality of residuals. Furthermore, the analysis of the data problems focusing on the distance, leverage, and influence indicated that there were no problems present. Table 6 shows the model summary at each step in the hierarchical regression of board involvement in IT governance on organization factors and board attributes.

<b>Table 6. Regression – Antecedents to Board IT Governance</b>			
	<b>Variables</b>	<b>Propositions 4, 5 and 6</b>	<b>Propositions 1, 2 and 3</b>
<b>Organization Factors</b>	Intercept	.109 (.245)	.498 (.412)
	Organization Size - Small <sup>a</sup>	-.268 (.315)	-.286 (.223)
	Organization Size – Medium <sup>a</sup>	-.467 (.291)	-.408+ (.205)
	Organization Size -Large <sup>a</sup>	-.152 (.293)	-.091 (.208)
	Organization Age – 20 years or less <sup>b</sup>	.307+ (.181)	.167 (.137)
	Operational Reliance on IT	-.119 (.109)	-.002 (.079)
	Strategic Reliance on IT – Factor 1 – Managerial Support	.335*** (.093)	.170* (.070)
	Strategic Reliance on IT – Factor 2 - Differentiation	.380*** (.093)	-.003 (.076)
	Strategic Reliance on IT – Factor 3 - Enhancement	.221* (.096)	.042 (.072)
<b>Board Attributes</b>	Proportion of Insiders		-.573** (.194)
	Board Size		-.785* (.369)
	IT Expertise Factor 1 – Internal Knowledge		.435*** (.095)
	IT Expertise Factor 2 – External Knowledge		.210** (.065)
	IT Expertise Factor 3 – Experience and Training		.218** (.072)
	IT Governance Mechanisms Factor 1 – Internal Activities		.146 (.098)
	IT Governance Mechanisms Factor 2 – External Activities		.185** (.074)
<b>Step 1</b>			
	F Value	4.962***	
	Model R-Square	.284***	
	Adjusted R-Square	.227***	
<b>Step 2</b>			
	F Value		13.049***
	Model R-Square		.678***
	Adjusted R-Square		.626***
	Change in R-Square		.394***
Coefficients listed are unstandardized betas. Standard errors are in parenthesis. + p < .1, * p < .05, ** p < .01, *** p < .001 <sup>a</sup> Dummy variable for organization size with "small" composed of those organizations with less than or equal to 100 employees, "medium" composed of those with 101-500 employees, "large" composed of those with 501-5000 employees, and the contrast group is those with 5001 or greater employees. <sup>b</sup> Dummy variable for organization age with 0 = formed more than 20 years ago, 1 = formed 20 years ago or less.			

The first set of variables entered in the hierarchical regression, the organization factors, resulted in a statistically significant, explanation of variance ( = 0.284, p < 0.001). The second set of variables entered into the regression equation, board factors, explained a statistically significant increase in the board involvement in IT governance ( = 0.394, p < 0.001), for a total explained variance of = 0.678, p < 0.001. This indicates that organization factors are insufficient in explaining board involvement in IT



governance – explaining only 28.4 percent of the variance in board IT governance involvement – and that by also including board attributes, approximately 68 percent of the variance is explained.

As proposed, we found a significant negative relationship at the .05 level between board size and board IT governance (Proposition 2), and a significant positive relationship at the .01 to the .001 levels between IT competency and board IT governance (Proposition 3)<sup>12</sup>. However, a higher proportion of insiders on the board did not result in a significant positive effect on board IT governance (Proposition 1). Instead the opposite effect was found – the lower the proportion of insiders on the board, the more likely the board would be involved in IT governance, which contradicts Proposition 1.

With respect to the organization factors, organization size was not a significant predictor of board IT governance (Proposition 4). However, the rest of the propositions with respect to the relationship between organization factors and IT governance were supported. We found age to be significantly and negatively related to board IT governance at the .01 level (Proposition 5), and we found a significant positive relationship at the .05 to .001 levels between overall role of IT in the organization and overall IT governance involvement (Proposition 8)<sup>13</sup>. Table 7 shows the model summary at each step in the hierarchical regression of IT contribution to firm performance on board involvement in IT governance.

**Table 7. Regression – Consequences of Board IT Governance**

Variables	Proposition 7 – Model 1	Proposition 7 – Model 2
Intercept	.197 (0.424)	-.075 (.385)
Ownership <sup>a</sup>	.567+ (0.325)	.423 (.294)
Organization Size - Small <sup>b</sup>	-.687 (0.626)	-.192 (.573)
Organization Size – Medium <sup>b</sup>	-.490 (0.569)	.035 (.524)
Organization Size - Large <sup>b</sup>	-.948 (0.547)	-.587 (.497)
Organization Age – 20 years or less <sup>c</sup>	.294 (0.366)	.155 (.330)
IT Governance		.337*** (.073)
F Value	1.104	21.004***
Model R-Square	.062	.251***
Adjusted R-Square	.006	.197***
Change in R-Square		.190***

Coefficients listed are unstandardized betas. Standard errors are in parenthesis.  
 + p < .1, \* p < .05, \*\* p < .01, \*\*\* p < .001  
<sup>a</sup> Dummy variable for ownership with 0 = publicly traded, 1 = privately held.  
<sup>b</sup> Dummy variable for organization size with “small” composed of those organizations with less than or equal to 100 employees, “medium” composed of those with 101-500 employees, “large” composed of those with 501-5000 employees, and the contrast group is those with 5001 or greater employees.  
<sup>c</sup> Dummy variable for organization age with 0 = formed more than 20 years ago, 1 = formed 20 years ago or less.

Model 1 presents the control variables for the regression, and Model 2 adds the independent variable, IT governance, representing the full model. The control variables entered in the first step of the hierarchical regression (Model 1) did not result in statistically significant explanation of variance. However, the board IT governance variable entered in the second step of the regression

<sup>12</sup> The coefficients of the IT competency constructs show that all but one of the coefficients is significantly and positively related to board IT governance (Table 6). The internal knowledge, external knowledge, experience and training, and external activities factors are significant at the 0.001, 0.01, 0.01, and 0.01 levels, respectively. The IT governance mechanisms internal activities factor is not significant; however, removing this factor from the regression reduces the overall R2; therefore, this variable is kept in the model.

<sup>13</sup> The operational reliance on IT factor is not statistically significant; however, the managerial support, differentiation, and enhancement factors for the strategic reliance on IT are significant at the 0.001, 0.001, and 0.05 levels, respectively (Table 6). Removing the operational reliance on IT factor from the regression reduces the overall R2; therefore, this factor is kept in the model, and Proposition 8 is accepted.

equation (Model 2) explained a statistically significant increase in IT contribution to firm performance ( $= 0.190$ ,  $p < 0.001$ ). Therefore, board IT governance explains 19 percent more variance of IT contribution to firm performance. The regression coefficient of board IT governance shows that it is significant and positively related to contribution of IT to firm performance at the 0.001 level. Therefore, Proposition 7 is accepted.

## 12. Discussion

Both the exercise of strategic choice and institutional forces appear to impact the antecedents and consequences of board IT governance.

In the first premise of our theoretical model, we used strategic choice theory to propose relationships between board attributes and board IT governance. Although prior research has not applied this theory to board involvement in IT governance, it appears that it may be an appropriate theoretical lens through which to examine the impact of board attributes on IT governance since the data analysis suggests that a board's composition may influence its involvement in IT governance. However, not all propositions were supported.

Contrary to Proposition 1, a negative relationship was found between the proportion of insiders and board IT governance. As we previously discussed, the relationship between insiders and board involvement in corporate governance has also yielded mixed results in previous studies. To examine the relationship between the proportion of insiders and board IT governance further, we investigated two alternate arguments.

First, it has been argued that boards rely on outside directors to reduce agency costs associated with monitoring managerial decision making and performance, whereas inside directors are relied on as the main source of advice on strategic issues (Baysinger & Butler, 1985). To investigate whether this argument holds and whether it might help explain the negative relationship found between proportion of insiders and overall board IT governance, we analyzed the relationship between insiders and two types of board IT governance activities that were introduced by Nolan and McFarlan (2005) – (1) defensive activities involving the monitoring of management and (2) offensive activities involving the provision of advice. According to Baysinger and Butler's argument (1985), there should be a negative relationship between inside directors and defensive IT governance (monitoring managerial decision making) and a positive relationship between inside directors and offensive IT governance (providing advice to management). However, we found that insiders were significantly and negatively related to both defensive ( $= 0.025$ ,  $p < 0.1$ , the regression coefficient for proportion of insiders was significant and negatively related at the 0.1 level) and offensive IT governance ( $= 0.029$ ,  $p < 0.05$ , the regression coefficient for proportion of insiders was significant and negatively related at the 0.05 level) (refer to Appendix C – Analysis 1). Therefore, Baysinger and Butler's argument (1985) does not appear to help explain the contradictory finding of Proposition 1.

Second, we proposed an alternate argument that boards with a larger proportion of insiders may have more knowledge of IT management and have more comfort in IT management and, thus, do not feel as much of a need to be involved in IT governance as would boards with a smaller proportion of insiders. To examine this argument, we regressed board IT governance on proportion of insiders and various measures of level of comfort the board has in IT management. We added a cross-product term (Proportion of Insiders X Level of Comfort Measure) to the model to test the possible interaction between proportion of insiders and level of comfort (low and high levels for four types of comfort – competency, integrity, transparency, and reliability) and their effects on board IT governance. The regressions resulted in statistically significant explanations of variance; however, the interaction terms were not statistically significant (refer to Appendix C – Analysis 2). This suggests that the proportion of insiders has the same effect on board IT governance for both low and high levels of comfort in IT management. Thus, the reasons for the negative relationship between proportion of insiders and board IT governance are not clear, and future work is needed in this area. It may be that, as is suggested in much empirical and theoretical research (see Hermalin & Weisbach, 2003), a higher proportion of insiders may diminish the effectiveness of governance.

Our analysis of the survey data confirmed the proposed negative relationship between board size and

board IT governance (Proposition 2). As proposed using strategic choice theory, it may be that the level of board involvement increases as the size of the board decreases because the smaller board size enhances the ability of the board to work together and contribute to deliberations. Given that this is the only study examining this relationship, the survey results are compelling evidence for the negative effect of board size on IT governance; however, further research is needed.

The strong support for the positive relationship between IT competency (IT expertise and IT governance mechanisms) and board IT governance is important because it offers the first empirical support for this relationship. This finding confirms the conceptual IT governance literature on the importance of directors' IT competency for board IT governance (e.g., Burson-Marsteller, 2005; Huff et al., 2006; Jordan & Musson, 2004; IT Governance Institute, 2003; Nolan & McFarlan, 2005). The strong statistical significance of this relationship in the survey data suggests the importance of directors' IT competency in contributing to their involvement in IT governance. These findings support Proposition 3, which, based on strategic choice theory, proposed that competence may push back limits on the exercise of choice by decision-makers and, thus, encourage board IT governance. Therefore, the argument that structures, processes, and relational mechanisms enable decision-makers to access relevant information in a timely fashion, and that expertise enables decision-makers to deal with the information when making strategic choices is supported.

In the second premise of our theoretical model, we used institutional theory to propose relationships between organization factors and board IT governance. The proposed negative relationship between organization size and board IT governance was not supported in the survey data; however the interview data seemed to suggest that the negative relationship does exist (Proposition 4). Mixed results have also been reported in the literature. The relationship between organization size and corporate governance was examined by Baack (2000) in a study in which she found a positive relationship existed. However, the level of differentiation in an organization (we used organization size as a proxy for level of differentiation) was found to be negatively related to corporate governance (Judge & Zeithaml, 1992). The mixed findings of the interviews and survey in this research and the conflicting findings from the literature with respect to board involvement in corporate governance indicate that future research is needed to investigate this relationship further.

The analysis of the relationship between organization age and board IT governance yielded interesting insights. As proposed, the survey data revealed that boards of younger organizations (20 years or younger) were more likely be involved in IT governance than boards of older organizations (Proposition 5). This is in line with prior literature that has used institutional theory to suggest that organizational processes reflect the practices at the time of founding because the organization adopts the predominant practices in that time and because organizational processes are resistant to change (e.g., Eisenhardt, 1988; Stinchcombe, 1965; Tolbert & Zucker, 1983). This research offers early, if not the first, evidence that, as suggested in the normative literature, the greater an organization's reliance on IT, the greater a board's IT governance (IT Governance Institute, 2003; Nolan & McFarlan, 2005) (Proposition 6).

Finally, for our third premise, we proposed that the extent to which IT contributes to firm performance is a function of the level of board involvement in IT governance. We found a significant and positive relationship between board IT governance and the contribution of IT to organizational performance (Proposition 7). In fact, board IT governance explained 19 percent of the variance in the contribution of IT to organizational performance. To our knowledge this is the first research that directly examined the performance consequences of board IT governance.

In addition to examination of the premises of our theoretical model, the responses to survey questions revealed another interesting result. Much of the IT governance research has recommended the use of board-level IT Strategy Committees to aid decision making (e.g., IT Governance Institute, 2003; Nolan & McFarlan, 2005; Peterson, 2003); however, as other studies have found (e.g., De Haes & Van Grembergen, 2005; Ernst & Young, 2006; Huff et al., 2006), we also found that most boards do not have such committees – 91 percent of the respondents to our survey indicated that his/her board did not have such a committee.

In fact, during our interviews, some of the directors were strongly opposed to an IT strategy committee, and they commented:

*Do you have a marketing committee of the board, do you have a commercial banking committee, no – you'd have 100 committees.*

*No. Boards avoid more committees... [there] used to be lots of committees, most of us are spending our time shrinking such committees, as opposed to creating another category.*

*We do strategy sessions at the board level and the CTO is part of those strategy sessions, but no specific committee. And it wasn't really a consideration. Who has time? It's a huge problem.*

Future research could investigate the role of such committees, as there is limited understanding of how or when IT Strategy Committees are effectively incorporated in board decision-making. For example, a field study of a Belgian financial group found that even though the company had an IT Strategy Committee it “did not enable a more thorough and ongoing involvement of boards in IT governance” (De Haes & Van Grembergen, 2005, p. 5).

## 12.1. Contributions

This research has several contributions to theory and to boards' practice of IT governance. The theoretical model is characterized as more exploratory than confirmatory and can be viewed as an early step toward understanding antecedents and consequences of IT governance. This somewhat limits the explanatory ability, thus, while not offering a prescriptive solution for all boards, this research will help identify key antecedents and consequences that may be applicable in selected settings. We discuss the implications for research and practice in turn.

## 12.2. Implications for Research

First, this research contributes to theory by responding to the recognized need for more research on board IT governance.

Second, this research contributes by developing and testing a multi-theoretic model of the antecedents and consequences of IT governance. From a theoretical perspective, the extant literature does not adequately describe and explain why some boards are involved in IT governance or whether firms with board IT governance have superior firm performance. Using strategic choice theory and institutional theory to study antecedents to actual board governance of IT and its consequences, this research was able to investigate these questions. Strategic choice and institutional theories appear to offer complementary views of why boards decide to become involved in the governance of IT. Board and organizational antecedents as strategic adaptations or institutional responses to IT governance needs are explored. Use of the two theories allowed the inclusion of antecedents to board IT governance, which have not been investigated in prior research and, therefore, offer a richer view of such governance. The survey's results showed that organizational factors explain 28.4 percent of the variance in board IT governance, and that board attributes explain 39.4 percent more of the variance, for a total explained variance in board IT governance of approximately 68 percent. Therefore, as proposed, each theory gives only a limited explanation of the whole phenomenon regarding the antecedents to board IT governance. Taken together, organizational factors and board attributes provide a richer, more complex view of the antecedents to IT governance. This may encourage researchers of board IT governance to explore the impact of organizational factors in addition to role of IT on board IT governance, and to continue to explore the impact of board attributes on board IT governance. In addition, the results of the survey suggest a relationship contrary to the one proposed for proportion of insiders and board IT governance. The negative relationship found suggests that a theory other than strategic choice may be applicable. Examination of the consequences of board IT governance using strategic choice theory through the survey confirmed the positive impact of board IT governance on the contribution of IT to organizational performance, explaining 19 percent of the variance.

The third theoretical contribution is the empirical assessment of the antecedents and consequences of board IT governance. As discussed, the survey results offer support for many of the antecedents and consequences of board IT governance proposed in prior literature and in the theoretical model of this research. Additionally, this research makes a contribution by being possibly the first to empirically examine the application in practice of Nolan and McFarlan's (2005) IT strategic impact grid.

Finally, we feel that our examination of board IT governance and board-level IT competency has responded, in part, to the call for board researchers to "go beyond structuralism and to examine board processes, board behavior, and directors' cognition....in order to improve our understanding of the board of directors' contribution to strategy" (Pugliese et al., 2009, p. 301). In a review of research on the relationship between boards of directors and strategy from 1972 to 2007, Pugliese et al. (2009) find that board research is evolving from normative and structural approaches to behavioral and cognitive approaches. For example, Useem and Zelleke (2006) and Finkelstein and Mooney (2003) conducted interviews with directors to study board processes.

Similarly, in our study, building upon prior research and guided by the interviews we conducted, we measured board IT governance using actual directors' behaviors and actions in IT strategic decision making and oversight of IT, we also measured IT competency of directors using the survey respondents' assessment of the IT expertise of the directors on the board and their use of IT governance mechanisms. By using objective criteria for measuring board involvement, we examine what is happening at the board level and the IT competency of directors, rather than relying exclusively on proxy variables (e.g., board size or proportion of insiders) as indicators of what might or could be happening. This is a first step toward opening the black box of board-level IT governance research. With our measure of board IT governance, we have enriched the understanding of how boards govern IT by identifying distinct dimensions of board involvement in IT governance. Similarly, with our measure of IT competency, we identified types of IT expertise and specific IT governance mechanisms through which IT governance can be enacted at the board level. IT governance mechanisms include structure, processes, and relational mechanisms such as: Including IT as an item on the agenda of the board; interaction of the board with senior IT management, and communication between board members and IT management (including CIO) between scheduled meetings. With a better understanding of board-level IT governance and IT competency and the development of measures for these constructs, further investigation of these measures and their impacts is now possible. We would like to further develop a behavioral and cognitive approach to study the contribution of boards to IT governance through a longitudinal study to explore the board processes and through collecting primary data using interviews, surveys, and direct observation techniques.

### 12.3. Implications for Practice

Directors should be reminded that, as with corporate governance, boards have a fiduciary duty and a duty of care in IT governance, they are responsible for acting honestly and in good faith and for spending time to make informed business judgments. Directors need to stop ignoring IT and start paying more attention to developing leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives.

Perhaps the greatest motivation for board involvement in IT governance is the significant positive relationship that board IT governance was found to have with the contribution of IT to organizational performance for the survey respondents. This is especially noteworthy given that there appears to be much room for improvement in board IT governance, with, on average, the survey respondents rating their boards' overall IT governance effectiveness at 53 percent (an average of 2.6 on a 5-point scale). Therefore, directors should mindfully examine their board's IT governance to assess if their level of involvement is appropriate and if it enables a greater contribution of IT to their organization's performance.

Directors may find it useful to ask themselves the degree to which<sup>14</sup>:

- IT is an item on the agenda of the board
- The board encourages the inclusion of IT on the meeting agenda
- The board works well with senior IT management
- Some board members and IT management (including CIO) communicate between scheduled meetings
- The recruitment of board members includes consideration of IT expertise
- The board gets independent assurance on the containment of IT risks
- The board gets independent assurance on the achievement of IT objectives
- There are regular sessions for outside directors to discuss IT.

Our survey results suggest that the level of IT governance practiced by a board is a factor of both board characteristics (and a function of rational choice) and organizational characteristics (and a function of institutional pressures). Thus, board IT governance is not only a function of rational choice by directors, but it is also influenced by institutional pressures. Directors, thus, need to be more sensitive to the characteristics of their board and of their organization because these characteristics may be influencing the mode of their board's IT governance. For example, the significant relationship between board characteristics (i.e., board size and IT competency) and IT governance may encourage boards to manipulate factors that are under their control in an attempt to increase their involvement in IT governance, while being cognizant of the organizational characteristics (i.e., organization age and role of IT) that may be influencing the board's governance of IT. Directors could reevaluate the size of their board to assess whether it is impeding debate and discussion. Furthermore, the identification of director IT competencies as antecedents of board IT governance may encourage boards to recruit directors with formal IT training (42 percent of the survey respondents had no directors with formal IT training) or to enlist their board in IT governance training programs (86 percent of the survey respondents identified their board as not having received IT governance training).

## 12.4. Limitations

There are some limitations in this exploratory research that should be mentioned. First, the relatively small sample and the inclusion of only members of the ICD in the sample limit the capacity to generalize the research findings. However, demographics of the respondents suggested that organizations from a variety of industries and ownership types were represented, and that the directors held a variety of positions on their boards. In addition, one-way analysis of variance (ANOVA) tests indicate that no statistically significant differences in the level of board IT governance exist in the responses of board members representing different ownership types of organizations. In other words, level of board IT governance practiced by a board does not differ by ownership type of organization<sup>15</sup>.

The second limitation is the possible response bias due to the fact that the survey relies on a single respondent. To assess validity and reliability, it would have been preferable to obtain multiple respondents per board. However, given the difficulty of obtaining responses to surveys in field research, and particularly with respect to board members, this was accepted as a limitation.

The third limitation is the potential for bias in the data due to self-reporting. It would have been helpful to have correlated the self-report, especially the self-report of the contribution of IT to organizational performance, with objective performance measures gathered from an independent source. However, it was not possible to use performance measures from secondary sources in this research because a large portion of the responding organizations were not publicly traded and, therefore, financial information was not publicly available. Subjective measures of performance have been used in previous research, and results similar to objective measures have been found.

<sup>14</sup> Items for the IT governance construct developed for this survey using EFA and shown in Appendix B.

<sup>15</sup> There was no statistically significant difference between boards of organizations of different ownership types as determined by one-way ANOVA ( $F(3,159) = 1.798, p = .150$ ). A Tukey post-hoc test revealed that there were no statistically significant differences in terms of board IT governance between the different ownership types of organizations.

The final limitation in this research is its cross-sectional versus longitudinal nature. In particular, a longitudinal study of the effects of board IT governance on firm performance would have provided more information and may have enabled a more accurate portrayal of the performance consequences.

### **13. Conclusion**

In this paper, we proposed a theoretical model based on strategic choice and institutional theories to understand the antecedents and consequences of board IT governance. Based on the theoretical model, we conducted interviews and a survey of corporate directors. The results indicate that some board attributes and organizational factors influence board involvement in IT governance, and that a contribution of IT to organizational performance appears to be positively influenced by increased involvement of boards in IT governance.

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## Appendices

### Appendix A.

**Table A-1. Industry Composition of Survey Respondents**

Industry	Number	Percent	Industry	Number	Percent
Advanced technology	12	6.4	Healthcare provider / Managed care	10	5.3
Agriculture	2	1.1	Industrial / Agricultural equipment	3	1.6
Bank and Savings institutions	10	5.3	Insurance	13	6.9
Chemicals	3	1.6	Metals and Metal products	8	4.3
Construction services and building materials	3	1.6	Non-profit	5	2.7
Consumer products	2	1.1	Other	8	4.3
Crown Corporation	4	2.1	Other financial institutions	14	7.4
E-commerce	4	2.1	Other healthcare	4	2.1
Education	2	1.1	Other manufacturing	4	2.1
Electronics/Electrical equipment	2	1.1	Other service company	19	10.1
Energy/Utilities	21	11.2	Professional services	10	5.3
Entertainment/Hospitality	5	2.7	Publishing	1	.5
Forest and Paper products	1	.5	Retail	3	1.6
Healthcare product/Pharmaceuticals	7	3.7	Transportation/Distribution	8	4.3
Total: 188					

**Table A-2. Ownership of the Organizations**

	Number	Percent
<b>Ownership</b>		
Government	25	13.3
Non-profit	52	27.7
Privately held	58	30.9
Publicly traded	52	27.7
Total	188	100

<b>Table A-3. Respondents' Board and IT Experience</b>		
	<b>Number</b>	<b>Percent</b>
<b>Number of Years on the Board</b>		
Less than 2 years	40	21.6
More than 2 years	145	78.4
Total	185	100
<b>Number of Years in an IT Role</b>		
None	113	60.4
Less than 2 years	12	6.4
2 - 10 years	19	10.2
More than 10 years	43	23
Total		
<b>Number of Years of General Management of IT Experience</b>		
None	84	44.7
Less than 2 years	7	3.7
2 - 10 years	37	19.7
More than 10 years	60	31.9
Total	188	100

**Appendix B.**

**Table B-1. Survey Questions for Measured Variables**

Variable	Survey Question
Proportion of Insiders - the number of insiders divided by the total number of directors on the board.	(i) How many directors are on the board? (ii) 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.)
Board size - the total number of directors.	How many directors are on the board?
Organization size - the number of employees in the organization.	Approximately how many employees does the organization have? Less than 50, 51 – 100, 101 – 500, 501 – 1000, 1001 – 5000, 5000 – 10000, More than 10000

List of items for each construct resulting from exploratory factor analysis (EFA):

1. Board IT Governance
2. IT Expertise
3. IT Governance Mechanisms
4. Role of IT
5. Contribution of IT to Organizational Performance.

**1. Board IT Governance**

**Table B-2. EFA of Board IT Governance**

<b>Analysis 1: Level of Overall Involvement in IT Governance</b>	
<b>Maximum Likelihood Solution (One Factor Extracted)</b>	
	<b>Overall IT Governance</b>
Eigenvalue:	8.058
Variance Explained:	57.554%
Cronbach's Alpha:	0.943
IT project governance/management methodologies <sup>a</sup>	0.827
Training and development to ensure the needs are fully identified and addressed for all staff <sup>a</sup>	0.806
Compliance with the agreed organizational risk profile of IT <sup>a</sup>	0.804
Workforce planning and investment to ensure recruitment and retention of skilled IT staff <sup>a</sup>	0.796
Monitors that IT delivers against the strategy through clear expectations and measurement <sup>b</sup>	0.787
Performs IT governance assurance and self-assessment <sup>b</sup>	0.779
Organization's progress or performance toward better IT governance <sup>a</sup>	0.772
Compliance with IT to laws, regulations, industry standards and contractual commitments <sup>a</sup>	0.764
Identifies possible IT threats and opportunities critical to the future of the organization <sup>b</sup>	0.756
Shapes the business/IT strategic alignment <sup>b</sup>	0.740
Stakeholders' satisfaction with IT (e.g. measured through a survey and/or number of complaints) <sup>a</sup>	0.706
Contribution from IT to a competitive advantage <sup>a</sup>	0.703
Advises during major IT decisions <sup>b</sup>	0.702
IT risks to which the organization is exposed <sup>a</sup>	0.656
<sup>a</sup> Indicates the extent to which the board monitors the following issues or activities. (Scale 1: Not at all - 4: To a large extent, N/A)	
<sup>b</sup> Indicates the extent to which the board is involved in the following activities. (Scale 1: Not at all - 4: To a large extent, N/A)	

## 2. IT Expertise

**Table B-3. EFA of Level of IT Expertise**

<b>Analysis 1: Level of IT Expertise on the Board</b>			
<b>Maximum Likelihood Solution / Varimax Rotation</b>			
	<b>Factor 1 Internal Knowledge</b>	<b>Factor 2 External Information</b>	<b>Factor 3 Experience and Training</b>
Eigenvalue:	8.417	1.957	1.374
Variance Explained:	46.760	10.872	7.632
Cronbach's Alpha:	0.914	0.885	0.840
IT policies in the organization <sup>a</sup>	.801	.270	.081
Performance of IT <sup>a</sup>	.791	.358	.092
IT risks to which the organization is exposed <sup>a</sup>	.789	.251	.092
Overall IT budget of the organization <sup>a</sup>	.788	.056	.049
Overall IT strategy/vision of the organization <sup>a</sup>	.782	.281	.195
IT resources (people, systems, financials) in the organization <sup>a</sup>	.775	.285	.190
Existing IT used in the organization <sup>a</sup>	.637	.366	.151
IT or business people to contact within the organization as sources of information about IT <sup>a</sup>	.551	.344	.190
Indicate the degree to which information from management about the organization's IT operations and management practices is sufficient <sup>b</sup>	.537	.107	.200
Secondary sources of knowledge as source of information about IT <sup>b</sup>	.277	.810	.210
Applications in general (i.e., internet, electronic data interchange, e-commerce, Groupware) <sup>a</sup>	.244	.797	.130
IT or business people to contact outside of the organization as sources of information about IT <sup>a</sup>	.213	.789	.181
Technology in general (i.e., personal computer, client-server, LAN, imagery technology, multimedia technology) <sup>a</sup>	.282	.721	.038
Systems development in general (i.e., traditional systems development life cycle, end-use computing, prototyping, outsourcing, project management practices) <sup>a</sup>	.224	.640	.333
Other directors to contact as sources of information about IT <sup>a</sup>	.309	.567	.333
How many directors have worked directly in an IT role within an organization or as a consultant or academic (e.g. in areas such as IT development, IT implementation, participation or leadership in new IT projects, management of IT projects)? <sup>c</sup>	.142	.173	.885
How many directors have received formal training in IT (i.e. certificates, diplomas, undergraduate or graduate degrees)? <sup>c</sup>	.111	.188	.837
How many directors have experience in the general management of IT within an organization or as a consultant or academic (e.g. in areas such as participation in the creation of an IT vision statement, IT strategy, IT policies, or IT budgets)? <sup>c</sup>	.237	.244	.743
<sup>a</sup> The extent to which the board members are knowledgeable about...(Scale 1: Not knowledgeable – 5: Very knowledgeable) <sup>b</sup> Scale 1: Not knowledgeable - 5: Very knowledgeable <sup>c</sup> Scale None, 1 director, 2-5 directors, more than 5 directors, don't know			



### 3. IT Governance Mechanisms

**Table B-4. EFA of Governance Mechanisms**

<b>Analysis 1: Level of IT Governance Mechanisms Presence on the Board</b>		
<b>Maximum Likelihood Solution / Varimax Rotation</b>		
	<b>Factor 1 Internal Activities</b>	<b>Factor 2 External Activities</b>
Eigenvalue:	4.283	1.176
Variance Explained:	53.536	14.694
Cronbach's Alpha:	0.846	0.828
IT is an item on the agenda of the board <sup>a</sup>	0.870	0.134
The board encourages the inclusion of IT on the meeting agenda <sup>a</sup>	0.855	0.239
The board works well with senior IT management <sup>b</sup>	0.753	0.213
Some board members and IT management (including CIO) communicate between scheduled meetings <sup>b</sup>	0.672	0.216
The recruitment of board members includes consideration of IT expertise <sup>c</sup>	0.582	0.374
The board gets independent assurance on the containment of IT risks <sup>a</sup>	0.144	0.910
The board gets independent assurance on the achievement of IT objectives <sup>a</sup>	0.254	0.899
There are regular sessions for outside directors to discuss IT <sup>a</sup>	0.486	0.591

<sup>a</sup> Indicates the degree to which the following items describe the board's processes. Where 1 is "Not at all", 2 is "Not really", 3 is "To some extent", and 4 is "To a large extent".

<sup>b</sup> Indicates the degree to which the following items describe the board's relationship and communication with management. Where 1 is "Not at all", 2 is "Not really", 3 is "To some extent", and 4 is "To a large extent".

<sup>c</sup> Indicates the degree to which the following items describe the board/management structure. Where 1 is "Not at all", 2 is "Not really", 3 is "To some extent", and 4 is "To a large extent".

4. Role of IT

<b>Table B-5. EFA of Role of IT</b>	
<b>Analysis 1: Operational Reliance on IT in the Organization</b>	
<b>Maximum Likelihood Solution (One Factor Extracted)</b>	
	<b>Factor 1</b>
Eigenvalue:	4.258
Variance Explained:	70.973%
Cronbach's Alpha:	0.917
Please indicate the extent to which you agree or disagree with the following statements as they relate to the existing IT in the organization, where 1 is "disagree strongly" and 5 is "agree strongly".	
IT breakdown will critically affect one or more of our functional departments	0.890
Organization relies heavily on IT for efficient operation	0.875
IT is vital to our organization	0.864
IT breakdown for extended periods will affect organizational activities severely	0.863
IT breakdown will affect our database access	0.796
IT breakdown will affect overall coordination within our organization	0.758

<b>Table B-6. EFA of Role of IT</b>			
<b>Analysis 2: Strategic Reliance on IT in the Organization</b>			
<b>Maximum Likelihood Solution / Varimax Rotation</b>			
	<b>Factor 1 Managerial Support</b>	<b>Factor 2 Differentiation</b>	<b>Factor 3 Enhancement</b>
Eigenvalue:	4.227	1.24	1.033
Variance Explained:	46.965%	13.782%	11.482%
Cronbach's Alpha:	0.841	0.785	0.692
Please indicate the significance of the following items as components of your portfolio of planned IT projects, where 1 is "very unimportant" and 5 is "very important":			
Projects whose primary benefit is providing new decision support information to top management	0.850	0.175	0.165
Projects whose primary benefit is providing new decision support information to middle and lower levels of management	0.837	0.149	0.055
Projects which enable development of new administrative control and planning processes	0.728	0.221	0.248
Projects which offer significant tangible benefits through improved operational efficiencies	0.601	0.328	0.450
Projects which will allow the organization to develop and offer new products or services for sale	0.113	0.915	0.058
Projects which appear to offer new ways for the organization to compete	0.235	0.861	0.112
Projects involving application of new technologies	0.312	0.576	0.291
Projects focusing on routine maintenance to meet evolving business needs, new regulatory or legal requirements	0.069	0.154	0.861
Projects focusing on existing systems enhancements	0.307	0.083	0.798

**5. Contribution of IT to Organizational Performance**

**Table B-7. EFA of Contribution of IT to Organizational Performance**

<b>Analysis 1: Operational performance</b>		
<b>Maximum Likelihood Solution / Varimax Rotation</b>		
	Factor 1 - External Performance	Factor 2 - Internal Performance
Eigenvalue:	4.389	1.101
Variance Explained:	62.705%	15.735%
Cronbach's Alpha:	0.882	0.880
Please assess the extent to which IT has contributed to the following seven areas of organizational performance. Where 1 is "Contribution is minimal" and 5 is "IT has contributed to a very great extent".		
Sales Revenue Increase	<b>.943</b>	.172
Market Share Increase	<b>.917</b>	.244
Customer Satisfaction	<b>.676</b>	.488
Return on Investment (ROI)	<b>.655</b>	.355
Process Improvement	.225	<b>.892</b>
Operating Efficiency	.244	<b>.883</b>
Cost Savings	.353	<b>.783</b>

## Appendix C.

**Table C-1. Supplemental Analysis 1 – Effects of Proportion of Insiders on Type of IT Governance**

Variables	Defensive IT Governance	Offensive IT Governance
Proportion of Insiders	-.442+ (.252)	-.475* (.238)
F Value	3.088+	4.001*
Model R-Square	.025+	.029*
Adjusted R-Square	.017+	.021*

Coefficients listed are unstandardized betas. Standard errors are in parenthesis.  
 + p < .1, \* p < .05, \*\* p < .01, \*\*\* p < .001

**Table C-2. Supplemental Analysis 2 – Effects of Proportion of Insiders and Level of Comfort in IT Management on Board IT Governance**

Variables	Level of Comfort – Transparency	Level of Comfort – Competency	Level of Comfort – Integrity	Level of Comfort – Reliability
Intercept	-.469 (.318)	-.666 (.426)	-.744+ (.397)	-.531 (.350)
High Level of Transparency	.396 (.402)			
High Level of Competency		.624 (.516)		
High Level of Integrity			.737 (.473)	
High Level of Reliability				.508 (.431)
Proportion of Insiders	-.155 (.407)	-.422 (.584)	-.472 (.575)	-.177 (.480)
Proportion of Insiders and High Level of Transparency Interaction	-.362 (.555)			
Proportion of Insiders and High Level of Competency Interaction		-.001 (.742)		
Proportion of Insiders and High Level of Integrity Interaction			.220 (.692)	
Proportion of Insiders and High Level of Reliability Interaction				-.243 (.609)
F Value	5.754***	5.458**	4.440**	6.041***
Model R-Square	.127***	.121**	.101**	.132***
Adjusted R-Square	.105***	.099**	.078**	.110***

Coefficients listed are unstandardized betas. Standard errors are in parenthesis.

+ p < .1, \* p < .05, \*\* p < .01, \*\*\* p < .001

<sup>a</sup> Dummy variable for level of transparency of IT management, composed of those responses with transparency rated 4 or 5 on a five point scale.

<sup>b</sup> Dummy variable for level of competency of IT management, composed of those responses with competency rated 4 or 5 on a five point scale.

<sup>c</sup> Dummy variable for level of integrity of IT management, composed of those responses with integrity rated 4 or 5 on a five point scale.

<sup>d</sup> Dummy variable for level of reliability of IT management, composed of those responses with reliability rated 4 or 5 on a five point scale.

## **About the Authors**

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