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Exploring IT Dependency and IT Governance: A Canadian Survey

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Abstract

The Canadian Institute of Chartered Accountants (CICA) has developed guidelines in order to help Boards of Directors and executive teams deal with information technology (IT) governance issues. Further, accounting firms offer IT governance advisory services. Prior literature suggests that effective IT governance can provide economic advantages to organizations. It also suggests that organizations should design IT governance to be aligned with their business strategy or decision model, and highlights significant internal and external contextual factors influencing IT governance. However, there is a need for empirical knowledge focusing on the influence of one contextual factor on IT governance, i.e. IT dependency. The purpose of this exploratory study is to identify the IT governance mechanisms (structures, processes and relational capabilities) used according to different levels of IT dependency (defensive or offensive IT modes), and compare their extent of use between these IT modes. Based on a survey, results suggest that the overall extent of use of IT governance mechanisms differs according to the IT mode, and is greater when an offensive IT mode is used than when a defensive IT mode is used.

Keywords: IT governance; IT dependency; survey.

Exploration de la dépendance aux TI et de la gouvernance des TI : Un sondage canadien

Résumé

L'Institut Canadien des Comptables Agréés (ICCA) a développé des directives dans le but d'aider les conseils d'administration et les équipes de hauts dirigeants à traiter des enjeux entourant la gouvernance des technologies de l'information (TI). De plus, les firmes comptables offrent des services-conseils en la matière. La littérature suggère qu'une gouvernance des TI efficace peut procurer des avantages économiques aux organisations. Elle suggère également que les organisations devraient élaborer la gouvernance des TI de façon à l'aligner avec leur stratégie d'affaires ou leur modèle de décision, et souligne les facteurs internes et externes influençant de façon significative la gouvernance des TI. Il existe cependant un besoin de connaissances empiriques quant à l'influence d'un facteur contextuel sur la gouvernance des TI, i.e. la dépendance aux TI. L'objectif de cette étude exploratoire est d'identifier les mécanismes de gouvernance des TI (structures, processus et capacités relationnelles) utilisés selon différents niveaux de dépendance aux TI (modes TI défensifs ou offensifs), et de comparer leur degré d'utilisation selon les modes TI. Les résultats d'un sondage suggèrent que le degré d'utilisation des mécanismes de gouvernance des TI diffère selon le mode TI, et est plus développé lorsqu'un mode offensif est utilisé que lorsque qu'un mode défensif l'est.

Mots-clés: Gouvernance des TI; dépendance aux TI; sondage.

INTRODUCTION

Information technology (IT) governance is an important topic of interest for accountants and organizations. Indeed, IT governance is one of the top 10 IT issues facing the accounting profession (5th in 2011; 8th in 2010; 3rd in 2009; 4th in 2008) (Datardina & Parker, 2011; Parker, 2010; Trites, 2009; Trites & Lavigne, 2008). Moreover, the four largest accounting firms worldwide offer a large variety of IT advisory services and have identified key success factors for IT governance (e.g., PwC & ITGI, 2006; ITGI & PwC, 2009). Furthermore, the Canadian Institute of Chartered Accountants (CICA) has developed guidelines to help Board of Directors in evaluating IT issues (CICA, 2004; 2007), and executive teams in aligning IT strategic planning with the strategic business plan (CICA, 2010).

Prior studies suggest that, on the one hand, a lack of effective IT governance can lead to an "unsuccessful development project [...], loss of competitiveness, and even organizational demise [...]" (Ali & Green, 2007, p. 43). On the other hand, effective IT governance could enhance organizations' competitiveness (Rau, 2004) as well as IT alignment with business (PwC & ITGI, 2006; De Haes & Van Grembergen, 2009), reduce costs (PwC & ITGI, 2006; Parent & Reich, 2009) and risk (Parent & Reich, 2009), improve customer service / satisfaction (Rau, 2004; PwC & ITGI, 2006) and security (PwC & ITGI, 2006), and create shareholder value (Parent & Reich, 2009).

In spite of those potential benefits, Boards of Directors do not seem to be as much involved in IT governance (Huff, Maher, & Munro, 2004; Nolan & McFarlan, 2005; Deloitte Consulting, 2007; CEFRIO, 2009) as they should be, in accordance with their strategic or risk management roles. Indeed, "board members use only some of the IT governance questions suggested by the CICA [2004] and not all the recommended ones" (Bart & Turel, 2010, p. 147). Indeed, having an

IT strategy committee of the Board seems to be a rare occurrence (Huff et al., 2006; Bart & Turel, 2009). Moreover, firms do not use all key IT governance mechanisms (structures, processes, relational capabilities) suggested in the literature (e.g., Weill & Ross, 2005; Ali & Green, 2007; Bowen, Cheung, & Rohde, 2007; Parent & Reich, 2009; De Haes & Van Grembergen, 2009).

However, "there is no best model of IT governance" (Weill & Ross, 2005, p. 29). IT policies should fit the organizations that boards oversee (Nolan & McFarlan, 2005), and fit the organizational decision model (PwC & ITGI, 2006). In addition, "the IT governance design needs to be one that can react quickly to competitive opportunities and efficiently utilise all available resources" (Bowen et al., 2007, p. 195). Accordingly, researchers have adopted a contingency standpoint to study IT governance antecedents (among others: organizational / decision-making structure, organizational environment, corporate business strategy, corporate vision, culture, strategic IT role, senior management of IT, satisfaction with management / use of IT, governance experience, organization size and diversity, industry, in Brown & Grant, 2005; IT investment characteristics, external environment and internal context, in Xue et al., 2008).

Overall, as indicated above, existing IT governance literature suggests IT governance mechanisms that should be part of an effective IT governance system, points out the benefits resulting from IT governance effectiveness, and discusses some IT governance antecedents. More specifically, in the light of the following recent exploratory and descriptive studies, the organization's dependency on IT can influence IT governance. Indeed, the extent to which an organization relies on IT could affect the choice of IT governance mechanisms to be implemented and the involvement of the Board of Directors (Nolan & McFarlan, 2005), the amount of time and attention the Board spends on IT governance (Parent & Reich, 2009), and the questions to be asked by the Board about IT governance (Bart & Turel, 2009, 2010; CEFRIO,

2009). However, to our knowledge, there is no empirical evidence to support that different level of IT dependency are leading to a different extent of use (or different choices) of IT governance mechanisms.

Based on a survey, this exploratory study seeks to provide evidence about the relationships between IT dependency and IT governance. In doing so, it identifies the IT governance mechanisms (structures, processes and relational capabilities) used according to different level of IT dependency (IT utilization modes, hereafter 'IT modes'), and compare their extent of use between these modes. Several reasons motivate the research objectives. First, while organizations' IT mode can differ from one firm to another, prior literature has not empirically identified which IT governance mechanisms are used with each of the different IT modes. Second, there is a need for more empirical knowledge about the antecedents of IT governance in different contexts. For instance, it may be effective for a firm having an offensive IT mode to have an IT architecture committee while this would less critical for a firm having a defensive IT mode. Third, there is a need for larger data sets to "validate the accuracy of the defined key minimum baseline for IT governance" (De Haes & Van Grembergen, 2009, p. 135). Finally,

> "In today's interconnected world, most organizations rely on IT to at least some degree in order to conduct their business. Their dependence ranges from simple accounting and office systems to advertising their offerings on the web, ordering supplies and services online, managing schedules, payrolls and inventories, monitoring automated processes, communicating with peers and customers, delivering online services, and conducting virtual Internet-based operations. Whatever their needs, business owners and managers must invest considerable time and money to maintain the IT environment required to support their businesses." (CICA, 2010, p. 1).

In that context, gaining a better understanding of the influence of IT dependency on the use of IT governance mechanisms becomes an important issue for accountants acting as Board members overseeing IT strategy and IT risk management angles, senior executives facing IT decision-making, as well as IT experts or internal auditors controlling IT systems.

The remainder of this paper is organized as follows. In the next section, a conceptual framework is developed. Thereafter, the research method is described, followed by the results, and the discussion and conclusion.

CONCEPTUAL FRAMEWORK

The conceptual framework derives from the IT governance literature. We first describe IT governance in terms of structures, processes and relational capabilities. We then define IT dependency in terms of IT modes. Next, we describe the relationships between IT modes and IT governance structures, processes and relational capabilities and make propositions. We finally present other contextual variables relevant to our study.

IT Governance

"IT governance today concerns how the IT organization is managed and structured, and it provides mechanisms that enable the development of integrated business and IT plans; it allocates the responsibilities within the IT organization, and it prioritizes IT initiatives ([...], Van Grembergen, De Haes, & Guldenstops, 2004; Weill & Ross, 2004)" (Simonsson, Johnson, & Ekstedt, 2010, p. 11). More specifically, "as a subset of corporate governance, IT governance is a responsibility of the Board of Directors (ITGI, 2003; Parent & Reich, 2009) and executives (ITGI, 2003)" (Authors, Forthcoming, p. 5). IT governance "consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives" (ITGI, 2003, p. 10). "*Structures* consist of formal positions and roles for making IT-related decisions (Bowen et al., 2007; Peterson, 2004), as well as committees and councils (Peterson, 2004)" (Authors, Forthcoming, p. 6). *Processes* focus on the implementation of IT management techniques and procedures in compliance with establishing

IT strategies and policies (Bowen et al., 2007). The structures and processes need to be complemented by *relational capabilities* (Peterson, 2004). "This capability is the active participation of, and collaborative relationships among, corporate executives, IT management, and business management" (Peterson, 2004, p. 15). The IT leadership by the CIO in articulating and communicating a vision for IT's role is also a key IT governance relational capability (De Haes & Van Grembergen, 2009). In this study, the "IT governance mechanisms" were selected from prior studies as part of a strong IT governance system (e.g., key IT governance mechanisms used by Top-performing companies, in Weill & Ross, 2005; factors in positive association with IT governance effectiveness, in Ali & Green, 2007; key minimum baseline mechanisms in De Haes & Van Grembergen, 2009; areas that should at a minimum be considered by Board of Directors in governing IT risk, in Parent & Reich, 2009).

IT dependency

"Researchers are unanimous that [...] the best IT governance solution for a given firm is contingent on a variety of factors (Brown & Magill, 1994; Brown, 1997)" (Brown & Grant, 2005, p. 703). In accordance with that premise, Nolan & McFarlan (2005) propose an "IT strategic impact grid" having four modes of IT dependency (IT modes), i.e., the factory and support modes that are characterized as 'defensive' and the strategic and turnaround modes that are described as 'offensive'. In the *support mode*, firms use technology basically to support employees' tasks and firms do not strategically depend on IT systems. In the *factory mode*, organizations need highly reliable IT systems as their operations depend on the Internet and business can be lost in the event of a systems failure; however, they are not proactive seekers of IT innovations for competitive advantage. In the *turnaround mode*, firms are in the midst of a strategic transformation that involves an important IT project with the objective of gaining a competitive advantage and

cutting costs; this mode is usually transitory and firms subsequently move to a factory or strategic mode. In the *strategic mode*, firms need reliability of their systems, but "they also aggressively pursue process and service opportunities, cost reductions, and competitive advantages" (Nolan & McFarlan, 2005, p. 101). In this study, Nolan & McFarlan's grid was used as a cornerstone to define IT dependency because it provides a rich coverage of possible situations illustrating the level of dependency on IT.

Since "firms do not need the same IT strategy to fulfill their mission" (CEFRIO, 2009, p. 17), it is reasonable to expect that the set of IT governance mechanisms suggested in the literature will not be used to the same extent under differing IT modes. Consequently, each IT mode should be associated with a specific set of IT governance mechanisms. We discuss below how defensive or offensive IT modes as an organizational contextual variable can influence IT governance structures, processes and relational capabilities, before suggesting propositions and presenting other contextual variables that need to be taken into consideration in the analysis.

Relationships Between IT Modes and IT Governance Structures

Parent & Reich (2009) propose a number of basic questions to help Boards of Directors govern IT risk, questions that can be expanded upon depending on the level of IT risk faced which is seen as the highest for firms in the strategic IT mode (an offensive mode). Nolan & McFarlan (2005) suggest that having the Board of Directors' audit committee deal with IT governance risks is fine for organizations that adopt a defensive IT mode. In contrast, organizations that have an offensive IT mode will need the support of an IT strategy committee of the Board of Directors. This suggests that IT mode can influence IT governance structures at the Board's level.

At the management level, IT governance structures can also be influenced by the IT mode. For instance, organizations that fundamentally use IT to support employees' daily activities and have little need for strategic IT (defensive, support mode) may not need certain individual formal positions and roles (e.g., a senior executive holding the IT governance function) or committees (e.g., IT project steering committee, IT security steering committee or IT architecture steering committee). In contrast, firms that aggressively pursue IT solutions for process and service opportunities, costs reductions, or competitive advantages (offensive, strategic mode) could benefit from the support of a full member of the executive committee holding the IT governance function, an officer responsible for assessing IT risks, or an IT steering committee providing strategic direction to IT projects and responsible for determining business priorities in IT investments. Moreover, firms that are in the midst of a strategic transformation that involves an important IT project (offensive, turnaround mode) may need to set up an IT project steering committee to manage the project. Furthermore, organizations where systems work provides little strategic differentiation or dramatic cost reduction and that have a need for highly reliable IT systems because most core business activities are on line (defensive, factory mode) could be supported by an officer responsible for developing and testing privacy and security policies, and by an IT security steering committee focusing on IT related risks and security issues.

Relationships Between IT Modes and IT Governance Processes

Considering that IT modes can influence IT governance structures, and that "it is easier to implement IT governance structures compared to IT governance processes" (De Haes & Van Grembergen, 2009, p. 135), it becomes even more important for organizations to link closely their IT governance processes to their IT mode in order to be more effective and efficient.

In that spirit, it is reasonable to expect that organizations that can quickly revert to manual procedures for the bulk of value transactions and that are not struck seriously even with repeated IT service interruptions (defensive, support mode) may not have put in place processes related to IT strategies and policies, or the evaluation, selection and management of IT projects. On the contrary, highly IT dependent firms (offensive, strategic mode) might have no choice to do so. They may also need to use a formal planning process to define and update the IT strategy, as well as IT budgets to control and report on IT activities/investments. On the one hand, since on line business activities characterize firms that are in a defensive, factory mode, they might engage outside agencies to test their security systems or to conduct security audits. On the other hand, organizations that engage a very important part of their capital spending in adopting new systems to obtain major process and service transformations as well as cost reductions (offensive turnaround mode) may more specifically need processes to monitor the planned business benefits during and after implementation of the IT investments / projects, track the business value of IT, and communicate objectives, expectations and guidance to all employees impacted by IT projects.

Relationships Between IT Modes and IT Governance Relational Capabilities

Relational capabilities relate to voluntary mechanisms that cannot be programmed and are often intangible and tacit (Peterson, 2004). Therefore, it is not surprising to observe a great diversity across firms (Authors, Forthcoming). In fact, when IT leadership comes from the top, IT governance relational capabilities as a whole are more developed (Authors, Forthcoming). Accordingly, it is reasonable to expect that firms adopting an offensive IT mode (strategic or turnaround mode) will have a senior executive in charge of IT who is articulating a vision for IT's role in the organization, and ensuring that this vision is clearly understood by managers

throughout the firm. Those firms may also create an environment where i) business and IT people are physically located close to each other and are trained about each other's area of expertise (business or IT); ii) senior business and IT management act as partners and informally discuss activities of the organization and IT's role; and iii) internal corporate communication regularly addresses general IT issues. Furthermore, in a turnaround mode, firms may benefit from using job-rotation mechanism (IT staff working in the business units and business people working in IT) in order to go through the IT system changes more efficiently.

As stated above, organizations that are in a factory mode (defensive) have most of their core business activities on line. Therefore, they may also need that business and IT people work closely together on a regular basis, even if the relational mechanisms are not programmed. When organizations have little need for strategic IT (defensive, support mode), they may not need a sophisticated IT governance. Therefore, it can be expected that IT relational capabilities will not need to be as developed as in the case of firms relying more on IT.

Propositions

Based on the above discussion, we expect that the extent of use of IT governance mechanisms will differ according to the IT modes that are used. This leads us to the following propositions:

Proposition 1 (P1): The extent of use of IT governance mechanisms will differ according to the IT mode.

Proposition 2 (P2): The extent of use of IT governance mechanisms will be greater when an offensive IT mode is used than when a defensive IT mode is used.

Other Contextual Variables

A number of researchers have studied the influence of firm size and industry on IT governance but overall results are mitigated (Brown & Grant, 2005). Accordingly, further research needs to be done to assess the impact of such specific factors as well as the size of IT department on IT governance (De Haes & Van Grembergen, 2009). Therefore, in addition to the IT mode, we take into consideration the influence of the following contextual variables on IT governance.

The *size of organization*, as well as the *size and decentralization of the IT function* may affect IT governance. More specifically, since larger firms are commonly characterized by more revenues, more assets and more employees, they could allocate more financial and human resources to implement an effective IT governance system. For instance, large firms are likely to decentralize aspects of their IT governance in order to be more responsive to business unit IT needs (Sambamurthy & Zmud, 1999). "Relative to larger enterprises, SMEs tend to be constrained regarding their endowments of financial resources and IT capabilities, prompting many SMEs to maintain quite small internal IT groups […]. Invariably, the work processes and decision processes associated with this internal IT group tend to be less mature, lacking both rigor and consistency (Thong, 1999), compared to IT groups in larger organizations" (Huang et al., 2010, p. 290).

According to Parent & Reich (2009), firms in the strategic IT mode are the most IT intensive while those in the support IT mode are the least IT intensive. Moreover, Boards of high IT intensity firms ought to seriously consider having an IT strategy committee as it can significantly impact the overall effectiveness of IT governance (Ali & Green, 2007). Therefore, *IT intensity* could be associated with IT governance.

Industry could also have an effect on the IT mode and on IT governance. For instance, "the IT strategy that works for a clothing retailer is not appropriate for a large airline" (Nolan & McFarlan, 2005, p. 105). Further, "it is acknowledged that the use of IT governance practices might be different in different types of industries" (De Haes & Van Grembergen, 2009, p. 125).

Finally, *financial performance* might influence IT strategic choices as well as key IT governance mechanisms. Indeed, IT governance effectiveness is positively correlated with financial performance (Weill & Ross, 2005). In other words, "the more a firm is satisfied with its financial performance or industry standing, the more likely the Board will have the luxury to ask – and probe with – more IT governance questions" (Bart & Turel, 2009, p. 327) while poor financial performance might keep the attention of the Board members away from IT strategic issues.

RESEARCH METHOD

We first gained an understanding of IT governance through a prior field study (four case studies, 17 interviews with Board members, IT executives, Chief internal auditors, and managers or executives in charge of web sites), preceded by a pilot study involving seven interviews obtained from a representative of a regulatory body in charge of the governance regulation, a senior partner in one of the largest accounting firms worldwide, four senior executives and one internal auditor of three units of a large financial group (Authors, Forthcoming).

Thereafter, since our concern was to collect data on IT governance and contextual variables from a representative sample, the survey design was an appropriate research method to use (Judd et al., 1991). Thus, to provide evidence about the influence of IT dependency on IT governance with a large data set, data were collected primarily from a mail survey. The questionnaire was sent to the senior executive / officer in charge of IT (e.g., Vice-president [VP] IT, Chief

information officer [CIO]), or the top manager who has an overview or a sufficient knowledge of the organization's IT governance and IT strategic issues, of a sample of Canadian organizations. Contact information and data related to the target firms were mainly collected from the *Financial Post Corporate Connection (FPCC) 2010* database which contains information on about 4,000 Canadian firms.

Target Population and Survey Implementation

The conceptual framework led to the development of the questionnaire. We followed Dillman's (2000) procedures in preparing and administering the survey. Most of the questions were selected (and adapted, if needed) from existing instruments, using seven-point Likert scales. English and French versions of the questionnaire were revised and pretested. Two academics and a translator revised both versions of the instrument while three IT executives / directors pretested it. The questionnaire took approximately 30 minutes to complete.

The initial target population was comprised of i) all Canadian organizations that have contact information for an executive/officer in charge of IT (CIO, VP IT, Manager or Director in charge of technology, Chief technology officer) included in the FPCC 2010 database; and ii) an equal number of additional firms randomly selected from this database. For these firms, the contact information was not available for the executive in charge of IT, so the survey was sent to the President/Chief executive officer. The final target population comprised 440 medium-to-large, privately owned or publicly traded Canadian organizations (considering wrong addresses, organizations that moved, organizations having their business outside Canada, Canadian subsidiaries of foreign companies with IT governance outside Canada, etc.).

The survey was done by mail and the package included a cover letter and a self-addressed postage-paid envelope in addition to the questionnaire. In both the cover letter and questionnaire,

it was stated that the information provided would be kept strictly anonymous and confidential, that it would only be used for the purpose of publication of scientific or educational articles, and that only summary statistics would be presented. Follow-up procedures included a second sending to those who had not replied to the first sending as well as reminders by emails and telephone calls. As this project involved human subjects, approval was obtained from our institutional Research Ethics Committee. The survey took place between November 2010 and February 2011.

Sample

A total of 102 usable questionnaires were received for a 23.2% response rate. Sample firms' and respondents' characteristics are presented in Table 1. About two thirds of the sample is comprised of medium-to-large listed firms, and one third of private organizations. On average, they are profitable. Financial services and Telecommunications – IT, Manufacturing, and Service and Retail organizations each represent about one-third of the sample. On average, respondents have more than six years of experience at their current position, 10 years within their organization, and 25 years in total. The majority of them has a position directly related to IT. More than 70% of respondents have an educational background in IT.

Insert Table 1 about here

An analysis of the non-response bias was performed to confirm the validity of the data. Initially, the comparison between respondents and non-respondents with respect to assets, revenue and market value did not reveal any significant differences. Moreover, the comparison between the first group of respondents (n = 26) and the last group of respondents (n = 25, the latter being used as a proxy for the non-respondents) did not reveal any significant differences in

the responses obtained for the main constructs of the study as well as for assets, revenue, net income, market value and number of employees. Thus, non-response bias does not appear to be a concern in this sample.

Measurement of Constructs

Descriptive statistics for the constructs and a correlation matrix are respectively presented in Table 2 and in Appendix.

Insert Table 2 about here

IT mode is measured using 17 items based on Nolan & McFarlan (2005). The respondents were asked to indicate the degree to which they agree with each of the 17 items as they apply to the IT systems of their organization (strongly disagree = 1, strongly agree = 7). A higher mean score indicates that the item best describes the IT systems. Composite indexes are used to obtain measures of Nolan & McFarlan's (2005) support, factory (defensive), strategic and turnaround (offensive) IT modes (average of respectively 5, 5, 7 and 6 items with scales from 1 to 7). It should be noted that some of the 17 questions relate to two IT modes.

IT governance structures are measured using 32 items from De Haes & Van Grembergen (2009), Weill & Ross (2005), Ali & Green (2007), Parent & Reich (2009) and Bowen et al. (2007). The respondents were asked to indicate the degree to which they agree with each of the items as they apply to their organization's IT governance structures (32 items strongly disagree = 1, strongly agree = 7). This measure is split between structures at management level and Board of Directors level. A higher mean score indicates that IT governance structures are more developed. To obtain a more complete description of IT governance structures, we used a number of dichotomous variables (11 items, Yes = 1 when the structure is present, No = 0 otherwise).

IT governance processes are measured using 27 items from De Haes & Van Grembergen (2009), Weill & Ross (2005) and Bowen et al. (2007). The respondents were asked to indicate the degree to which they agree with each of the items as they apply to their organization's IT governance processes (27 items, strongly disagree = 1, strongly agree = 7). A composite sub-index is used to get an overall measure of IT governance processes (average of 27 items with scales from 1 to 7). This measure is split into general, IT projects, and IT strategies and policies' processes. A higher mean score indicates that IT governance processes are more developed.

IT governance relational capabilities are measured using 11 items from De Haes & Van Grembergen (2009). The respondents were asked to indicate the degree to which they agree with each of the items as they apply to their organization (strongly disagree = 1, strongly agree = 7). A composite sub-index is used to get an overall measure of IT governance relational capabilities (average of 11 items with scales from 1 to 7). A higher mean score indicates that IT governance relational capabilities are more developed.

It should be noted that a composite index comprised of the questions from the three sub-indexes described above is also computed to get an overall measure of the use of IT governance mechanisms (structures, processes and relational capabilities) (average of 70 items with scales from 1 to 7).

IT intensity is measured using 5 items from Brown & Magill (1994). The respondents were asked to indicate the degree to which they agree with each of the items as they apply to IT's role in their organization's strategic choices regarding their products/services (average of 5 items, not dependent = 1, totally dependent = 7). A higher mean score indicates that firms are more IT intensive.

A prominent contemporary view of IT governance structure (centralized, decentralized, federal / hybrid) is observed in IT governance research (Brown & Grant, 2005). Since we adopted a more practical view (in accordance with Peterson [2004], and Weill & Ross [2004, 2005]) to measure IT governance structures, we added a measure for the decentralization of the IT function in order to take into consideration this "contemporary" view. In that spirit, *IT function decentralization* is measured using eight items from Brown & Magill (1994) and four items adapted from King et al. (2010). These last items were originally developed by Gordon & Narayanan (1984) and have been empirically tested in previous research (Chenhall, 2003). The respondents were first asked to indicate the degree to which eight IT function-related tasks and responsibilities are decentralized to business units (resulting in multiple units with IT personnel dispersed throughout the organization) (highly centralized = 1, highly decentralized = 7). They were also asked to indicate the degree to which the IT-decision making authority has been delegated to business units throughout the organization for four types of decisions (no delegation = 1, total delegation = 7). A higher mean score indicates that the IT function is more decentralized.

The *size of the IT function* is measured by asking respondents about the total number of employees (internal and outsourced) in the IT function. Accounting figures from the last completed fiscal year at the time of the survey are used to measure the *size of the organization* (assets and revenues) and *the financial performance* (net income). Total number of employees is also used to measure size, as well as market capitalization. Higher mean scores indicate respectively a larger size and a better financial performance. When analyzing differences between groups, the natural log of these variables is used to improve reliability of the measure. The natural log of the size (IT function and total employees) is used to reduce collinearity when performing regression analysis (Arena and Azzone, 2009). Further, in the regression analyses,

financial performance is measured using a dummy variable, i.e. 1 if positive net income, 0 otherwise. *Industry* classifications are based on *FP500* database categories and organizations are classified into three categories to analyze the impact of industry on IT governance (Financial services and Telecommunications – IT, Manufacturing, and Service and Retail organizations).

As shown in Panel A (Table 2), Cronbach's Alphas are above 0.80 for most IT governance constructs indicating good reliability (Nunnally, 1978). The lower reliability coefficients obtained for some constructs, for example for the support mode (0.65), are acceptable in exploratory research. In such case, the generally agreed upon lower limit is 0.60 (Hair, Anderson, Tatham, & Black, 1998). The characteristics from Nolan and McFarlan's (2005) factory and strategic IT modes are more prevalent in our sample firms (means = 4.76 and 4.89 respectively). Overall for the 102 organizations, IT governance structures (mean = 2.34) are less developed than processes (mean = 4.38) and relational capabilities (mean = 4.26). Furthermore, these organizations are moderately IT intensive (mean = 4.66) and their IT function is more centralized than decentralized (mean = 2.61). In the same spirit, in the light of Panel B (Table 2), IT governance structures are clearly not developed at the Board of Directors level while they are somewhat developed at the management level. Indeed, about 75% of the sample firms have a senior executive/officer holding the IT governance function while about 85% have an IT officer or manager responsible for IT security, compliance and/or risk.

Data analysis

To assess if the extent of use of IT governance mechanisms differs according to the IT mode (P1), we had to assign an IT mode to each organization. This has been done by selecting the mode corresponding to the highest (dominant) mean score of the organization's four individual

mode scores based on Nolan & McFarlan's (2005) classification of organizations' IT dependency into four IT modes. In addition, in order to challenge this classification and examine the results from another standpoint, a cluster analysis was performed to classify the 102 organizations (see below). Then, for both classifications, we used ANOVAs to test for between groups differences in terms of the extent of use of IT governance mechanisms (measured by a composite index and three sub-indexes), and in terms of other contextual variables (IT intensity, IT function decentralization, size and performance of the organization, and size of the IT function).

The primary purpose of a cluster analysis "is to group objects based on the characteristics they possess […] so that each object is very similar to others in the cluster with respect to some predetermined criterion" (Hair et al., 1998, p. 473). This exploratory technique allows for an empirical classification of data, based on clustering variables. After ensuring that the sample was representative of the target population, and that there were no multicollinearity problems between variables, we determined the optimal number of groups. As there is no formal method to do so, we used a heuristic approach. First, according to a visual exam of dendrograms for hierarchical cluster analysis using both Ward's method and the average linkage method, a classification into five or four groups respectively seemed to be appropriate. Second, the analysis of agglomeration coefficients for hierarchical analysis indicates that three or five groups lead to large increases in the value of agglomeration coefficients (using either Ward's or the average linkage methods). Finally, a correspondence table shows that the creation of a fourth group allows for the isolation of nine observations according to the Ward's method (16 according to the average linkage method). Overall, considering the number of observations (n = 102) and the aim of our study, the optimal number of groups appears to be 'four'. Therefore, we performed a cluster analysis to identify four homogeneous groups of organizations. This analysis was performed using the K-

means method and, as clustering variables, the 17 questions used to measure IT modes (scale from 1-7).

RESULTS

This exploratory study seeks to provide evidence about the relationships between IT dependency and IT governance. In the next sections, the extent of use of IT governance mechanisms according to different IT modes is documented, and analyses of between group differences are presented. This is followed by results regarding the influence of a defensive or offensive IT mode.

The Extent of Use of IT Governance Mechanisms According to IT Modes (P1)

Classification of organizations according to Nolan & McFarlan's (2005) four IT modes

As a first step, organizations were classified according to the characteristics of the four IT modes suggested by Nolan & McFarlan (2005). Each organization was assigned a specific and single IT mode by selecting the highest of its four individual mode scores to represent the dominant manner in which the organization uses IT. Table 3 presents the results of analyses of between groups differences regarding IT mode, IT governance mechanisms and other contextual variables.

Insert Table 3 about here

The classification of organizations according to Nolan & McFarlan (2005) led to a support dominant IT mode group (n = 8), a factory dominant IT mode (n = 26), a strategic dominant IT mode (n = 56), and a turnaround dominant IT mode (n = 12). Overall, the organizations in the

strategic and turnaround modes (offensive) use more IT governance mechanisms (structures, processes and relational capabilities) than those in the two defensive groups (support and factory). Significant differences between groups in the IT governance overall index can be noted between the support mode (defensive) and the strategic and turnaround modes (offensive) and between the factory (defensive) and strategic (offensive) modes. Further, as there are no group pairs with significant differences regarding IT governance structures, the significant differences between groups in the IT governance overall index are mainly driven by the ones respecting IT governance processes and, to a lesser extent, relational capabilities. These results provide some support to the first proposition (P1), and insights for the second one (P2).

There is no significant differences between groups in terms of the size and performance of organization, or the IT function decentralization. However, differences in IT intensity mirror those in the IT governance overall index and the size of the IT function differs between organizations in the support mode (defensive) and those in the strategic and turnaround modes (offensive).

Classification of organizations in groups using cluster analysis

As a second step, as stated previously, a cluster analysis led to the identification of four homogeneous groups of organizations based on the 17 questions used to measure IT modes. Table 4 presents the results of analyses of between groups differences regarding IT mode, IT governance mechanisms and other contextual variables.

Insert Table 4 about here

As shown in Table 4, there is no significant differences between the four groups in terms of items characterizing a defensive approach. Differences between groups arise from the offensive

IT mode items (e.g., the organization aggressively pursues IT solutions for process and services opportunities, cost reductions, or competitive advantages). Indeed, Group 1 (Gr1) and Group 4 (Gr4) both have offensive IT mode characteristics that are greater (means = 6.12 and 5.04 respectively) and significantly different from both Group 2 (Gr2) and Group 3 (Gr3). In that respect, Gr2 and Gr3 are not significantly different from each other. Moreover, Gr1 has the greatest 'IT offensive mode' score, and the greatest IT intensity, as both are significantly greater than (and different from) Gr4. Further, the size of the IT function is larger in Gr1's organizations than in the three other groups (Figures not reported in Table 3). There is no significant differences between groups in terms of size and performance of organizations (Figures not reported in Table 3), nor regarding IT function decentralization.

The extent of use of IT governance mechanisms (overall index) is not significantly different between Gr1 and Gr4 (the 'more offensive IT mode' groups), and between Gr2 and Gr3. In contrast, there is a significant difference between both Gr1 and Gr2/Gr3, and between Gr4 and Gr2/Gr3. Upon examining the extent of use of IT governance structures, we find the same results at the management level. However, the extent of use of IT governance structures at the Board of Directors level is low, and not significantly different between any of the four groups.

In each of the four groups, the extent of use of IT governance processes is comparable to IT governance relational capabilities. Both are greater than the use of IT governance structures. More specifically, Gr2's IT governance processes and relational capabilities are significantly lower than those of more IT offensive groups (Gr1 and Gr4). It should be noted that Gr3 is significantly different from Gr1 and Gr4 in terms of the extent of use of 'general' IT governance processes only.

As proposed in P1, results suggest that the extent of use of IT governance mechanisms differs according to the IT mode. Further , they provide insights regarding P2 as to the greater extent of use of IT governance mechanisms by organizations in an offensive IT mode compared to those in a defensive IT mode.

Influence of a defensive or an offensive IT mode on the use of IT governance mechanisms (P2)

To assess if the extent of use of IT governance mechanisms is greater when an offensive IT mode is used than when a defensive IT mode is used (P2), we used regression analyses. IT governance structures, processes and relational capabilities as well as the overall IT governance index are the dependent variables and the *IT offensive* mode is an independent variable. We also controlled for the potential effect of other contextual variables. In the light of the cluster classification and the above analysis, we categorized organizations from Gr1 and Gr4 as 'IT offensive' (*IT offensive* = 1) and Gr2 and Gr3 as IT defensive (*IT offensive* = 0). Regression results are presented in Table 5.

Insert Table 5 about here

In Model 1, we control for *IT intensity*, *ITF decentralization*, *LN ITF employees*, *LN org employees*. The adjusted R^2 indicate that the models are successful in explaining an important part of the variance, particularly for the overall index (*ITG all*) and the structures and processes indexes (adjusted R^2 = 0.458, 0.427 and 0.385 respectively). Further, results indicate that the extent of use of IT governance mechanisms for these three indexes is positively and significantly ($p \leq 0.05$) influenced by the use of an IT offensive mode. IT intensity positively influences overall IT governance (*ITG all*), processes and relational capabilities, but only marginally for the first two variables. The size (*LN ITF employees*) of the IT function positively and significantly

affects structures and overall IT governance but with a lesser degree of significance for the latter. The level of decentralization (*ITF decentralization*) also influences structures in a similar manner. The size of an organization (*LN org employees*) positively and significantly influences overall IT governance, processes and relational capabilities. Overall, Model 1 provides a great deal of support for P2.

Model 2 takes into consideration the performance of the organization with a dummy variable (*Positive net income*). By adding this variable to the initial model, the adjusted R^2s increase significantly for all regressions (e.g., for the overall IT governance index, the adjusted R^2 goes from 45.8% to 53.4%). Regarding the variables analyzed above, Model 2's results are similar to those of Model 1 except that the size of the IT function (*LN ITF employees*) is no longer significant. The performance of the organization has a significant positive effect on overall IT governance as well as processes. For both models, industry (measured as dummy variables for Financial services and Telecommunications – IT organizations and for Manufacturing ones) does not have a significant effect on IT governance, hence the variable is not included in the regression results presented in Table 5.

We can conclude from the above results from both models that having an IT offensive mode is a key factor explaining the extent of use of IT governance mechanisms.

DISCUSSION AND CONCLUSION

As stated previously, this study seeks to provide empirical evidence about the influence of IT dependency on IT governance. In doing so, it also provides an overall picture of IT governance in Canadian organizations. By describing the extent to which different IT governance mechanisms are used in practice, we provide evidence that will be helpful for accountants involved in IT

governance (as Board members, senior executives, IT experts or internal auditors). By assessing the relationship between IT dependency and IT governance, and taking into consideration organizations' IT intensity, IT function decentralization and IT function size, as well as industry, organizational size and financial performance, the results of this study lead to a better understanding of the use of IT governance in different contexts.

"Several frameworks assist IT governance decision making" (Simonsson et al., 2010, p. 11) and many "best practices" are suggested to Boards of Directors for dealing with IT governance issues in real-life situations (e.g., Parent and Reich, 2009). However, prior studies indicate a lack of Board involvement and suggest that it might be explained by a lack of IT knowledge or competence (e.g., Huff et al., 2006). We learn from this empirical study that IT dependency provides another explanation for this lack of involvement. In other words, Boards may not have to be involved at a 'maximum' level if the organization's IT mode does not require them to be, i.e. if the organization is using a more defensive mode. Our results point in the same direction as those of Bart & Turel (2010). They showed that the variations in the extent to which questions suggested by the CICA guidelines (2004) were asked by Board members of Canadian firms might be explained by Nolan & McFarlan's (2005) IT modes. The results of our study may thus help the CICA refine its guidelines (CICA, 2004, 2007). It may also be of interest to other organizations providing guidelines to Board members or management.

In summary, this exploratory study contributes to the governance and information systems literature and benefits the accounting profession.

This study has some limitations. The sample size is limited and caution should be exercised when seeking to generalize results. Further, as the study is a survey, usual limitations pertaining

to this research methodology apply. Future research could replicate the study to support generalization of the findings.

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APPENDIX

Correlation matrix (Pearson) (n=102)

		1	2	3	4	5	6	7	8	9	10	11	12	13
	IT mode													
1	- Support	1.0												
2	- Factory	-.46**	1.0											
3	- Strategic	-.52**	.77**	1.0										
4	- Turnaround	-.37**	.56**	.83**	1.0									
5	IT governance	-.34**	.44**	.58**	.55**	1.0								
6	- Structures	-.30**	.37**	.48**	.49**	.92**	1.0							
7	- Processes	-.32**	.43**	.58**	.51**	.90**	.67**	1.0						
8	- Relational capabilities	-.28**	.37**	.47**	.39**	.73**	.48**	.78**	1.0					
9	IT intensity	-.48**	.46**	.59**	.58**	.37**	.34**	.30**	.33**	1.0				
10	IT function decentralization	.05	.08	.04	.01	.09	.21*	-.04	-.12	.14	1.0			
11	Size of IT function	-.19	.29*	.27**	.22*	.19	.26**	.11	-.08	.10	.03	1.0		
12	Size of organization	-.24*	.23*	.27**	.19	.48**	.40**	.51**	.29**	-.03	-.04	.44**	1.0	
13	Performance of organization	-.09	.27*	.21	.19	.44**	.41**	.45**	.21*	.05	-.03	.20	.55**	1.0

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

TABLE 1
Sample firms' and respondents' characteristics

Panel A: Organizations' size and performance

Variables	N	Mean	Median	Std Dev.	Min.	Max.
Size						
Number of employees						
In total	102	6236.5	581	18,045.7	2	136,000
In IT function[a]	98	167.9	28.5	478.7	1	4,000
Market value[b, c]	63	2,328,194	71,627	6,353,176	487	43,918,756
Assets[b, d]	87	4,195,296	263,716	16,117,463	123	145,301,000
Revenues[b, d]	99	1,489,093	198,529	3,896,928	0	30,997,000
Performance						
Net income[b, d]	88	97,325	6,607	506,356	-3,550,000	1,860,386

Panel B: Organizations' main industry

Industry	N	Industry	N
Financial services/Insurance	16	Services	19
Manufacturing	11	Telecommunications/Media/IT	16
Mining	11	Utilities	3
Oil & Gas	7	Agriculture/Food & Beverages/Drugstores	6
Retail/Wholesale	10	Biotechnology/Pharma	3

Panel C: Respondents' number of years of professional experience

Number of years	N[a]	Mean	Median	Std Dev.	Min.	Max.
In total	101	25.1	25.0	7.3	7	45
Within the organization	97	10.5	10.0	9.0	1	35
At current position	97	6.3	5.0	4.8	1	21

Panel D: Respondents' position and general background

Position within the organization	N	Educational background	N[a]
VP IT	15	IS/IT	54
VP IT, & CIO or CTO or Finance or other	10	Business/IT	19
CIO	16	Business/Accounting	14
CTO	13	Engineering	6
Director IT	29	Sciences	4
Manager IT	6	Engineering or Sciences/Business	2
CEO or CFO	7	Other	2
Director finance or other administrative officer	5	Total	101
Other	1		
Total	102		

[a] Some respondents did not answer all questions.

[b] Numbers are in thousands of Canadian dollars.

[c] The sample includes 43 companies listed on the Toronto Stock exchange (TSX), 20 companies listed on the TSX-Venture (TSX-VEN) or Canadian Stock Exchange (CNSX), 38 private organizations (including governmental organizations), and one organizational type is missing.

[d] Data were not available for some private organizations.

TABLE 2
Descriptive statistics

Panel A: Variables measured on a Likert-type scale (n = 102)

Variables	Nb. of questions	Cronbach Alpha	Mean	Median	Std Dev.	Min.	Max.
IT mode[a]							
Defensive							
Support	5	0.65	3.11	3.00	0.90	1.17	5.67
Factory	5	0.51	4.76	4.83	0.92	2.00	6.83
Offensive							
Strategic	7	0.85	4.89	5.00	1.19	2.14	7.00
Turnaround	6	0.81	4.20	4.33	1.36	1.00	7.00
IT governance	*70*	*0.97*	*3.43*	*3.49*	*1.25*	*0.61*	*6.03*
Structures	32	0.95	2.34	1.72	1.60	0.09	5.41
Management level	23	0.96	2.61	1.72	2.03	0.00	6.70
Board of Directors level	9	0.74	1.63	1.44	0.99	0.33	4.89
Processes	27	0.96	4.38	4.59	1.30	1.04	6.63
General	9	0.86	3.86	4.06	1.40	1.00	6.56
IT projects	12	0.95	4.78	5.00	1.43	1.00	7.00
IT strategies & policies	6	0.91	4.37	4.58	1.35	1.00	7.00
Relational capabilities	11	0.86	4.26	4.45	1.15	1.00	6.36
Other contextual variables [b]							
IT intensity	5	0.91	4.66	4.80	1.51	1.00	7.00
IT function decentralization	12	0.92	2.61	2.21	1.41	1.00	6.83
Tasks and responsibilities	8	0.94	2.46	1.94	1.63	1.00	7.00
Decision-making authority	4	0.78	2.91	2.75	1.50	1.00	7.00

Panel B: Dichotomous variables

Variables	N[b]	Yes	No
ITG Structures – Management level			
A senior executive (or officer) holds the IT governance function	102	76	26
If yes: He/She is a member of the executive committee	72	53	19
He/She has a direct reporting line to the CEO	48		
COO	4		
CFO	11		
Another executive or the Board	8		
He/She has been appointed by Board of Directors	14		
Senior executive team	56		
There is an: officer or manager responsible for IT security, compliance and/or risk	101	86	15
IT steering committee at the executive (or senior management) level	102	48	54
IT project steering committee	102	56	46
IT security steering committee	100	18	82
IT architecture steering committee	102	25	77
ITG Structures – Board of Directors level			
The Board of Directors has among its members a Lead director for IT	102	7	95
There is an IT strategy committee at the Board of Directors level	102	5	97
There is a committee at the Board of Directors level (other than IT strategy committee) that overviews IT assurance activities	101	26	75

[a] In accordance with Nolan & McFarlan's (2005). Some questions characterize two IT modes.
[b] Organizations' size and performance, as well as the size of the IT function, are presented in Table 1.

TABLE 3
Analyses of between group differences – IT mode, IT governance and other contextual variables
Groups according to Nolan & McFarlan's (2005)

Variables [a]	Means				Statistics		Group pairs with significant differences at p<0.05
	Sup[b] n=8	Fac[b] n=26	Str[b] n=56	Tur[b] n=12	F or Welch[c] (p<0.05*)		
IT mode							
Defensive							
Support (Sup)	**4.44**	2.80	2.79	2.27	13.82*		Sup-Fac; Sup-Str; Sup-Tur
Factory (Fac)	2.60	**4.75**	4.23	3.29	10.97*		Sup-Fac; Sup-Str; Sup-Tur
Offensive							
Strategic (Str)	2.33	4,68	**5.48**	4.62	28.01*		Sup-Fac; Sup-Str; Sup-Tur; Fac-Str
Turnaround (Tur)	2.19	4.45	5.01	**5.47**	24.78*		Sup-Str; Sup-Tur; Fac-Str; Fac-Tur
IT governance	2.20	2.97	3.72	3.87	6.05*		Sup-Str; Sup-Tur; Fac-str
Structures	1.20	1.84	2.60	2.54	3.38*		--- [d]
Management level	1.14	1.98	3.05	2.92		23.88*	--- [e]
Board of Directors level	1.35	1.48	1.77	1.56	0.79		---
Processes	2.94	3.92	4.66	5.02	7.46*		Sup-Str; Sup-Tur; Fac-Str; Fac-Tur
General	2.32	3.44	4.15	4.43	6.35*		Sup-Str; Sup-Tur
IT projects	3.43	4.24	5.07	5.46	6.08*		Sup-Str; Sup-Tur; Fac-Str; Fac-Tur
IT strategies & policies	2.92	3.97	4.61	5.03	6.18*		Sup-Str; Sup-Tur
Relational capabilities	3.27	3.93	4.43	4.90	4.86*		Sup-Str; Sup-Tur
Other contextual variables [f]							
IT intensity	3.08	3.98	5.05	5.33		23.92*	Sup-Str; Sup-Tur; Fac-Str
IT function decentralization	2.47	2.86	2.59	2.23	0.59		---
Tasks and responsibilities	2.19	2.74	2.45	2.10	0.52		---
Decision-making authority	3.03	3.11	2.88	2.50	0.46		---

[a] Variables measured on a Likert-type scale from 1-7.
[b] Scores for each IT mode were generated from the responses to questions developed based on Nolan and McFarlan (2005). Each organization was assigned a specific and single IT mode by selecting the highest of the four individual mode scores to represent the dominant manner in which the organization used its IT. The dominant mean mode score is in bold.
[c] According to the Levene Test, if we assume that variance is equal among groups, we examine the F Statistic; if not, we examine the Welch Statistic. For multiple comparisons between groups, we use Tuckey HSD Test, if we assume that variance is equal among groups; if not, we examine Dunnett's T3 Test.
[d] Sup-Str (p value = 0.058).
[e] Sup-Str (p value = 0.055).
[f] There are no significant differences between groups with respect to the size of organization (ln employees, ln assets, ln revenues, or ln market capitalisation), and the performance of organization (ln net income). As for the size of the IT function (ln number of employees), there is a significant difference between support and strategic modes, as well as between support and turnaround modes. When classifying organizations into three industries (Financial services and Telecommunications – IT, Manufacturing, and Service and Retail organizations, n = 32, 32, 38 respectively), a cross tabulation of organizations' industry and the organizations' dominant IT mode indicate a significant difference between groups according to industry membership. Organizations in Financial services and Telecommunications – IT are mainly in the Strategic and Turnaround mode while manufacturing and services and retail organizations are mainly in factory or strategic modes.

TABLE 4
Analyses of between group differences – IT mode, IT governance and other contextual variables
Groups according to cluster analysis [b]

Variables [a]	Means				Statistics		Group pairs with significant differences at p<0.05[c]
	Gr1 [b] n=17	Gr2 [b] n=28	Gr3 [b] n=15	Gr4 [b] n=42	F or Welch[c] (p<0.05*)		
IT mode							
Defensive[d]	3.73	3.59	3.33	3.49	1.71		---
Offensive[d]	6.12	3.23	3.62	5.04	100.48*		gr1-2; gr1-3; gr1-4; gr2-4; gr3-4
IT governance	4.23	2.63	2.93	3.82	10.55*		gr1-2; gr1-3; gr2-4; gr3-4
Structures	3.31	1.49	1.58	2.78	8.45*		gr1-2; gr1-3; gr2-4; gr3-4
Management level	3.86	1.53	1.67	3.17		42.49*	gr1-2; gr1-3; gr2-4; gr3-4
Board of Directors level	1.91	1.40	1.33	1.78	1.74		---
Processes	5.02	3.56	4.01	4.80		39.39*	gr1-2; gr2-4
General	4.48	3.12	3.18	4.34	7.88*		gr1-2; gr1-3; gr2-4; gr3-4
IT projects	5.47	3.88	4.46	5.21		40.16*	gr1-2; gr2-4
IT strategies & policies	4.90	3.59	4.36	4.67	5.26*		gr1-2; gr2-4
Relational capabilities	4.97	3.65	4.23	4.40	5.73*		gr1-2; gr2-4
Other contextual variables [e]							
IT intensity	6.02	3.46	4.13	5.12		43.41*	gr1-2; gr1-3; gr1-4; gr2-4
IT function decentralization	2.74	2.58	2.32	2.67	0.30		---
Tasks and responsibilities	2.54	2.35	2.15	4.25	2.52		---
Decision-making authority	3.15	3.04	2.65	3.61	0.78		---

[a] Variables measured on a Likert-type scale from 1-7.
[b] Groups are based on a cluster analysis using (as clustering variables) the 17 items used to measure IT mode.
[c] According to the Levene Test, if we assume that variance is equal among groups, we examine the F Statistic; if not, we examine the Welch Statistic. For multiple comparisons between groups, we use Tuckey HSD Test, if we assume that variance is equal among groups; if not, we examine Dunnett's T3 Test.
[d] Scores for each IT mode were generated based on the responses to 10 items characterizing a defensive IT mode or 10 items characterizing an offensive mode by Nolan and McFarlan (2005).
[e] There are no significant differences between groups with respect to the size of organization (ln employees, ln assets, ln revenues, or ln market capitalisation), and the performance of organization (ln net income). As for the size of the IT function (ln number of employees), there is a significant difference between Gr1-2, Gr1-3, and Gr1-4. When classifying organizations into three industries (Financial services and Telecommunications – IT, Manufacturing, and Service and Retail organizations, n = 32, 32, 38 respectively), a cross tabulation of organizations' industry and cluster groups indicate a significant difference between groups according to industry membership. Financial services and Telecommunications – IT organizations tend to be in groups 1 and 4 while Manufacturing organizations are mainly in groups 2 and 3. Services and retail organizations are mainly in groups 2 and 4.

TABLE 5
Regression of IT governance variables ($ITGV_i$) on contextual variables

Model 1: $ITGV_i = \beta_0 + \beta_1$ (*Offensive IT mode*$_i$) + β_2 (*IT intensity*$_i$) + β_3 (*ITF decentralization*$_i$) + β_4 (*LN ITF employees*$_i$) + β_5 (*LN org employees*$_i$) + ε_i

Model 2: $ITGV_i = \beta_0 + \beta_1$ (*IT offensive*$_i$) + β_2 (*IT Intensity*$_i$) + β_3 (*ITF decentralization*$_i$) + β_4 (*LN ITF employees*$_i$) + β_5 (*LN org employees*$_i$) + β_6 (*Positive net income*$_i$) + ε_i

Independent variables	$ITGV_i$ - Model 1[a] (n = 96)				$ITGV_i$ - Model 2[a] (n = 83)			
	ITG all[b]	Struc.[c]	Proces.[d]	Rel. C.[e]	ITG all[b]	Struc.[c]	Proces.[d]	Rel. C.[e]
Constant	0.098	-1.456	1.172	1.981	-0.301	-2.117	0.963	1.881
	(0.851)	(0.035)	(0.042)	(0.001)	(0.568)	(0.002)	(0.106)	(0.003)
Offensive IT mode$_f$[f]	0.591	0.724	0.593	0.195	0.638	0.890	0.546	0.132
	(0.023)	(0.033)	(0.036)	(0.488)	(0.018)	(0.010)	(0.071)	(0.676)
IT intensity$_i$	0.163	0.123	0.164	0.275	0.188	0.123	0.207	0.330
	(0.057)	(0.269)	(0.079)	(0.004)	(0.030)	(0.259)	(0.033)	(0.002)
ITF decentralization$_i$	0.068	0.201	-0.029	-0.081	0.080	0.231	-0.026	-0.098
	(0.349)	(0.037)	(0.719)	(0.315)	(0.274)	(0.015)	(0.748)	(0.256)
LN ITF employees$_i$	0.166	0.306	0.078	-0.027	0.092	0.184	0.045	-0.060
	(0.064)	(0.010)	(0.419)	(0.783)	(0.317)	(0.119)	(0.663)	(0.579)
LN org employees$_i$	0.146	0.089	0.209	0.160	0.154	0.145	0.163	0.158
	(0.036)	(0.327)	(0.007)	(0.037)	(0.036)	(0.118)	(0.048)	(0.067)
Positive net income$_i$[g]					0.549	0.535	0.697	0.226
					(0.046)	(0.127)	(0.025)	(0.484)
Adjusted R^2 (all $p \leq 0.001$)	0.458	0.427	0.385	0.209	0.534	0.512	0.445	0.231

[a] Probabilities for βs are indicated in parentheses.
[b] IT governance structures, processes and relational capabilities.
[c] Structures.
[d] Processes.
[e] Relational capabilities.
[f] IT offensive = 1 for organizations classified as offensive according to cluster analysis;
= 0 for organizations classified as defensive according to cluster analysis.
[g] Positive net income = 1 for organizations with net income greater than 0;
= 0 for organizations with net income equal to or less than 0.