



The Internal Audit Function and Information Technology Governance: An Exploratory Survey

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Abstract

The internal audit function (IAF) has gained exposure since the enforcement of the Sarbanes-Oxley regulation (SOX, 2002) and its equivalent in Canada (Bill 198, 2002). The role of the IAF has evolved from a traditional role (accounting and financial control) to a more strategic one (risk management and governance), in a changing business environment where information technology (IT) has become important to organizations. IT governance is one of the top 10 IT issues for the accounting profession. Accountants can be involved in IT governance as Board members, internal auditors, external auditors or senior executives. Prior literature suggests that the IAF plays a role in corporate governance, and that IT governance is a subset of corporate governance. However, no study has taken a close look at IAF involvement in IT governance. The purpose of this exploratory study is to describe IAF involvement in IT governance (in terms of structures, processes and relational capabilities), and to assess the relationship between IAF characteristics and this involvement. Based on a survey, results suggest that several measures of IAF resources or competencies, involvement in risk management or interaction with Board of Directors committees are positively associated with IT governance structures, processes or relational capabilities.

Keywords: Internal audit function; IT governance; survey.

La fonction vérification interne et la gouvernance des technologies de l'information : un sondage exploratoire

Résumé

La fonction vérification interne (FVI) est plus exposée depuis l'entrée en vigueur de la réglementation Sarbanes-Oxley (SOX, 2002) et de son équivalent au Canada (Loi 198, 2002). Le rôle de la FVI a évolué d'un rôle traditionnel (comptabilité et contrôle financier) à un rôle plus stratégique (gestion des risques et gouvernance), dans un environnement d'affaires changeant où les technologies de l'information (TI) sont devenues importantes pour les organisations. La gouvernance des TI est l'une des 10 enjeux TI les plus importants pour la profession comptable. Les comptables peuvent être impliqués dans la gouvernance des TI en tant que membres de conseils d'administration, vérificateurs internes, vérificateurs externes ou hauts dirigeants. La littérature suggère que la FVI joue un rôle dans la gouvernance d'entreprise, et que la gouvernance des TI est un sous-ensemble de la gouvernance d'entreprise. Cependant, aucune étude n'a examiné attentivement l'implication de la FVI dans la gouvernance des TI. L'objectif de cette étude exploratoire est de décrire l'implication de la FVI dans la gouvernance des TI (en termes de structures, processus et capacités relationnelles), et d'examiner la relation entre les caractéristiques de la FVI et cette implication. Les résultats d'un sondage suggèrent que plusieurs mesures des ressources ou des compétences de la FVI, de l'implication dans la gestion des risques ou de l'interaction avec le conseil d'administration sont positivement associées aux structures, processus et capacités relationnelles de la gouvernance des TI.

Mots-clés: Fonction vérification interne; gouvernance des TI; sondage.

INTRODUCTION

The internal audit function (IAF) has gained exposure since the enforcement of the Sarbanes-Oxley regulation (SOX, 2002) and its equivalent in Canada, in some respects (Bill 198, 2002). Indeed, “although SOX does not specifically address the corporate governance role of the IAF, the expanded corporate governance requirements for the audit committee, the external auditors, and management suggest an expanded role for the IAF, as well” (Gramling et al., 2004, p. 196). Moreover, “the IAF has a unique opportunity to serve an important role in acting as a resource to the other parties charged with monitoring, maintaining, and enhancing the quality of an entity’s corporate governance” (Gramling et al., 2004, p. 240). Thus, the IAF’s expanded scope includes a critical role in supporting effective organizational governance (Abdolmohammadi et al., 2006).

According to Bhattacharjya & Chang (2007, p. 24), information technology (IT) governance “has increasingly become a key component of corporate governance because of the pervasive influence of information systems and the associated technology infrastructure in every component of an organization’s activities”. “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). In fact, IT governance is one of the top 10 IT issues facing the accounting profession (Datardina & Parker, 2010; Parker, 2010; Trites, 2009; Trites & Lavigne, 2008). In that spirit, the four largest accounting firms worldwide have identified success factors for IT governance (e.g., PwC & ITGI, 2006; ITGI & PwC, 2009). To help Boards of Directors in evaluating IT issues, the Canadian Institute of Chartered Accountants (CICA) has developed two sets of guidelines (CICA, 2004; 2007). Nevertheless, Boards do not seem to be much involved in IT governance (e.g., Huff et al., 2004; Nolan & McFarlan, 2005; Deloitte Consulting, 2007; Andriole, 2009; CEFRIO, 2009). Overall, in practice, “the adoption of IT governance practices lags behind the adoption of corporate governance practices (Bhattacharjya & Chang, 2007, p. 26). By monitoring risks and identifying internal control system weaknesses (Arena & Azzone, 2009), and by partnering with executive management and the audit committee (Rittenberg & Anderson, 2006), the

IAF might help Boards and executive management to fulfill their responsibilities with respect to IT governance. In that spirit, the Institute of Internal Auditor (IAA)'s competency framework (2008) covers to a certain extent some governance or IT knowledge necessary to perform internal audit tasks.

Gramling et al. (2004) present a synthesis of the extant internal auditing literature on the role of the IAF in corporate governance. As well, Sarens (2009) refers to Cooper et al. (2006), Hass et al. (2006), and Allegrini et al. (2006), as recent studies that have extensively evaluated this role. Other studies investigate organizational factors associated with the development of internal audit departments (Arena et al., 2006), the effectiveness of the internal control system (Jokipi, 2010), and the effectiveness of internal auditing (Arena & Azzone, 2009). Hermanson et al. (2000) examine the association between the IAF's IT-related risk activities and organizational characteristics (e.g., industry, number of internal auditors/IT auditors, age of computer systems). In addition to these characteristics, Burton (2000) suggests that future research should consider the influence on the IAF's IT-related activities of other factors such as the experience of IT internal auditors, the maturity of the audit department, the size of the audit department relative to the organization. In a comparative case study, Authors (Forthcoming) found that IAF involvement in IT governance differs between firms, and that IAF characteristics might influence this involvement.

However, internal audit and IT governance literature do not provide empirical insights about the IAF's role in IT governance as a whole. More specifically, we know little about IAF involvement in IT governance structures, processes and relational capabilities. Further, there is a need to identify factors that could influence this involvement. This research aims to explore empirically what the IAF does to support IT governance and factors that explain this contribution. The purpose of the study is i) to describe IAF involvement in IT governance (in terms of structures, processes and relational capabilities); and ii) to assess the relationships between IAF characteristics and this involvement.

This study is motivated by the following reasons. First, IT governance is one of the Top 10 IT issues for the accounting profession, and accountants can be involved in IT governance as Board members, internal auditors, external auditors or senior executives. Second, the role of the IAF has evolved from a

traditional role (accounting and financial control) to a more strategic role (risk management and governance), in a changing business environment where IT has become important to organizations. Thus, in practice, there is a need to understand this expanded role of the IAF that includes IT governance. Third, prior literature suggests that the IAF plays a role in corporate governance and that corporate governance drives IT governance. However, no study has taken a close look at IAF involvement in IT governance, and its antecedents.

CONCEPTUAL FRAMEWORK

The topic under study is examined using a conceptual framework derived from the internal audit and IT governance literatures.

IAF involvement in IT governance

“In a broad sense, 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)” (Authors, Forthcoming, pp. 5-6). IT governance includes structures, processes and relational capabilities. “*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). *Relational capabilities* are defined as “the active participation of, and collaborative relationships among, corporate executives, IT management, and business management (Peterson et al., 2000)” (Peterson, 2004, p. 15), and are complementing the structures and processes (Peterson, 2004). In this study, IAF *involvement in IT governance (structures, processes and relational capabilities)* was defined based on ITGI (2006), and a previous field study (Authors, Forthcoming).

For instance, IAF involvement in IT governance structures refers to internal auditors’ role and

responsibilities, or to an IT Chief internal auditor who is a member of an IT committee. Moreover, when an IT Chief internal auditor presents formal IT reports to the Chief executive officer (CEO), when IT internal auditors' reports addressed to the executive committee to identify best practices, or when IT internal auditors use an IT governance framework, the IAF is involved in IT governance processes. Furthermore, IT leadership coming from the IT Chief internal auditor, a CEO consulting with the IT Chief internal auditor about IT issues, or the Chief internal auditor working closely with the Corporate security officer/CSO are part of IAF involvement in IT governance relational capabilities.

IAF characteristics

IAF characteristics have been investigated in prior studies aiming at, for instance, identifying the drivers of IAF effectiveness (Arena & Azzone, 2009), identifying factors associated with the compliance and the use of the Institute of Internal Auditors (IIA) standards (Abdolmohammadi, 2009), assessing the relationships “between audit committee oversight and the amount of IAF resources allocated to internal-control-based activities” (Abbott et al., 2010, p. 2), and discussing the IT-related activities of internal auditors (Burton, 2000). In this study, we propose that IAF characteristics can influence IAF involvement in IT governance.

Resources

The size of the IAF “clearly determines that amount of time that internal auditors can dedicate to auditing activities” (Arena & Azzone, 2009). Indeed, the total number of internal auditors and the number of internal auditors relative to the total number of employees (Arena & Azzone, 2009), the number of auditors relative to the IT auditors (Burton, 2000), as well as the IAF budget (Abbott et al., 2010) are all characterizing IAF resources.

In this study, IAF *resources* refer to the total number of internal auditors, the number of IT auditors relative to the total number of internal auditors, the budget allocated to this function and the audit tools (frameworks and guides) that are used by internal auditors.

Competencies

“In today’s interconnected world, most organizations rely on IT to at least some degree to conduct their business” (CICA, 2010, p. 1). The IT used by organizations has become more complex. Indeed, “The IAF must embrace technology, understand it, and be able to effectively audit the processes and use it as an audit tool. [...] Knowledge of IT controls, IT auditing techniques, and the current trends in IT enhances understanding and efficient utilization of IAF resources” (Hass et al., 2006, p. 839). In that spirit, Burton (2000) suggests that further research should focus on the number of auditors with good understanding of IT, the number of specialists IT auditors, the number of available senior IT auditors, as well as the experience of IT auditors. Moreover, internal auditor competencies are related to the membership of the Chief Audit Executive (CAE) in the IIA, and the achievement by internal auditors of an accounting certification and/or IIA professional certifications (Arena and Azzone, 2009). Furthermore, the maturity of the internal audit department can affect IT audit tasks undertaken (Burton, 2000).

In this study, IAF *competencies* refer to i) the number of years there has been an IAF in the organization; ii) the fact that the IAF is (or is in the process to be) accredited in accordance with the IIA’s Quality Assurance and Improvement Program; iii) the number of years of IT audit experience of IT internal auditors; iv) the senior executive in charge of the IAF’s number of years of experience in auditing and within the organization; v) the number of hours of formal training of IT and other internal auditors; vi) the number of internal auditors having a CIA, a CISA or an accounting designation relative to the total number of internal auditors.

Involvement of the IAF in risk management

Control risk self-assessment techniques can improve the effectiveness of the IAF (Arena & Azzone, 2009). Since IT governance includes the management of IT-related risks (Authors, Forthcoming), in this study, we consider that the involvement of the IAF in risk management is a characteristic that could be relevant to explain IAF involvement in IT governance. The *involvement of the IAF in risk management*,

concept includes the adoption of control risk self-assessment techniques as Arena & Azzone (2009), and the percentage of internal auditors' time employed to carry out risk assessment (financial and IT risks).

Interaction between the IAF and Board of Directors committees

An interaction between the IAF and the audit committee is important, as they both aim at monitoring and evaluating the internal control system (Arena & Azzone, 2009). Moreover, a close link between both “can promote the role of the IAF within the organization (Goodwin & Yeo, 2001; Raghunandan et al., 2001; Goodwin, 2003), increase its opportunity to suggest improvement actions and to see them implemented in practice” (Arena & Azzone, 2009, p. 47). Indeed, the involvement of the audit committee in the IAF activities improves IAF effectiveness (Arena & Azzone, 2009) and increases the financial resources (budget) allocated to internal-control-based activities (Abbott et al., 2010).

In this study, the *interaction between the IAF and Board of Directors committees* refers to the interaction with the audit committee, as well as other Board committees. More precisely, we explore IAF interaction with committees such as the Governance and risk management committee since they could be involved in IT governance (Authors, Forthcoming). The interaction with Board committees includes i) IAF functional link to the audit committee; ii) private meetings between the senior executive in charge of the IAF and members of the audit committee; iii) the review of the IAF's work and proposals by the audit committee; and iv) the interaction between the IAF and other Board committees.

Relationships between IAF characteristics and IAF involvement in IT governance

The extent to which the IAF is involved in IT governance can be influenced by IAF characteristics. Indeed, from a corporate governance standpoint, the characteristics of the internal audit team (resources, competencies), the involvement of internal auditing in risk management, and the level of interaction between internal auditing and the audit committee can influence IAF effectiveness (Arena & Azzone, 2009). In that spirit, it can be expected that IAF characteristics will be associated with IAF involvement in IT governance. Indeed, an IAF comprised of a limited (large) number of internal auditors, or characterized

by a lack of (an abundance of) IT competence may be a barrier (driver) to IAF involvement in IT governance. Further, if the IAF is (is not) involved in business risk management, it can be expected that it is also (is not) involved in IT-related risk management, which is an IT governance process. In addition, “increased expectations of audit committees will result in enhanced relationships between the IAF and the audit committee” (Gramling et al., 2004, p. 198). Thus, an IAF that is interacting more (less) with the audit committee of the Board for compliance or corporate governance matters might be more (less) inclined to address IT issues with the Board or any of its committees (e.g., IT strategy committee, governance committee, risk management committee). For instance, a lack of IT competence on the Board can lead Board members to have higher expectations respecting IAF involvement in IT governance, and bring more interaction. In other words, IT governance requires a sufficient number of resources with IT competencies, the integration of IT risks in business risk management, as well as the involvement of the Board of Directors in IT issues. Therefore, it can be expected that IAF characteristics presented above will affect IAF involvement in IT governance. This leads us to the following propositions:

***P1:** There is an association between IAF resources and IAF involvement in IT governance.*

***P2:** There is an association between IAF competencies and IAF involvement in IT governance.*

***P3:** There is an association between the involvement of the IAF in risk management and IAF involvement in IT governance.*

***P4:** There is an association between the interaction between the IAF and committees of the Board of Directors and IAF involvement in IT governance.*

In exploring the above propositions, we control for the influence of the size of the organization (Gramling et al., 2004; Goodwin-Stewart & Kent, 2006), the environment (regulated or not) to take into account the influence of normative requirements pertaining to internal auditing and/or control (Arena & Azzone, 2009) and the industry (Hermanson et al., 2000), as these factors have been used in prior studies of the IAF.

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 (Authors, Forthcoming). A recent empirical survey on the influence of IT dependency on IT governance provided additional insights (Authors, 2011).

In the current study, since our concern was to describe IAF involvement in IT governance and explore the influence of IAF characteristics on such involvement, we needed to collect data from a large representative sample. Thus, a survey was an appropriate research method to use (Judd et al., 1991). Since the CAEs are the heads of internal audit activities (IIA, 2008; Abdolmohammadi, 2009), the questionnaire was addressed to the senior executive/officer in charge of the IAF (e.g., CAE, Vice-President (VP) Internal Audit, VP Audit & Risk Management, Chief Internal Auditor, Internal Audit Officer) of a target population of Canadian organizations.

Target Population and Survey Implementation

The questionnaire was developed on the basis of the conceptual framework. We followed Dillman's (2000) procedures in designing and administering the survey. Most of the questions were selected (and adapted, if needed) from existing instruments, using seven-point Likert scales and dichotomous variables. Three academics and a translator revised the English and French versions of the questionnaire while two Chief internal auditors and one partner from a large accounting firm actively involved in the IIA pretested it. The questionnaire took approximately 25 minutes to complete. The survey package included a cover letter and a self-addressed postage-paid envelope in addition to the questionnaire. In both the cover letter and questionnaire, respondents were assured that the information provided would be kept strictly anonymous and confidential. As this study involves human subjects, an ethics approval was obtained from our institutional Research Ethics Committee. In administering the survey, follow-up procedures were

carried out by email and, to a lesser extent, by phone. Replacement questionnaires were mailed to all organizations that did not respond to the first mailing.

The target population was selected from the *Financial Post 500 2010* database. The latter includes data on Canada's Top 800 private and public firms (Top 500 and 300 additional top corporations). All firms having an IAF were targeted. The target population is comprised of 417 medium-to-large, publicly traded, privately held or public sector/governmental or not-for-profit Canadian organizations (considering the removal of firms that did not have an IAF, unreachable firms, organizations with foreign ownership or having their business outside Canada, firms outsourcing all their IAF activities, and accounting firms because of their consulting role to organizations targeted by our study). The survey was administered over a period of about four months from the end of March to July 2011.

Sample

A total of 130 senior executives/officers in charge of the IAF have completed the survey (response rate 31.2%). Sample firms' and respondents' characteristics are presented in Table 1. About 62% of the sample is comprised of medium-to-large listed firms, 22% of public sector/governmental organizations and cooperatives, and 16% of private organizations. On average, they are profitable. Most organizations (102) made important changes to their information systems within the last three years, and their information systems are more centralized than decentralized (not tabulated). About 40% of the sample is represented by organizations from the Services industry and from the Financial services/Insurance sector. The majority of respondents have a position directly related to the IAF. More than 80% have an accounting/auditing educational background. The most common designations held by respondents are an accounting designation (CA), or a combination of an accounting designation and Certified Internal Auditor (CIA).

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

Detailed descriptive statistics are presented in the Results section, including Tables 2, 3 and 4. Appendix A presents descriptive statistics for the independent variables that are used in the regression analyses. A correlation matrix of all independent and dependent variables is presented in Appendix B.

The IAF's characteristics are measured as follows. *Resources* are measured using four items adapted from Arena & Azzone (2009), Abbott et al. (2010) and Burton (2000). *Competencies* are measured with ten items adapted from Arena & Azzone (2009), Hass et al. (2006) and Burton (2000). The *involvement of the IAF in risk management* is measured with the two items used by or adapted from Arena & Azzone (2009). Lastly, the *interaction of the IAF with committees of the Board of Directors* is measured with four items adapted from Arena & Azzone (2009), Abbott et al. (2010) and Christopher et al. (2009).

The *IAF's involvement in IT governance structures, processes and relational capabilities* is measured using items from (or developed in the light of) Authors (Forthcoming) and ITGI (2006).

First, a composite index was computed to get an overall measure of the *IAF involvement in IT governance structures* (sum of 13 dichotomous items with values from 0 to 2, identified as 'a' in Table 4, Panel A). A higher mean score indicates that the IAF is more involved in IT governance structures.

Second, *IAF involvement in IT governance processes* is measured using 23 items. The respondents were asked to indicate the degree to which they agreed with each of the items as they applied to IAF

involvement in IT governance processes (strongly disagree = 1, strongly agree = 7). A composite index is used to get an overall measure of this involvement in IT governance processes (average of 23 items with scales from 1 to 7). A higher mean score indicates that the IAF is more involved in IT governance processes.

Finally, IAF *involvement in IT governance relational capabilities* is measured using nine items. The respondents were asked to indicate the degree to which they agreed with each of the items as they applied to IAF involvement in IT governance relational mechanisms ensuring the synergy between business and IT (strongly disagree = 1, strongly agree = 7). A composite index is used to get an overall measure of this involvement in IT governance relational capabilities (average of nine items with scales from 1 to 7). A higher mean score indicates that the IAF is more involved in IT governance relational capabilities.

The reliability of the composite indexes related to IAF involvement in IT processes and relational capabilities (Cronbach's alphas = 0.93 and 0.83 respectively) is very good (Nunnally, 1978). The reliability for IAF involvement in IT structures index is acceptable (Cronbach's alpha = 0.60), as the generally agreed upon lower limit in exploratory research is 0.60 (Hair et al., 1998).

Total revenues from the last completed fiscal year at the time of the survey are used to measure the *size of the organization*. The natural log of revenues is used to reduce collinearity when performing regression analysis (Arena and Azzone, 2009). A higher mean score indicates larger size. Listed firms and public sector/governmental organizations were considered as operating in a *regulated environment* while privately held ones are not (Yes = 1; No = 0). Based on the 2010 edition of the FP500 database categories, three groups of *industry* are used: i) Financial services / Insurance and Telecommunications / IT / Media are grouped under 'Financial and Telecom/IT'; ii) Manufacturing, Mining, Oil & Gas, Food & Beverages and Biotechnology are grouped under 'Manufacturing'; and iii) Retail, Services and Utilities are grouped together.

RESULTS

This exploratory study seeks to describe IAF involvement in IT governance, and assess the relationships between IAF characteristics and this involvement. In the following section, a descriptive analysis provides details regarding IAF characteristics, as well as IAF involvement in IT governance structures, processes and relational capabilities. Thereafter, regression analyses are used to assess the four propositions under study.

Description of IAF characteristics

Detailed descriptive statistics of IAF characteristics in terms of resources, competencies and involvement of this function in risk management are presented in Table 2, and those in terms of the interaction between the IAF and Board of Directors committees are in Table 3.

Insert Table 2 about here

Panels A, B and C of Table 2 provide an overall picture of IAF resources. First, with respect to the amount of human resources, results suggest a great variation between firms (standard deviations greater than means). On average, there is a limited number of full time equivalent employees in the IAF in the sample firms (mean = 9). The number of IT internal auditors (mean = 1.4) is even more limited, as about half of the organizations have no IT auditors. Second, about 45% of the firms have an IAF's operating budget of \$600,000 and less, while about 25% allocate more than \$1,600,000. The IAF's budget is approved at the Board level in the majority of organizations. Third, in more than 90% of the firms, the IAF uses the IIA International Standards for the Professional Practice of Internal Auditing and a governance framework such as COSO (Committee of Sponsoring Organizations of the Treadway Commission). On average, the IIA's Global Technology Audit Guides (GTAG) and computerized audit techniques are used to a lesser extent (about 55-60% of the sample firms) than the more general guides and frameworks. The data show that IAF resource elements pertaining to IT (i.e., IT employees and IT tools used) are more limited than those for the IAF in general (e.g., COSO).

From a cursory review of Panel D (Table 2), it can be concluded that IAF competencies seem to be developed to a high level in the sample firms. Indeed, on average, the IAF has been established for about 14 years. Moreover, the senior executive/officer in charge of the IAF has 17 years of experience in auditing, six to seven years within the organization or in charge of an IAF, and has been a member of the IIA for more than ten years. Furthermore, on average, internal auditors other than IT auditors have about 47 hours of auditing and other job-related formal training in the last year, but little IT-related audit training (mean = 7.0). Accounting and CIA designations are commonly held by respondents (means = 4.0 and 1.7 respectively).

Regarding IT-related competencies, only half of the organizations have IT auditors. In these firms, on average, IT internal auditors have eight years of IT audit experience, respectively 23 and 32 hours of audit/job-related and IT-related training. The IT professional designation CISA is common for IT auditors (mean = 1.9) while it is less frequent for non-IT auditors (mean = 0.5). These results suggest that there is an overall lack of IT competence in the IAF.

On average, an important proportion of the IAF's time (almost 45%) is spent on auditing financial and IT risks (Panel E, Table 2). This involvement of the IAF in risk management suggests that organizations take the risk management process seriously. This result is in line with Abdolmohammadi et al. (2006). Indeed, as stated in the introduction, the IAF's expanded scope includes a critical role in supporting effective organizational governance.

In the light of Table 3, the IAF reports to the audit committee and attends audit committee meetings in the majority of the sample firms (about 90%). The IAF's reporting to the audit committee is not surprising as this is one of the governance mechanism put in place to protect the independence of the IAF (Christopher et al., 2009). Further, results indicate that the IAF also interacts with other Board committees. For instance, the IAF can be involved in the Corporate risk committee, the Finance & risk management committee or the Nominating & corporate governance committee. This involvement provides additional support to our contention that the IAF is quite involved in risk management.

Insert Table 3 about here

Description of IAF involvement in IT governance

The majority of the sample firms has a senior executive/officer holding the IT governance function (about 90%) and officers managers responsible for IT security, compliance and/or risk (about 85%) (not tabulated). The presence of these executives/officers enables the development of IT governance relational capabilities. In Table 4, we present statistics related to the involvement of the IAF in IT governance structures, processes and relational capabilities.

Insert Table 4 about here

In the light of Panel A (Table 4), only about one third of the sample firms has a separate officer/manager in charge of IT internal audits. As shown in note 'b' (Table 4), the majority of these officers/managers reports to the senior executive in charge of the IAF. In addition, in organizations where there are IT internal auditors, these auditors report mainly to the senior executive in charge of the IAF, or to the officer/manager in charge of IT internal audits (note 'b', Table 4). In most of the organizations (113 out of 128), the senior executive/officer in charge of the IAF or the officer/manager in charge of IT internal audits reports periodically to the audit committee on IT risks and results of IT audits performed. IT audit matters are usually included in periodic audit reports, and, to a lesser extent, in stand alone IT audit reports. A close look at the involvement of the IAF on different organizational IT committees indicates a lesser implication than the one with the audit committee pertaining to IT-related matters. For instance, in organizations where there is an IT project steering committee, the senior executive/officer in charge of the IAF is a member of this committee and is invited to committee meetings in less than 35% of the organizations (in less than 30% when there is an IT security steering committee; in less than 20% when there is an IT steering committee; and in about 15% of the organizations when there is an IT architecture committee). It should be added that the senior executive/officer in charge of the IAF is not very much involved with Board committees (other than the audit committee) that overview IT-related

risks or audit activities. Only 15 organizations have such committees and the IAF senior executive/officer is invited to some meetings in about half the cases (7 out of 15). Overall, the above discussion suggests that the IAF is not much involved in IT governance structures.

This overall picture developed in the light of dichotomous variables tends to be supported when using an overall composite measure of the involvement of the IAF in IT governance structures. As shown in Panel B (Table 4), sample firms have a weak mean score of 5 (on a total maximum score of 15). In comparison, the IAF is more involved in IT governance processes (mean = 4.48 on a 1-7 scale) and relational capabilities (mean = 4.20 on a 1-7 scale). More specifically, the IAF is more involved in IT governance processes as it assesses risk in planning overall and individual elements of IT audits (mean = 5.76) and uses IT governance and control frameworks in planning, performing and reporting on IT audits (mean = 5.06). Also, the IAF is heavily involved in the evaluation of several processes (mean greater than 5, not tabulated), namely the effectiveness of IT controls in different locations, data integrity, privacy procedures, IT security, IT asset management and safeguarding, IT-related threat and risk management methods to ensure continuity of processing, and IT-related disaster-recovery procedural plan, testing and documentation. Further, in terms of relational capabilities, internal auditors are trained about IT control (mean = 5.12, not tabulated).

Relationships between IAF characteristics and IAF involvement in IT governance

We have proposed associations between IAF resources (P1), competencies (P2), involvement in risk management (P3), interaction with the committees of the Board of Directors (P4), and the involvement of the IAF in IT governance. Table 5 presents the results of regression analyses for each of these propositions.

Insert Table 5 about here

Panel A of Table 5 presents the regression results respecting the model for IAF resources. The regression of IAF involvement in IT governance structures shows that it is mainly driven by the number of

IT auditors relative to the total number of internal auditors, followed by the size of the IAF (total number of internal auditors) and the use of tools such as governance frameworks and IIA's guides by the IAF. As illustrated by the second regression (Panel A, Table 5), the use of such tools influences IAF involvement in IT governance processes, and the fact that an organization operates in a regulated environment. The third regression (Panel A, Table 5) highlights that the frameworks and guides used by the IAF, the number of IT auditors relative to the total number of internal auditors, operating in a regulated environment and the size of the organization affects IAF involvement in IT governance relational capabilities. It should be noted that IAF involvement in IT governance structures, processes or relational capabilities is not driven by the operating budget allocated to the IAF or the industry, since these factors are not significant in any of the three 'resource' regressions. Overall, the resources used by the IAF in terms of percentage of IT internal auditors and frameworks/guides are the two most significant factors influencing the involvement of the IAF in IT governance. In support of P1, IAF resources represent a valid explanation for the variation in IAF involvement in IT governance structures, processes or relational capabilities with significant adjusted R^2 going from 19.2% to 22.9%.

The regression results presented in Panel B (Table 5) pertain to the relationship between IAF competencies and IAF involvement in IT governance. In the first regression, the percentage of internal auditors having a CIA designation is the only significant determinant and, surprisingly, it is negatively associated with IAF involvement in IT governance structures. In the second regression, the senior executive/officer in charge of the IAF's number of years of experience within the organization is associated with the IAF involvement in IT governance processes. In the third regression, IAF involvement in IT governance relational capabilities is mainly driven by the percentage of internal auditors having a CISA designation, followed by the senior executive/officer's total number of years of experience in auditing and within the organization. It should be noted that IAF involvement in IT governance structures, processes or relational capabilities is not driven by the maturity of the IAF (number of years) or the fact that this function is (or will be) accredited by the IIA's Quality Assurance and Improvement Program, nor

the number of hours of internal auditors' formal training, or the fact that they have an accounting designation. Moreover, the size of the organization, the industry or operating in a regulated environment does not influence IAF involvement in IT governance in any of the 'competency' regression. Overall, the senior executive/officer of the IAF and internal auditors' competencies (respectively the number of years of experience in auditing or within the organization, and an IT professional designation) are the only two significant factors influencing IAF involvement in IT governance. However, in contrast with the IAF resources (Panel A, Table 5), IAF competencies explain a smaller percentage of the variation in IAF involvement in IT governance structures, processes or relational capabilities with significant adjusted R^2 from 13.7% to 14.0%. Therefore, the support for P2 is somewhat low.

According to the results presented in Panel C (Table 5), the involvement of the IAF in risk management is not related to IAF involvement in IT governance structures (first regression), while it is influencing IAF involvement in IT governance processes (second regression) or relational capabilities (third regression) (when measured by the proportion of time spent by the IAF in auditing financial and IT risks). However, in each of the three 'involvement of the IAF risk management' regressions, the size of the organization is the most significant driver of IAF involvement in IT governance. Moreover, the industry influences IAF involvement in IT governance processes. For instance, this involvement is greater in Financial and Telecom/IT firms (lesser in Manufacturing firms) than in Retail, Services and Utilities firms. Overall, results provide some support for P3, as the involvement of the IAF in risk management appears to represent a potential explanation of the variation in IAF involvement in IT governance processes and relational capabilities (adjusted R^2 are significant, and respectively 14.9% and 9.0%).

Lastly, as shown in Panel D (Table 5), the audit committee's interaction with the IAF (by having private meetings with senior executive/officer in charge of the function or reviewing IAF's work and proposals) is associated with IAF involvement in IT governance processes (second regression) while audit committee's review of the IAF's work and proposals is associated with IAF involvement in IT governance relational capabilities. As in the case of the 'risk management' model (Panel C), the size of the

organization is significant in all three regressions of the ‘interaction of the IAF with Board committees’ model. Thus, size is an important driver of IAF involvement in IT governance. Moreover, the industry influences IAF involvement in IT governance processes in the same manner as in Panel C’s processes regression. Overall, results provide partial support for P4, as the interaction between the IAF and the audit committee of the Board of Directors seems to be a potential explanation of the variation in IAF involvement in IT governance processes and relational capabilities (significant adjusted R² of 20.2% and 7.2% respectively).

DISCUSSION AND CONCLUSION

This exploratory study provides insights about which IAF characteristics give rise to a greater IAF involvement in IT governance. Indeed, results suggest that several measures of IAF resources or competencies, involvement in risk management or interaction with Board of Directors committees are positively associated with IT governance structures, processes or relational capabilities.

Many professional accountants are involved in an IAF. By taking a close look at IAF involvement in IT governance, and its antecedents, this study is relevant to their practice. The results highlight the extent to which the IAF supports IT governance and provide insights about drivers and barriers of this contribution. By documenting IAF involvement in IT governance, this exploratory study helps accountants understand the IAF’s expanded role. It also provides useful information to update the IIA’s competency framework (2008).

The study results should be relevant to accountants involved as internal auditors supporting IT governance, external auditors using internal auditors’ work, senior executives making decisions about resources allocation, or Board members on audit committees mandated to appoint, dismiss and evaluate the head of the IAF. It can also be of interest to Board members on risk management or governance committees dealing with governance issues. In other words, this study provides guidance as to which

factors should be enhanced to increase IAF involvement in IT governance, assuming that this involvement can contribute to governance effectiveness.

Overall, since organizations can benefit from effective IT governance to which the IAF can contribute, they should be interested in enhancing their knowledge concerning IAF involvement in IT governance structures, processes and relational capabilities, as well as the identification of the factors that could influence this involvement. Further, since the IAF plays a role in corporate governance, and IT governance is a subset of corporate governance, this empirical exploratory study represents a first step in building a bridge between corporate governance, IT governance and internal audit literatures. Further research is needed to identify other determinants of IAF involvement in IT governance structures, to assess the impact of different measures of this involvement, and to test hypotheses in the light of the results of this study.

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APPENDIX A**Descriptive statistics for independent variables used in the regression analyses (n=130)**

Variables	Mean	Median	Std. Dev.	Min.	Max.
<i>Resources</i>					
Total number of internal auditors (LN)	1.51	1.61	1.14	-1.39	5.11
Percentage IT internal auditors	0.13	0.10	0.16	0	1.00
Operating budget ^a	2.90	3.00	1.53	1.00	6.00
Frameworks and guides used by IAF ^b	0.76	0.75	0.23	0.25	1.00
<i>Competencies</i>					
Number of years of IAF function	13.75	10.00	11.28	0.50	70.00
IAF accredited (or in the process to be) – IIA's Quality Assurance and Improvement Program ^c	0.42	0	0.49	0	1
Average number of years of IT audit experience of internal auditors	4.37	1.50	5.84	0	30.00
Senior executive/officer's total number of years of experience in auditing	16.91	15.00	9.27	1.00	47.00
Senior executive/officer's years of experience within the organization	6.07	4.00	5.65	0	28.00
IT auditors' average hours of formal training in last 12 months	29.10	18.50	41.80	0	334.00
Other auditors' average hours of formal training in last 12 months	54.25	40.00	44.54	0	240.00
Percentage of internal auditors with CIA designation	0.28	0.20	0.31	0	1.00
Percentage of internal auditors with CISA designation	0.17	0.12	0.23	0	1.00
Percentage of internal auditors with accounting designation	0.64	0.60	0.33	0	2.00
<i>Involvement of the IAF in risk management</i>					
Use of Control Risk Self-Assessment Techniques in the area of information systems ^c	0.42	0	0.49	0	1
Percentage of IAF's time spent on auditing of IT and financial risks	43.46	40.00	21.37	0	100.00
<i>Interaction between the IAF and Board of Directors committees</i>					
IAF functionally reports to Board of Directors Audit Committee ^c	0.89	1.00	0.31	0	1
Senior executive/officer in charge of IAF has private meetings with the Audit Committee ^c	0.84	1.00	0.37	0	1
IAF's work and proposals reviewed by the Audit Committee ^d	0.85	0.83	0.20	0	1
Interaction with Board Committees other than Audit Committee ^c	0.35	0	0.48	0	1
<i>Control variables</i>					
Size of organization (LN Revenues)	14.12	14.08	1.32	11.44	17.28
Regulated environment ^c	0.85	1.00	0.35	0	1
Industry – Financial and Telecom/IT ^c	0.29	0	0.46	0	1
Industry – Manufacturing ^c	0.32	0	0.47	0	1

^a Operating budget is measured on a scale of 1 (Between \$100,000 and \$200, 000) to 6 (over \$3,000,000).

^b The variable is measured as the percentage of four frameworks and guides that can be used by the IAF.

^c The variables is measured as 1 if yes, 0 otherwise.

^d The variable is measured as the percentage of six IAF's work and proposals reviewed by the Audit Committee.

TABLE 1
Sample firms' and respondents' characteristics

Panel A: Organizations' size and performance						
Variables	n ^d	Mean	Median	Std Dev.	Min.	Max.
Size						
Assets ^{a, b}	129	12,875,564	2,244,220	44,162,347	37,412	411,640,000
Revenues ^a	130	3,170,295	1,308,068	4,951,619	93,326	32,008,000
Nb of employees	130	7519	2435	16,200	91	138,000
Market value ^{a, c}	81	5,786,361	2,012,130	9,820,345	54,620	53,709,012
Performance -						
Net income ^a	128	492,382	99,406	1,677,817	-396,900	17,731,000
Panel B: Organizations' main industry						
Industry	n	Industry	n			
Financial services/Insurance	27	Services	24			
Manufacturing	17	Telecommunications/Media/IT	11			
Mining	7	Utilities	10			
Oil & Gas	13	Food & Beverages	3			
Retail	17	Biotechnology	1			
Panel C: Respondents' position and general background						
Position within the organization ^e	n	Major ^f	n ^d			
VP internal audit; VP & chief auditor	32	Accounting/Auditing	69			
Chief auditor; chief audit executive	13	Accounting/Auditing and other business area	24			
Director internal audit	51	Accounting/Auditing and computer science or information systems	6			
Manager internal audit	16	Accounting/Auditing and Arts/Humanities or science	9			
Director IT internal audit	4	Business/Management or Finance	10			
CFO	7	Computer science or Information systems	5			
Other	7	Arts/Humanities	4			
Total	130	Other	2			
		Total	129			
Panel D: Respondents' designation						
Designation ^g	n	Designation ^g	n			
Certified Internal Auditor (CIA)	8	CIA and accounting designation	30			
Certified Information systems Auditor (CISA)	4	CIA, CISA and accounting designation	10			
Chartered Accountant (CA)	53	CISA and accounting designation	8			
Certified Management Accountant (CMA)	7	Other	2			
Certified General Accountant (CGA)	5	None	3			

^a Numbers are in thousands of Canadian dollars.

^b One hundred and three organizations have subsidiaries/divisions, of which 69 have some or all of them located outside Canada.

^c The eighty-one companies are listed on the TSX with 25 also listed on the NYSE or NASDAQ; 28 responses are from public sector/governmental organizations and cooperatives; 21 are from private organizations.

^d Some respondents did not answer all questions.

^f Most organizations (102) made important changes to their information systems within the last three years.

^g Fifty respondents indicate being also responsible for another management function, mainly risk management and/or compliance.

^h The highest level of formal education completed by the respondents is a bachelor degree for 90, a master degree for 31 and another degree for six; three respondents did not respond.

ⁱ In addition to the designations mentioned above, eight respondents hold a CFE (Certified Fraud Examiner), two hold a CISSP (Certified Information Systems Security Professional) and two hold a CCSA (Certification in Control Self-Assessment).

TABLE 2
 Characteristics of the IAF – Resources, competencies and involvement in risk management

Panel A: Resources - employees						
Variables	n	Mean	Median	Std. Dev.	Min.	Max.
Number of full time equivalent						
IT internal auditors ^a	130	1.4	0.8	2.5	0	16
Other internal auditors ^b	130	7.6	4.0	15.0	0	150
Total	130	9.0	5.0	17.1	0.3	166
Panel B: Resources - budget						
Operating budget allocated to the IAF:	n	IAF budget is approved by:				n ^c
Between \$100,000 and \$200,000	25	Board Committee (e.g., Audit)				35
Between \$300,000 and \$600,000	34	Senior executive (e.g., CFO, CEO)				39
Between \$700,000 and \$1,500,000	36	Board Committee and senior executive				37
Between \$1,600,000 and \$2,000,000	13	Senior executive in charge of IAF				3
Between \$2,100,000 and \$3,000,000	8	Board Committee and/or senior executive and				
Over \$3,000,000	14	Senior executive in charge of IAF				14
Total	130	Total				128
Panel C: Resources – tools						
The IAF uses:						n ^c
IIA International Standards for the Professional Practice of Internal Auditing (in whole or in part)						122
IIA's Global Technology Audit Guides (GTAG)						75
Computerized audit techniques to perform internal audits (e.g., data mining, continuous audit)						79
Governance frameworks (e.g., COSO)						118
Panel D: Competencies						
Variables	n ^c	Mean	Median	Std. Dev.	Min.	Max.
Number of years of IAF function in organization ^d						
Average number of years of IT audit experience of IT internal auditors	66	8.2	7.0	5.8	0	30
Senior executive/Officer in charge of the IAF:						
Number of years of experience in auditing:						
In total	128	17.0	15.0	9.3	1	47
Within the organization	128	6.1	4.3	5.7	0	28
Number of years of IT audit experience ^e	83	7.4	5.0	6.7	0.5	34
Number of years in charge of an IAF	128	6.9	5.0	6.9	0.2	30
Number of years member of Institute of Internal Auditors (IIA)	101 ^f	10.8	10.0	7.3	1	33
Average number of hours of formal training over last 12 months:						
IT internal auditors:						
Audit or other job-related training	65	23.1	20.0	37.8	0	288
IT-related audit training	65	31.7	30.0	25.9	0	150
Other internal auditors:						
Audit or other job-related training	127	47.7	40.0	42.5	0	240
IT-related audit training	127	7.0	1.0	10.9	0	58
Professional designations:						
IT internal auditors:						
Certified Internal Auditor (CIA)	65	0.4	0	0.8	0	4
Certified Information Systems Auditor (CISA)	65	1.9	1.0	1.7	0	8
Accounting designation (CA, CMA or CGA)	65	0.7	0	0.9	0	4
Other	65	0.7	0	1.5	0	10
Other internal auditors:						
Certified Internal Auditor (CIA)	127	1.7	1.0	3.0	0	24
Certified Information Systems Auditor (CISA)	127	0.5	0	1.4	0	13
Accounting designation (CA, CMA or CGA)	127	4.0	2.0	6.2	0	58
Other	127	0.7	0	2.0	0	13

TABLE 2
 Characteristics of the IAF - Resources, competencies and involvement in risk management
 (continued)

Panel E: Audit practices (including involvement of the IAF in risk management^g)						
Variables	n ^c	Mean	Median	Std. Dev.	Min.	Max.
Proportion of the IAF's time spent on:						
Auditing of financial risks ^g	130	28.6	20.0	21.4	0	100
Auditing of IT risks ^g	130	14.9	14.5	10.0	0	50
Operational audits	130	29.0	30.0	17.7	0	100
Compliance audits	130	19.0	15.0	17.0	0	90
Investigation of fraud and irregularities	130	4.7	5.0	4.7	0	20
Other	130	3.8	0	6.6	0	35
Proportion of the IAF's time spent on:						
Assurance/audit activities	129	81.9	86.0	16.0	2	100
Consulting activities	129	18.1	14.0	16.0	0	98

^a Sixty-one organizations have no IT auditors. On average, IT auditors represent 23.6 percent (Std. Dev. = 14.2 percent) of total auditors in the 69 organizations with such auditors.

^b One organization has no other internal auditors.

^c Some respondents did not answer all questions.

^d *IAF Competency*: In 54 organizations, the IAF is (or is in the process to be) accredited in accordance with the Quality Assurance and Improvement Program of the IIA.

^e Forty-two officers in charge of the IAF do not have IT audit experience; five did not respond.

^f One hundred and six respondents are member of the IIA: five did not indicate for how long.

^g The *involvement of the IAF in risk management* is measured by the total proportion of time spent on auditing financial and IT risks (%) and a dichotomous variable asking if the IAF uses Control risk self-assessment (CRSA) techniques in the area of information systems (n = 54 with Yes = 1).

TABLE 3
 Characteristics of the IAF - Interaction between the IAF and Board of Directors Committees

Panel A: Reporting by senior executive/officer		
Variables	Functionally	Administratively
Senior executive/officer in charge of the IAF reports to:		
Audit Committee	93	3
Audit Committee and senior executive (e.g., CEO, CFO)	23	11
Senior executive	<u>14</u>	<u>113</u>
Total	130	127 ^a
Panel B: Interaction with Audit Committee		
Variables	Yes ^a	No ^a
Senior executive/officer in charge of the IAF:		
Attends Audit Committee meetings	126 ^b	3
Has private/in camera meetings with the Audit Committee Chair or individual members	109 ^c	20
The Audit Committee reviews:		
The IAF's proposals related to:		
Program/plans	124	5
Budget	77	51
Risk assessment	105	23
The results of audits performed	127	2
Management responses to internal audit findings/suggestions	114	14
Any difficulties/scope restrictions encountered by internal auditors	116	12
Panel C: Interaction with other Board Committees		
Variables	n	
Instances on which a representative of the IAF is involved:		
Board (as a whole)	4	
Corporate risk/Finance & risk management committee	16	
Nominating & corporate governance committee	12	
Compensation committee	5	
Other (e.g., Reporting, Information security, Conduct review, Safety, health & environment)	<u>9</u>	
Total	46 ^d	
Involvement of the representative of the IAF on these committees:		
Active as consultant	13	
Observer	7	
Review/report	16	
Attends at times	<u>4</u>	
Total	40 ^a	

^a Some respondents did not answer all questions.

^b Five IAF senior executive officer attend these meetings only sometimes.

^c The mean number of meetings per year is 4.19 (Std. Dev. 2.9) and the median is four (n = 91).

^d Eleven respondents indicate that the IAF representative is also involved with a second committee mainly as a consultant or to present reports.

TABLE 4
IAF's involvement in IT Governance

Panel A: Dichotomous variables			
IAF's involvement in IT governance structures	n	Yes	No
A separate officer/manager is in charge of IT internal audits ^{a, b}	130	48 ^b	82
Committees:			
IT steering committee at executive (or senior management) level	130	82	48
Senior executive/officer in charge of IAF is:			
A member and invited to committee meetings ^a		14	
Invited to some committees meetings only ^a		27	
Neither of the above		41	
	129	112	17
IT project steering committee(s)			
Senior executive/officer in charge of IAF is ^c :			
A member and invited to committee meetings ^a		38	
Invited to some committees meetings only ^a		33	
Neither of the above		39	
	127	38	89
IT security steering committee			
Senior executive/officer in charge of IAF is ^c :			
A member and invited to committee meetings ^a		11	
Invited to some committees meetings only ^a		15	
Neither of the above		11	
	126	41	85
IT architecture steering committee			
Senior executive/officer in charge of IAF is ^c :			
A member and invited to committee meetings ^a		6	
Invited to some committees meetings only ^a		16	
Neither of the above		19	
Senior executive/officer in charge of the IAF or the officer/manager in charge of IT internal audits reports periodically to the Audit Committee on IT risks and results of IT audits performed ^a	128	113	15
IT audit matters are included in ^c :			
Stand alone IT audit reports ^a	101		
Always		47	
Sometimes		30	
Never		24	
Periodic audit reports ^a	103		
Always		47	
Sometimes		51	
Never		5	
A committee at the Board of Directors level (other than the Audit Committee) that overviews IT-related risks and/or IT-related audit activities	129	15	114
Senior executive/officer in charge of the IAF or the officer/ manager in charge of IT internal audits is ^c :			
Invited to some committee meetings ^a		7	
Not invited to committee meetings		6	

TABLE 4
IAF's involvement in IT Governance (continued)

Panel B: Composite indexes						
IAF's involvement in IT governance (Nb. of questions)	n ^c	Mean	Median	Std. Dev.	Min.	Max.
Structures (13) ^a	130	5.15	5.00	2.58	0	12
Processes ^d						
All (23), including	128	4.78	4.91	1.09	1.65	7.00
Use of risk assessment in planning overall and individual elements of IT audits (2)	128	5.76	6.00	1.25	1.00	7.00
Use of IT governance and control frameworks in planning, perform and report on IT audits (3)	129	5.06	5.33	1.71	1.00	7.00
IAF evaluates IT processes (12)	129	4.75	4.83	1.24	1.58	7.00
Relational capabilities ^d (9)	129	4.29	4.25	1.12	1.33	7.00

^a The IAF's involvement in IT governance structures is measured by a composite index computed with 13 dichotomous items (11 items 0, 1; 2 items 0, 1 or 2; total maximum score = 15).

^b In 41 organizations, the separate officer/manager in charge of the IT internal audits reports to the senior executive in charge of the IAF while in seven firms, this officer/manager reports to another executive/officer (e.g. CFO, VP IT, IT security director). In the 69 organizations where there are IT internal auditors, 36 report to the senior executive in charge of the IAF, 25 report to the officer/manager in charge of IT internal audits, and 8 report to others (e.g. CFO, Internal audit manager).

^c Some respondents did not answer all the questions.

^d Variables are measured on a scale from 1 to 7 anchored at Strongly disagree and Strongly agree.

TABLE 5
Regression analyses

General model: $IAF \text{ in } ITG_i = \beta_0^a + \beta_{1 \text{ to } n} (IAF \text{ characteristics}_i) + \beta_{n+1} (LN \text{ Revenues}_i) + \beta_{n+2} (Regulated_i) + \beta_{n+3} (Ind \text{ Fin and Telecom}/IT_i) + \beta_{n+4} (Ind \text{ Manufac}_i) + \varepsilon_i$			
Panel A: Resources (P1)			
Independent variables	IAF's involvement in IT governance ^b		
	Structures ^c	Processes ^d	Relational capabilities ^e
Total number of internal auditors (LN)	0.745 (0.050)	-0.137 (0.382)	-0.111 (0.498)
Percentage IT internal auditors	4.773 (0.001)	0.893 (0.153)	1.612 (0.012)
Operating budget allocated to the IAF	-0.144 (0.590)	0.060 (0.589)	-0.163 (0.162)
Frameworks and guides used by IAF	2.003 (0.065)	1.703 (0.000)	1.880 (0.000)
<i>Control variables</i>			
Size of organization (LN Revenues)	-0.217 (0.398)	0.135 (0.207)	0.205 (0.069)
Regulated environment	0.389 (0.534)	0.484 (0.065)	0.614 (0.026)
Industry - Financial and Telecom/IT	0.178 (0.742)	0.348 (0.127)	0.284 (0.230)
Industry - Manufacturing	0.099 (0.850)	-0.353 (0.107)	0.090 (0.695)
Adjusted R ²	0.193 (0.000)	0.229 (0.000)	0.192 (0.000)
Panel B: Competencies (P2)			
Independent variables	IAF's involvement in IT governance ^b		
	Structures ^c	Processes ^d	Relational capabilities ^e
Number of years of IAF function	0.012 (0.600)	-0.001 (0.437)	-0.010 (0.310)
IAF accredited (or in the process to be) – IIA's Quality Assurance and Improvement Program	0.149 (0.766)	0.155 (0.468)	0.013 (0.952)
Average number of years of IT audit experience of internal auditors	0.066 (0.181)	0.021 (0.314)	-0.016 (0.444)
Senior executive/officer's total number of years of experience in auditing	-0.032 (0.238)	-0.019 (0.104)	-0.030 (0.012)
Senior executive/officer's years of experience within the organization	0.044 (0.341)	0.042 (0.032)	0.059 (0.004)
IT auditors' average hours of formal training in last 12 months	0.001 (0.167)	0.002 (0.526)	0.002 (0.458)
Other auditors' average hours of formal training in last 12 months	0.001 (0.109)	0.003 (0.198)	0.004 (0.116)
Percentage of internal auditors with CIA designation	-1.564 (0.034)	-0.243 (0.438)	-0.418 (0.192)
Percentage of internal auditors with CISA designation	1.512 (0.127)	0.133 (0.763)	1.175 (0.007)
Percentage of internal auditors with accounting designation	-1.073 (0.124)	-0.294 (0.320)	-0.233 (0.441)
<i>Control variables</i>			
Size of organization (LN Revenues)	-0.100 (0.649)	0.108 (0.249)	0.117 (0.223)
Regulated environment	0.324 (0.636)	0.338 (0.248)	0.436 (0.147)
Industry - Financial and Telecom/IT	0.435 (0.451)	0.375 (0.131)	0.340 (0.178)
Industry - Manufacturing	0.019 (0.973)	-0.270 (0.246)	0.040 (0.867)
Adjusted R ²	0.139 (0.004)	0.140 (0.004)	0.137 (0.005)

TABLE 5
Regression analyses (continued)

Panel C: Involvement of the IAF in risk management (P3)			
Independent variables	IAF's involvement in IT governance ^b		
	Structures ^c	Processes ^d	Relational capabilities ^e
Use of Control Risk Self-Assessment Techniques in the area of information systems	0.077 (0.866)	0.143 (0.443)	0.212 (0.280)
Percentage of IAF's time spent on auditing of IT and financial risks	0.006 (0.562)	0.009 (0.046)	0.010 (0.025)
<i>Control variables</i>			
Size of organization (LN Revenues)	0.477 (0.009)	0.238 (0.001)	0.173 (0.025)
Regulated environment	0.303 (0.653)	0.366 (0.179)	0.454 (0.115)
Industry - Financial and Telecom/IT	0.825 (0.149)	0.437 (0.059)	0.315 (0.195)
Industry - Manufacturing	-0.618 (0.248)	-0.409 (0.058)	-0.007 (0.977)
Adjusted R ²	0.044 (0.073)	0.149 (0.000)	0.090 (0.007)
Panel D: Interaction between the IAF and Board of Directors committees (P4)			
Independent variables	IAF's involvement in IT governance ^b		
	Structures ^c	Processes ^d	Relational capabilities ^e
IAF functionally reports to Board of Directors Audit Committee	-0.258 (0.774)	-0.035 (0.923)	-0.136 (0.725)
Senior executive/officer in charge of IAF has private meetings with the Audit Committee	1.199 (0.102)	0.524 (0.070)	0.153 (0.626)
IAF's work and proposals reviewed by the Audit Committee	-0.058 (0.964)	1.139 (0.025)	1.030 (0.061)
Interaction with Board Committees other than Audit Committee	0.110 (0.827)	-0.021 (0.917)	-0.319 (0.144)
<i>Control variables</i>			
Size of organization (LN Revenues)	0.419 (0.024)	0.211 (0.004)	0.198 (0.014)
Regulated environment	0.432 (0.526)	0.413 (0.123)	0.431 (0.143)
Industry - Financial and Telecom/IT	0.735 (0.201)	0.374 (0.100)	0.388 (0.119)
Industry - Manufacturing	-0.586 (0.277)	-0.382 (0.072)	-0.038 (0.872)
Adjusted R ²	0.051 (0.071)	0.202 (0.000)	0.072 (0.029)

^a To simplify the presentation, results for the constant β_0 are not indicated for all regressions.

^b Probabilities (p values) for β s and adjusted R²'s are indicated in parentheses.

^c n = 130.

^d n = 128.

^e n = 129.