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Organizational IT Knowledge as a Predictor of IT Control Quality: An Empirical Investigation

Basil Hamdan
Utah Valley University, basil.hamdan@uvu.edu

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Basil Hamdan
Utah Valley University
basil.hamdan@uvu.edu

ABSTRACT

The purpose of this study is to examine whether or not the presence (absence) of IT knowledge gap between the Board of Directors (BoD) and the Senior Management Team (SMT) on one hand the Information Systems Management Team (ISMT) on the other hand affects IT control quality (ITCQ) under the Sarbanes-Oxley Act. The study results show that having IT expertise in the audit and corporate governance committee is associated with a lower likelihood of reporting poor ITCQ. Contrary to what is hypothesized, the association between the IT expertise of the SMT and IT control quality was insignificant. This research holds the promise of increasing our understanding of the antecedents of ITCQ; an understanding that is critical to achieving effective IT control over financial reporting.

Keywords

Sarbanes-Oxley Act, information asymmetry, IT control quality, IT knowledge

BACKGROUND

Section 404 of the Sarbanes-Oxley Act requires publicly traded companies to disclose any weaknesses in the internal control over their financial reporting systems. Depending on their significance, such weakness could call into question the credibility and validity of the financial statements generated by these systems.

This research is concerned with IT controls; a subset of the overall system of internal controls. As organizations continue to automate and computerize their business processes including accounting and financial reporting, it is of paramount importance that they design and implement IT controls to ensure the reliability of financial information and to safeguard the information systems produce them.

Research evidence indicates that roughly one-fifth of the companies that disclosed internal control weaknesses in the first year of Section 404 compliance had at least one IT control weakness[1] (Bedard et al. 2011; Canada et al. 2009). Further evidence indicates that firms with IT-related weaknesses report more non-IT-related weaknesses than firms without IT-related weak components (Grant et al. 2008; Klamm et al. 2009). These findings provide support not only to the pervasive nature of IT controls but also to the notion that IT control weaknesses exacerbate internal control deficiencies.

Research findings also show that poor IT control quality could lead to serious consequences. These include, but are not limited to, lower profitability and financial health (Stoel et al. 2009), higher charges by audit firms (Grant et al. 2008), and less accurate management earnings forecast (Li et al. 2012). On the positive side, research evidence suggests that the voluntary disclosure of weaknesses concerning information security is associated with higher market value (Gordon et al. 2010).

While a handful of studies examined the consequences of disclosing IT control weaknesses, research on the determinants of these weaknesses remains very limited (Li et al. 2007). In an effort to fill this gap, this study aims to obtain an understanding of whether or not the presence (absence) of IT knowledge gap between the Board of Directors (BoD) and the Senior Management Team (SMT) on one hand the Information Systems Management Team (ISMT) on the other hand affects IT control quality (ITCQ) under the Sarbanes-Oxley Act. Here, IT control quality is proxied by the disclosure (non-disclosure) of IT control weaknesses in the context of section 404 of the Sarbanes-Oxley Act. A firm with IT control weaknesses is said to have poor ITCQ.

[1] Examples of IT control weaknesses include poor firewall configuration, weak encryption, poor password management, lack of information security policies, lack of policy enforcement lack of information security awareness and education, lack of separation of duties, and lack of formal change management.

HEORETICAL PERSPECTIVE & HYPOTHESES DEVELOPMENT

In theory, the BoD is ultimately responsible for ensuring the reliability of the financial statements. In practice, however, the BoD delegates this responsibility, among others, to the SMT. The SMT, in turn, delegates to the ISMT the responsibility of making key IT governance decisions including ensuring the integrity and overall security of the financial reporting systems through designing and implementing effective IT controls.

Drawing on the agency theory (Eisenhardt 1989; Jensen et al. 1976), this research views having poor IT control quality as a manifestation of goal incongruence between the BoD and the SMT as the principal and the IS function as the agent. It further draws on the IT governance literature to identify factors that impact the alignment between the ISMT and the overall organization.

One of the basic tenets of the agency theory is the issue of goal agreement (disagreement) between the principals and the agents (Baiman 1982; Tuttle et al. 1997) which in turn is dependent on the level of information that the principals possess about the agents and their behavior. Having complete information, or information symmetry per the language of the agency theory, enhances the principals' ability to verify the actions taken by the agents and evaluate whether these actions are in line with the principals' interests. When such information is insufficient or absent, agents who know that their actions could not be easily verified are more likely to act in ways that are not necessarily conductive to achieving the organizational goals.

The question then is how to influence the relationship between the principals and agents so as to increase (decrease) goal agreement (disagreement). Drawing on the corporate governance research (e.g., Daily et al. 2003a; Daily et al. 2003b), the IT-business alignment research (e.g., Chan et al. 2006; Reich et al. 2000), and the agency theory with its notion of information asymmetry, this research proposes the IT background element as a key determinant of the presence (absence) of alignment between the ISMT on one hand and the overall organization on the other hand. Here, the IT background of the organization is defined in terms of two elements: (1) the IT background of the BoD and (2) the IT background of the SMT. The IT background of the BoD is proxied by two of its committees: (a) the corporate governance committee and (b) the audit committee.

As its name suggests, the corporate governance committee is in charge of advising the BoD on matters related to corporate governance including IT governance. Such matters include the composition of other BoD committees (e.g., the audit committee) and nominating members to serve on these committees. The audit committee is the monitoring arm of the BoD, responsible for reviewing the effectiveness of internal control including IT controls, assuring the integrity of the financial information produced by the financial reporting systems, and ensuring regulatory compliance such as complying with the Sarbanes-Oxley Act; the focus of this research.

In light of the aforementioned responsibilities and the pivotal role these two committees play, this study adopts the view that organizations with IT-knowledgeable members on these committees are less likely to have information asymmetry between their BoD and the ISMT. The same is true for firms with IT-experienced SMTs (Bassellier et al. 2003; Reich et al. 2000). Armed with such knowledge and having more information at their disposal, the BoD and the SMT in such organizations are well-suited to assess and verify the effectiveness of the actions taken by the ISMT, including those taken in the course of implementing IT controls to ensure the faithful representation of the financial statements and the integrity of the systems that generate them. On the other side, an ISMT whose actions are easily verifiable would be less motivated to engage in self-interested behavior and more inclined to implement effective IT controls.

Furthermore, the current research adopts the view that IT knowledgeable BoDs and SMTs are more likely to appreciate the depth and breadth of the risks associated with having weak IT control on financial reporting. This understanding is expected to influence the overall IT governance effort in a multitude of ways. These include setting the tone at the top regarding the importance of IT control, allocating the resources necessary for designing and implementing effective IT controls, and resolving any associated issues. Ultimately, this concerted effort would leave to better IT control quality. Therefore, the following three hypotheses are advanced:

> ***H1: The lack of IT-related background among members of the corporate governance committee of the BoD is associated poor IT control quality.***
>
> ***H2: The lack of IT-related background among members of the audit committee of the BoD is associated with poor IT control quality.***
>
> ***H3: The lack of IT-related background among members of the Senior Management Team is associated with poor IT control quality.***

A research model is presented in Figure 1. The model places the three IT background elements in a nomological network relating them to IT control quality as proxied by the presence (absence) of IT control weaknesses.

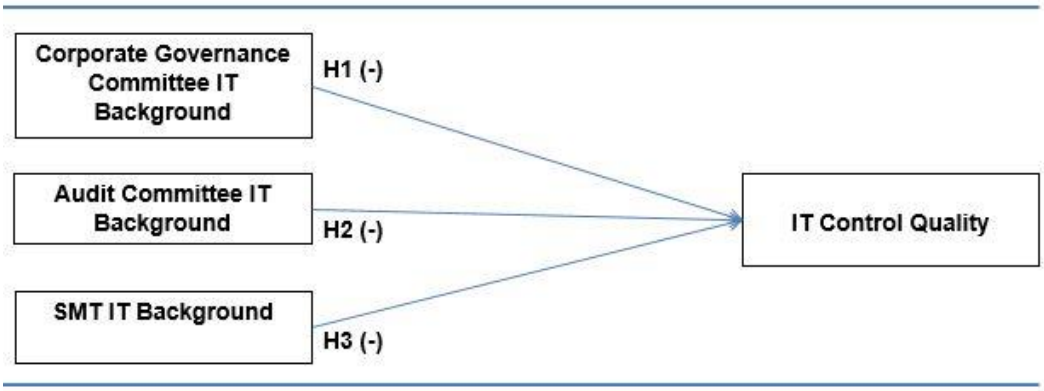

Figure 1: Theoretical Research Model

RESEARCH METHODOLOGY

Research Model and Measured Variables

This research utilized Logistic Regression to empirically test the association between IT control quality and the proposed IT background elements. Specifically, the research Model tests H1, H2, and H3 with IT control quality as a dependent variable and the IT background elements as independent variables. The expectation is that the coefficients of β1, β2, and β3 will be negative and significant.

$$ITCQ = \beta 0 + \beta 1\ GOVIT + \beta 2\ AUDIT + \beta 3\ SMTIT + \beta 4\ ROA + \beta 5\ BIG4$$

The IT background variable refers to whether members of the respective BoD committee or SMT previously held an IT executive position, held a senior executive position in an IT company (e.g. software, programming, database or Internet companies), worked as an IT auditor/consultant, or received a university degree in an IT related field (e.g. computer science, information systems).

In addition to the hypothesized relationships, this research includes two control variables that have been found to impact the disclosure of internal control weaknesses, including IT-related weaknesses, and that may impact other study variables.

Firms with lower profitability have fewer resources to allocate towards implementing effective internal control systems and/or correcting internal control weaknesses (Ashbaugh-Skaife et al. 2007). Therefore, this research includes return on assets (ROA) to control for profitability. Further research evidence points to a positive association between the disclosure of internal control weaknesses and the size of the audit firm. As noted by Ge and McVay (2005) "since large audit firms are exposed to a greater legal liability, they might be more diligent about searching for, and reporting, material weaknesses". Therefore, and consistent with other studies on IT control weaknesses (e.g., Grant et al. 2008), this research includes a variable (BIG4) to control whether the audit firm in the year of disclosing an IT control weakness was one of the big four and 0 otherwise. Table 1 provides descriptions of the study variables.

Type	Label	Description
Dependent	ITCQ	1 if the firm reported at least one IT control weakness; 0 otherwise (control firm).
Independent	GOVIT	1 if at least a member on the corporate governance committee had IT background; 0 otherwise.
Independent	AUDITIT	1 if at least one member on the audit committee had IT background; 0 otherwise.
Independent	SMTIT	1 if at least one member on the Senior Management Team had IT background; 0 otherwise.
Control	ROA	Income Before Extraordinary Items divided by the average of the current year's Total Assets and the prior year's Total Assets, multiplied by 100.
Control	BIG4	1 if the audit firm in the year of disclosing an IT control weakness was one of the big 4; 0 otherwise.

Table 1: Study Variables

Data Sources and Sample Selection

To collect the data necessary to test the hypotheses set forth in this research, we turn to the Audit Analytics database and proxy statements. The initial pool of firms consists of those firms with internal controls weaknesses from January 2005 to December 2009 as reported in Audit Analytics. For each of these firms, the different categories of internal control weaknesses are examined to identify firms with IT control weakness. In addition, we use Audit Analytics to identify a control group of firms that reported non-IT control weaknesses during the study period. The matching process was conducted based on two criteria: the industry code and the firm size measured in terms of total revenues at the end of the year of disclosing an internal control weakness. This should provide a baseline for understanding the incremental impact of the proposed governance elements on the IT control quality. If a match is not found, the IT control weakness firm is dropped from the sample.

In order to assess the goodness of the matching procedure and that the study sample is not materially different from the control group, a t-test was conducted to examine whether the difference in size, measured in terms of total revenues, between firms in the two groups is statistically significant. Table 2 provides a comparison of the mean revenues between the two groups for each of the fiscal years covered as well as for the entire period. The t-tests indicate that the differences in revenues are not statistically significant for the 5 years suggesting that the matching procedure was successful.

	2005		2006		2007		2008		2009		Total	
	Sample	Control	Sample	Control	Sample	Control	Sample	Control	Sample	Control	Sample	Control
N	50	50	39	39	35	35	27	27	11	11	162	162
Mean	926	996	1,117	1,027	521	452	497	477	414	305	778	753
t-stat.	-0.199		0.165		0.333		0.141		0.619		0.144	
p-value	0.843		0.870		0.740		0.889		0.543		0.886	

Table 2: Assessment of the Matching Process Goodness

Data on IT governance is available in the annual proxy statements which publicly traded firms are required to file in compliance with SEC regulations. For firms in both samples, the proxy statements were searched for information about the educational and professional background of the individuals who were members of their corporate governance committee, audit committee, and Senior Management Team in the year in which internal control weaknesses were reported. The biographies of these members as disclosed in the proxy statements were carefully read to determine if they have IT background or not. For example, if a member previously held an IT executive position, held a senior executive position in an IT company (e.g. software, programming, database or Internet companies), worked as an IT auditor/consultant, or received a university degree in an IT related field (e.g. computer science, information systems), he/she was considered as having an IT background.

RESEARCH RESULTS

Table 3 provides coefficients and significance levels. The statistical results indicate that the IT background element of the BoD was a strong predictor of IT control quality. More specifically, the results indicate that the absence of IT experience and background in the BoD corporate governance and audit committees is associated with a higher likelihood of disclosing IT-related control weaknesses, providing support for H1, H2. Contrary to what is hypothesized, results show that the association between the IT background of the SMT and IT control quality is moderately insignificant. Thus, H3 is not supported.

Variable	Expected Sign	Coefficient Estimate	Significance
GOVIT(1)	-	-.744	.002
AUDIT(1)	-	-.840	.001
SMTIT(1)	-	-.340	.099
ROA		-.267	.293
BIG4(1)		-.631	.001
% of poor ITCQ firms classified correctly		71.6	
% of good ITCQ firms classified correctly		67.9	

Table 3: Research Model - Investigating the Effect of the IT Background on IT Control Quality (H1-H3)

With respect to the control variables, the statistical results indicate that there is a negative and significant (p-value of .001) association between the likelihood of reporting weaknesses pertaining to IT controls and the size of the audit firm. Overall, the model has an R-square of 23% and overall classification accuracy of 70%.

CONCLUSION

Despite the evident negative impact of having poor IT control quality, very little research has been done to obtain an understanding the determinants of having and reporting IT control weaknesses. The current work attempts to fill this gap by proposing and testing a model linking the IT background of the BoD and SMT to IT control quality.

Two of the three hypotheses put forth in this research were supported. The results provide support for negative association between the IT background of the BoD and IT control quality and the underlying contention that IT control quality is contingent on the presence (absence) of information asymmetry between the IS function and the overall organization.

While the empirical results offer interesting and promising insights into the role of the IT background in influencing the disclosure IT control weaknesses, a major limitation of this study has to do with the binary nature of the independent variables. For example, a company having more members with IT expertise on its audit committee, corporate governance committee, and Senior Management Team would possibly have a higher level of IT knowledge (hence, lower level of information asymmetry) than a company with fewer IT knowledgeable members. Future research might measure IT background as a continuum.

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