The Influence of Internal Control Weaknesses on Firm Performance

Syou-Ching Lai
Tainan Christian University

Hungchih Li
National Cheng Kong University

Henghsiu Lin
University of Portland

Frederick Wu
University of North Texas (Emeritus)

This study investigates the effect of internal control (IC) weaknesses on firm performance. Our findings confirm that IC weaknesses, in general, have a negative impact on firm performance and that this impact varies with each of the major IC components. Our findings confirm that IC material weaknesses in a firm's control environment, information technology, accounting documentation, accounting policies and procedures, or control design have a significantly negative impact on firm performance. We also confirm that delaying remedial actions addressing IC weaknesses will continue to hamper firm financial performance.

INTRODUCTION

With the passage of the Sarbanes-Oxley Act (SOX) by the U.S. Congress in 2002, internal control (IC) has gained recognition and significance in terms of its expected contributions to corporate performance and the reliability of financial reporting. In 1992, IC as suggested by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) is comprised of five components including the control environment, risk assessment, control activities, information and communication and monitoring activities. The definition of internal control eventually becomes widely adopted by companies with the passage of SOX. IC has also ultimately led to improved investor confidence in corporate financial reporting and the stability of the financial and investment markets. The Act has redrawn the borders for IC research and practical application.

Adopting the recommendation of the COSO, SOX implicitly reaffirms that effective IC will provide assurance in achieving three corporate objectives: (1) operational efficiency and effectiveness, (2) financial reporting reliability, and (3) the observance of government regulations. Accounting scholars in the past have focused on the financial reporting reliability (e.g., Ashbaugh-Skaife, Collins & Kinney,

2007; Ashbaugh-Skaife, Collins, Kinney & LaFond, 2008; Costello & Wittenberg-Moerman, 2011; Doyle, Ge & McVay, 2007a; Jarvinen & Myllymaki, 2016; Klamm & Watson, 2009) and relegated the first objective to those specializing in internal audit. The issue of operational efficiency and effectiveness lies outside the domain of IC in the financial accounting process.

There is limited evidence on the relation between IC weaknesses and firms' operating effectiveness and efficiency. Cheng, Dhaliwal and Zhang (2013) and Sun (2016) examine the relation between firms' IC weakness disclosure and investment decisions that could affect firms' operations and future performance. However, these two studies do not directly investigate the impact of IC weaknesses on firm performance. Kuhn, Ahuja, and Mueller (2013) and Stoel and Muhanna (2011) examine the impact of IC weaknesses on operational efficiency and effectiveness; however, these two studies only categorize IC weaknesses into IT and non-IT related weaknesses. Feng, Li, McVay and Skaife (2015) mainly focus on firms with inventory-related material weaknesses. They find that firms with inventory-related IC weaknesses have lower inventory turnover ratios and are more likely to report inventory impairments. In addition, they report that once the inventory IC weaknesses are remediated, firms exhibit better operating results. All these studies are limited in scope in the IC weaknesses examined. This motivates us to adopt COSO's five-component IC framework and classify IC weaknesses into seven major types of IC weaknesses to explore the impact of different type of internal control weaknesses on firm's performance, thus filling the gap in the IC weakness literature.

Our research objectives are identifying and measuring the relationships between firm performance and material IC material weaknesses based on the COSO five-component IC framework and the impact of delays in addressing IC material weaknesses on firm performance. Our contention is that each of the five components covers certain business processes of the firm's value chain. It is therefore worthwhile to ascertain the contributions of a firm's IC system's components to operational efficiency and effectiveness.

The results of this study confirm that material weaknesses in IC have a negative impact on firm performance in terms of return on assets (ROA) and Tobin's Q (TQ) for the current as well as the following year. Our study provides evidence that different IC components have different degrees of impact on firm performance. More importantly, the results indicate that the control environment; information technology (IT); accounting policies, procedures, and documentation; and control design have a significant negative impact on firm operational efficiency and effectiveness and consequently firm performance, for both the current year and the following. This finding has practical implications for internal audit practices. Internal audits should emphasize not only accounting controls for reliable financial reporting, but also controls for operational risks to ensure the quality of ongoing operations and to achieve operational efficiency and effectiveness, which ultimately lead to profitability. Our study also reveals that delays in remedying IC material weaknesses negatively impact firm performance in subsequent years.

Our paper contributes to the internal control literature in three ways. First, SOX 404 requires management to use a framework to evaluate internal control effectiveness. Given that most firms are using COSO's internal control framework, we examine the material weaknesses within the context of the five components of COSO internal control framework, which to our knowledge, has not been explored in prior studies. Second, we contribute to the literature on the role of internal controls in operational efficiency and effectiveness. The extant literature on internal controls focuses more on how internal control material weaknesses (ICMW) affect the financial reporting reliability. Our work sheds additional light on the impact of internal control quality on firms' operational risks. Ineffective internal controls decrease operational efficiency and effectiveness which results in poor financial performance. Third, by revealing that there are different degrees of negative consequences of ICMW from these five COSO components on firm performance, our work extends and complements the extant internal control literature that explores consequences of ICMW disclosures on firms' financial reporting and performance.

The rest of the paper proceeds as follows. Section 2 reviews the related literature and develops the hypotheses. Section 3 discusses the research design including the classification of the seven major types of IC weaknesses. Section 4 presents the results, followed by the conclusion in Section 5.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Section 404 of the SOX focuses on reliable financial reporting but says nothing about operational efficiency and effectiveness. As asserted by the COSO, however, effective IC should lead to not only reliable financial reporting but also operational efficiency and effectiveness in a firm's value chain. To achieve this operational objective, a management control system built on an effective accounting system should affect resource control over business processes through strategic planning, control, and feedback (Macintosh, 1994). An accounting system based on effective ICs should also be integrated into business processes to achieve operational efficiency and effectiveness (Lin and Wu, 2006). Ultimately, efficient and effective business processes lead to the realization of goals or objectives set forth in the strategic plan, including such financial goals as profits and return on investment. Prior research provides evidence that weak IC can create more opportunities for earnings management, profit revisions and financial report restatements (Ashbaugh-Skaife et al., 2007; Doyle et al., 2007a, 2007b; Jarvinen & Myllymaki, 2016; Kinney and McDaniel, 1989;). With operational efficiency and effectiveness, it will reduce the need for management to manipulate earnings through year-end entry adjustments.

COSO's definition of IC accomplishes three objectives. These objectives imply three types of risk to be controlled by a firm's IC: information risk, operational risk, and compliance risk. Operational risk control is most crucial to how firms manage and conduct business processes and achieve strategic competitive advantages (Callaban and Nemec, 1999; McAfee and Brynjolfsson, 2008; Simons, 1990; 1991). These days, much of the firms' business processes rely on IT to achieve their goals (Barua, Kriebel and Mukhopadhyay, 1995; Bharadwaj, Bharadwaj and Konsynski, 1999) and the reliability of IT relies on built-in IT-based control systems to achieve process goals (Anthony and Govindarajan, 2007). IT controls ensure quality control over business processes embedded in technological processes. Thus, IT controls have a direct impact on value creation in firm value chains (Masli, Peters, Richardson and Sanchez, 2010). This reasoning explains why COSO unequivocally relates IC to operational efficiency and effectiveness.

Thus, a sound IC system should lead to efficiency and effectiveness in business processes, and ultimately to the realization of the organization's strategic goals. Similarly, a poor IC system could lead to poor consequences for the firm. Prior studies establish that poor internal controls lead to less reliable financial reporting (e.g., Ashbaugh-Skaife et al., 2007; Costello and Wittenberg-Moerman, 2011; Doyle et al., 2007a; Hong and Lee, 2015; Jarvinen & Myllymaki, 2016; Klamm and Watson, 2009), affects firm valuation and cost of equity (Ashbaugh-Skaife, Collins, Kinney and LaFond, 2009; Li, Yu, Zhang and Zheng, 2016; Ogneva, Subramanyam and Raghunandan, 2007), lower bond ratings (Hammersley, Myers and Zhou, 2012); changes in CFO compensation (Hoitash, Hoitash and Johnstone, 2012); and lower firm investment level (Sun, 2016). We therefore posit that ICMW disclosures are associated with decreases in firm performance. The following hypothesis is established.

H_1: Companies with material weaknesses in IC will not perform as well as companies without IC material weaknesses.

To date, some research has provided evidence of the impact of certain type of IC weaknesses on firm performance. Ge and McVay (2005) find that companies with at least one IC material weakness on average have lower ROA. They focus on the general firm characteristics of firms that disclose at least one IC material weakness, but do not specifically investigate which weaknesses are associated with poor performance. Furthermore, they make no theoretical arguments linking IC to operational efficiency and effectiveness, which underpin firm performances. Kuhn, Ahuja, and Mueller (2013) and Stoel and Muhanna (2011) examine the impact of IC weaknesses on operational efficiency and effectiveness; however, these two studies only categorize IC weaknesses into IT and non-IT related weaknesses. Feng et al. (2015) focus on firms with inventory-related material weaknesses. They find poor inventory-related IC affects firm's inventory turnover ratio and leads to more inventory impairments. Overall, only limited evidence exists regarding the impact of IC weaknesses on firm performance.

To achieve the effectiveness of internal controls, a firm needs to have all five COSO components functioning together. The Audit Analytics database provides 21 categories of material IC weaknesses

during our sample period. We first classify these 21 categories into the five IC components defined by the COSO and further divide these IC weaknesses into the seven types of IC weaknesses. (See section 3).

These seven types of internal controls are either firm-level controls or account level controls. For instance, the control environment is the foundation of COSO, implying that if the control environment is strong, the other four components are less likely to have material weaknesses. Control environment is a firm-level control; it sets the tone of the firm. Any weaknesses in this component can affect business operations in a negative way. Whereas, account reconciliation and non-routine transactions controls, end of period adjustments and controls over financial disclosure and report restatements can be subject to data manipulation in business processes by management with the intent of overstating these processes' results. These types of IC weaknesses are more account-level rather than firm-level type. Usually, firm-level IC material weakness generates more seriously negative impact on firm performance than account-level material weakness. Thus, the following hypothesis is established.

H_2: The degree of the negative impact of IC material weaknesses on firm performance varies with each of the seven major components of IC material weaknesses.

IC Material weaknesses can be categorized and quantified based on firms' 10-K reports submitted to the SEC. The number of material IC weaknesses potentially denotes the level of inadequacy and insufficiency in business strategy, management, organizational structure, and a host of other operational factors, resulting in poor firm performance. It is logical to infer that the higher the number of IC material weaknesses, the greater its negative impact on firm performance. Thus, we propose the following hypothesis.

H_3: A negative relationship exists between the number of IC material weaknesses and firm performance.

Another interesting question to be answered is if a firm identifies IC material weaknesses in year t and takes no remedial action in year t+ 1, will the firm continue to suffer in performance? Logically speaking, eliminating IC material weaknesses should improve operational efficiency and effectiveness in the business processes (Feng et al., 2015). Therefore, the following hypothesis is proposed.

H_4: A firm that does not correct its IC material weaknesses from year t to year t+ 1 will continue to suffer from poor performance.

Research Methodology

Classification of IC Weaknesses

The Audit Analytics database provides 21 categories of material IC weaknesses during the period 2004–2007. We reclassify these 21 categories into the five IC components defined by the COSO. The weaknesses in risk assessment, information and communication, and monitoring are too few to deserve further investigation. Therefore, our investigation focuses on the remaining two IC components - control environment and control activities. Material IC weaknesses within control activities are further categorized into four areas: IT, accounting documentation, policy and procedures, weaknesses in financial reporting, and control designs. We further categorize weaknesses in financial reporting into three elements: (1) journal entries, account reconciliations, and non-routine transactions, (2) end-of-period adjustments, and (3) restatements of financial statements and Section 404 disclosures. Designs of control are identified with segregation of duties and internal audit. We then reclassify our sample firms' reported control weaknesses using these seven types of IC weaknesses. The results are presented in Table 1.

TABLE 1
CLASSIFICATION OF IC WEAKNESSES

COSO Framework	Classification of IC Weaknesses	Frequency of Occurrences	Proportions
Control Environment	Management, accounting personnel resources, audit committee, ethical issues	1159	17%
Control Activity	IT control	378	6%
	Accounting documentation, policies, and/or procedures	1726	25%
	Control designs	365	5%
	Weaknesses of financial reporting:		
	Journal entries, account reconciliations, non-routine transactions	1079	16%
	End-of-period adjustments	1090	16%
	Restatements of financial statements, restatements of Section 404 disclosures	1024	15%

Measurements of variables and testing models

This study adopts two measures often used in previous studies as a proxy for firm performance: ROA (Barua et al., 1995; Hitt and Brynjolfsson, 1996; Weil, 1992) and Tobin's Q (TQ) (Bharadwaj et al., 1999). According to Grullon, Michaely, Benartzi, and Thaler (2005), return on equity is sensitive to changes in capital while ROA is not. ROA is a general index of a firm's overall performance in terms of efficiency and effectiveness in the utilization of all assets under the firm's control. The more efficiently and effectively the company employs all its resources to generate profits, the higher its ROA, which is calculated as follows: ROA = Profit before interest, taxes, and depreciation/Average total assets for a year. The corporate governance and financial reporting literature has widely adopted TQ as an alternative measure of firm performance (Bharadwaj et al., 1999; Gompers, Ishii and Metrick, 2003; La Porta, Lopez-de-Silanes, Shleifer and Vishny, 2002). This index measures the relationship between the market value and the replacement costs of the firm's assets, thereby revealing the value of intangible assets and the time value of money. Ultimately, it indicates whether the firm is performing efficiently and effectively. A TQ greater than one means that the firm has small tangible assets but high market and intangible assets values, a good indication of good financial performance. On the other hand, a TQ of less than one denotes low financial performance. For this study, we adopt the following measure, used by Chung and Pruitt (1994): TQ = (Market value of stockholders' equity + book value of liabilities)/Book value of Assets. Since this study investigates the impact of various areas of IC weakness on performance in the current year as well as in the subsequent year, the performance measures include ROA_t, ROA_{t+1}, TQ_t, and TQ_{t+1} for a period of two years.

The independent variables are the seven classified types of IC material weaknesses (see Table 1). In addition, we include three control variables that prior research (see e.g., Madura, 1995; Myers and Majluf, 1984; Opler and Titman, 1994; Rajan and Zingales, 1995) has established to have a significant impact on firm performance: ratio of the book value to the market value of the firm (*BM*); financial leverage (*LEV*) and firm size (SIZE).

To empirically test the impact of various areas of IC weaknesses on firm performance for the current period (t) and next (t + 1), this study adopts the following regression models:

To test H_1:

$$ROA_{t,\,t+1}\,(TQ_{t,\,t+1}) = \alpha_0 + \alpha_1 MW_t + \alpha_2 BM_t + \alpha_3 LEV_t + \alpha_4 SIZE_t + \varepsilon_t \quad (1)$$

To test H_2:

$$ROA_{t,\,t+1}\,(TQ_{t,\,t+1}) = \alpha_0 + \alpha_1 CE_t + \alpha_2 ITC_t + \alpha_3 ADPP_t + \alpha_4 JE_t + \alpha_5 EPA_t + \alpha_6 RES_t + \alpha_7 CD_t + \alpha_8 BM_t + \alpha_9 LEV_t + \alpha_{10} SIZE_t + \varepsilon_t \quad (2)$$

Where:

MW= 1 if a firm reports material IC weakness, 0 otherwise;
CE= 1 if a firm reports control environment weakness, 0 otherwise;
ITC= 1 if a firm reports IT weakness, 0 otherwise;
ADPP= 1 if a firm reports accounting documentation, policy, and/or procedures weakness, 0 otherwise;
JE= 1 if a firm reports journal entry, account reconciliation, and non-routine transaction control weakness, 0 otherwise;
EPA= 1 if a firm reports end-of-period adjustment weakness, 0 otherwise;
RES= 1 if a firm reports financial disclosure and report restatements, 0 otherwise;
CD= 1 if a firm reports control design weakness, 0 otherwise;
BM = ratio of stockholder equity to the firm's market value;
LEV = ratio of firm debt to total assets, based on book value;
SIZE = natural log of sales of the firm; and
t = year 2004, 2005, 2006, or 2007.

To test H3:

$$ROA_{t,\,t+1}\,(TQ_{t,\,t+1}) = \alpha_0 + \alpha_1 NUM_{mw} + \alpha_2 BM_t + \alpha_3 LEV_t + \alpha_4 SIZE_t + \varepsilon_t \quad (3)$$

Where:

NUM_{mw}= total number of IC weaknesses encompassing the seven types of IC adopted for this study.

To test H_4:

$$ROA_{\,t+1}\,(TQ_{\,t+1}) = \alpha_0 + \alpha_1 NORE + \alpha_2 BM_t + \alpha_3 LEV_t + \alpha_4 SIZE_t + \varepsilon_t \quad (4)$$

where:

NORE = 1 if a firm does not correct IC weaknesses, 0 otherwise.

Sample Selection

This study covers firms that are traded in the U.S. stock markets during 2004–2007. Data about IC weaknesses are extracted from the Audit Analytics database. Financial data of the firms are from the Compustat database. Firms without the required data from both databases are excluded from the sample. We first identify 1782 firms with material IC weaknesses and then exclude 665 firms without the required data from both databases, ending up with 1,117 firms in the study sample. To meaningfully compare firms with IC material weaknesses (experimental group) with firms without IC material weaknesses (control group), we select another 1,117 firms without IC material weaknesses from the Audit Analytics database to match the 1,117 firms with IC material weaknesses. The required financial data for these

firms (control group) are obtained from the Compustat database. The control group is selected to match the experimental group in terms of firm size (in sales) in the same industries.

EMPIRICAL RESULTS

Performance and the existence of IC weaknesses

Table 2 reports the results of comparing firms with and without IC material weaknesses. The descriptive statistics indicate that the means of the *ROA* and *TQ* for firms with IC material weaknesses are -3.46 and 1.72, respectively, while those for firms without IC material weaknesses are 2.14 and 1.95, respectively. The differences are significant at the .01 level for *ROA* and at .05 for *TQ*. Comparing the controlled variables (*BM, LEV*, and *SIZE*) between the two sets of samples, Table 2 indicates that firms with material IC weaknesses have higher debt structures (significant at the .10 level) and smaller sizes in sales (significant at the .05 level). Although the t-value for the ratio of the book value to market value (*BM*) appears to have no significant impact on performance, a regression analysis shows otherwise (presented below).

TABLE 2
DESCRIPTIVE STATISTICS (2004-2007)

	ICMW=1 (n=1117)		ICMW=0 (n=1117)		t-test of mean differences
Variable	Mean	Std. Dev.	Mean	Std. Dev.	t-value
ROA	-3.46	29.20	2.14	17.06	-5.52***
TQ	1.72	2.42	1.95	1.80	-2.45**
BM	0.29	0.47	0.29	0.37	0.13
LEV	21.63	24.58	19.71	22.44	1.91*
SIZE	5.83	1.95	6.02	1.80	2.34**

*, **, *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.
Variable definitions: ICMW = firms with material IC weaknesses; NOMW = firms without material IC weaknesses; *ROA* = rate of return on total assets; *TQ* = Tobin's Q; *BM* = the ratio of the book value to market value; *LEV* = the liability ratio; *SIZE* = a firm's size in sales.

The results of Models (1)–(4) are presented in Tables 3 through 7, respectively. All adjusted R^2 values indicate good fit for all the models. Table 3 presents the statistical results of Model 1; the coefficients of MW for *ROA* and *TQ* are all negative for periods, t and t + 1, indicating a negative impact from IC material weaknesses on firm performance. The t values are statistically significant at p = 0.01. Given that all control variables exert a significant impact on firm performance, except for BM and LEV in period t + 1, we find that additional significant impact on firm performance comes from IC material weaknesses. Thus, H_1 is supported.

TABLE 3
REGRESSION OF THE EXISTENCE OF ICMW ON FIRM PERFORMANCE (t, t+1)

		ROA				TQ			
	Year	T		t+1		T		t+1	
	Predicted Sign	Coef	t-value	Coef	t-value	Coef	t-value	Coef	t-value
Intercept		-23.7	-15.96***	-18.36	-11.85***	4.225	336.67***	3.895	27.94***
MW	-	-4.142	-5.055***	-3.54	-4.224***	-0.328	-4.754***	-0.261	-3.469***
BM	-	2.434	2.343**	-0.72	-0.632	-1.207	-13.79***	-1.025	-10.04***
LEV	-	-0.148	-7.992***	-0.125	-6.462***	-0.011	-7.073***	-0.002	-0.929
SIZE	+/-	4.704	21.25***	3.754	16.25***	-0.286	-15.31***	-0.296	-14.24***
Adj R^2		0.198		0.144		0.185		0.15	

*, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
Variable definitions: MW = firms with material weakness; BM = the ratio of book value over market value; LEV= the liability ratio; SIZE= firm size in sales.

Performance and types of IC weaknesses

Table 4 presents the results of Model 2, highlighting the impact of the seven types of IC material weaknesses, as well as the impact of control variables on performance, for the periods t and t+1. For period t, all the *ROA* coefficients are negative, consistent with the confirmation above of H_1. Of the seven types of IC material weaknesses, control design (*CD*) and control environment (*CE*) have the highest degree of impact. Next in impact is IT control (*ITC*) and end-of-period adjustments (*EPA*). These four types of IC material weaknesses all have a significantly negative effect (at either .01 or .05 level) on *ROA*; the other three types of IC material weaknesses, although not having a statistically significant impact on *ROA*, still exert a negative impact. For period t + 1, a negative impact is found for the same four control types as just presented, but only IT control (*ITC*) is found to be statistically significant. One additional control type—accounting documentation, policy, and/or procedures (*ADPP*)—has a negative impact on *ROA*. The reason fewer control weaknesses have a statistically significant impact on *ROA* is because IC weakness corrections are made in period t + 1 subsequent to the discovery of IC material weaknesses in period t. This assertion is also supported by the confirmation of H_4, presented below. In conclusion, control design and control environment are the most significant factors affecting firm performance in *ROA* for the period t, followed by IT control and end-of-period adjustments. For the period t + 1, these four types of control still have a negative impact on *ROA*, but none of them is statistically significant.

As for the IC impact on *TQ* for period t, accounting documentation, policies, and procedures, end-of-period adjustments, and control design have the strongest negative impact ($p < 0.01$); IT control weaknesses impact *TQ* with $p < 0.05$. When firms take steps to improve and strengthen IC systems, *TQ* values also improve and overall IC weaknesses do not have as much impact on *TQ* in period t+ 1 as in period t. But accounting documentation, policies, and procedures continue to affect firm *TQ* in year t+1.

The empirical evidence indicates that five of the seven IC types - control environment; control design; accounting documentation, policy, and procedures; end-of-period adjustments; and IT control – have an impact on firm performance. A weak control environment reflects poor management throughout the organization. Control of IT also has significant impact on *ROA* in the current period and the next. Our

findings are consistent with prior work on the impact of IT weakness on firm performance (Ahuja, Kuhn and Mueller, 2013; Carter, Phillips and Millington, 2012; Stoel and Muhanna, 2011). IT has been widely deployed as a strategic weapon to conquer the market through the effectiveness and efficiency of business processes. Failure to exploit its potential is a control weakness and will be reflected in the results of operations. End-of-period adjustments also have a significant impact on ROA and *TQ* in the current period. We believe the reason for this is that reactions to poor performance should entail process adjustments or even process reengineering. Finally, control design also has a significant negative impact on *ROA* and *TQ* in the current year. Control design should permeate the operations of the entire organization and therefore, if weak, operations will suffer, as will earnings, thereby affecting the ROA. Thus, H_2 is supported.

Impact of the number of IC weaknesses on performance

Table 5 reports that the total number of IC weaknesses (NUM_{MW}), calculated on the presence of the seven types of IC weaknesses, affects *ROA* and *TQ* negatively and significantly at the 1% level for periods t and t+1. Although improvement of IC in the subsequent year (t + 1) lessens the magnitude of the negative impact of IC weaknesses on performance, the impact continues to be statistically significant at the 1% level. Thus, H_3 is supported.

TABLE 4
REGRESSION OF THE TYPE OF ICMW ON Firm Performance (t, t+1)

		ROA				TQ			
	Year	T		t+1		t		t+1	
	Predicted Sign	Coef	t-value	Coef	t-value	Coef	t-value	Coef	t-value
Intercept		-4.030	-3.627***	-13.23	11.04***	3.954	25.95***	3.237	29.73***
CE	-	-2.640	-4.575***	-1.300	-1.322	-0.101	-1.279	0.080	0.891
ITC	-	-1.849	-2.322**	-2.422	-1.727*	-0.227	-2.078**	-0.147	-1.155
ADPP	-	-0.475	-0.610	-1.427	-1.255	-0.604	-5.651***	-0.228	-2.205*
JE	-	-0.769	-1.286	0.036	0.035	-0.038	-0.463	-0.026	-0.280
EPA	-	-1.328	-2.123**	-1.214	-1.147	-0.235	-2.738***	-0.067	-0.700
RES	-	-0.224	-0.371	1.082	1.057	-0.149	-1.793	-0.047	-0.508
CD	-	-2.826	-3.231***	-0.200	-0.136	-0.403	-3.363***	-0.064	-0.483
BM	-	-0.198	-0.396	-1.245	-1.438	-0.865	-12.62***	-0.964	-12.26***
LEV	-	-0.057	-6.361***	-0.090	-5.770***	-0.018	-14.38***	-0.007	-5.317***
SIZE	+/-	1.331	11.71***	2.849	15.69***	-0.194	-12.46***	-0.178	-10.77***
Adj R^2		0.258		0.140		0.131		0.199	

*, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

Variable definitions:
CE = control environment weakness; *ITC* = IT control weaknesses; *ADPP* = accounting documentation, policy, and/or procedures; *JE* = journal entries, account reconciliations, and non-routine transaction control issues; *EPA* = end-of-period adjustment weakness; *RES* = restatements of Section 404 disclosures; *CD* = control design; *BM* = the ratio of book value to market value; *LEV* = the liability ratio; and *SIZE* = firm size in sale.

TABLE 5
REGRESSION OF THE NUMBER OF ICMWs ON FIRM PERFORMANCE (t, t+1)

		ROA				TQ			
	Year	T		t+1		t		t+1	
	Predicted Sign	Coef	t-value	Coef	t-value	Coef	t-value	Coef	t-value
Intercept		-23.91	-16.43***	-18.52	-12.18***	4.165	33.76***	3.846	28.02***
NUM_{mw}	-	-1.272	-5.79***	-1.112	-4.90***	-0.075	-4.042***	-0.057	-2.906***
BM	-	2.345	2.262**	-0.834	-0.733	-1.214	-13.85***	-1.034	-10.12***
LEV	-	-0.147	-7.985***	-0.125	-6.446***	-0.011	-7.112***	-0.002	-0.978
SIZE	+/-	4.741	21.48***	3.786	16.44***	-0.283	-15.12***	-0.293	-14.11***
Adj R^2		0.201		0.147		0.183		0.148	

*, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
Variable definitions:
NUM_{mw} = total number of IC weaknesses in the seven types of IC adopted for this study;
BM = the ratio of book value over market value;
LEV= the liability ratio; and
SIZE= firm size in sales.

Impact of the remediation of IC weaknesses on performance

Table 6 shows that in period t+1 (between 2005 and 2007), 168 out of the 1,117 sample firms take no action to eliminate IC weaknesses identified in the previous time period. Table 7 presents the results of a regression analysis (Model 4) in which the impact of non-remediation on *ROA* is significantly negative at the 5% level. The impact on *TQ* is significant for all three control variables, but non-remediation is not. The overall significance of this finding is that non-remediation negatively affects earnings, which logically affect the firm's ROA. Thus, H_4 is partially supported.

TABLE 6
NUMBER OF FIRMS WITH NON-REMEDIATION OF ICMW (2004-2007)

YEAR	Remediation	Non-Remediation	Total
2004	0	0	296
2005	196	47	243
2006	229	68	297
2007	228	53	281
Total	653	168	1117

TABLE 7
REGRESSION OF REMEDIATION OF ICMWs ON FIRM PERFORMANCE
t+1

		ROA		TQ	
	Predicted Sign	Coef	t-value	Coef	t-value
Intercept		-23.38	-9.505***	4.167	20.04***
NORE	-	-4.027	-2.286**	0.001	0.005
BM	-	1.704	0.915	-0.766	-4.863***
LEV	-	-0.15	-4.875***	0.008	3.056***
SIZE	+/-	4.239	11.13***	-0.429	-13.303***
Adj R^2		0.148		0.206	

*, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
Variable definitions:
NORE = non-remediation of ICMW;
BM = the ratio of book value over market value;
LEV= the liability ratio; and
SIZE= firm size in sales.

CONCLUSIONS

Our study first confirms that IC weaknesses have an immediate negative impact on firm performance in the current year and, with non-remediation, the subsequent year. Our findings also support those of Feng et al. (2015), Kuhn et al. (2013) and Stoel and Muhanna (2011) that performances of the companies with IC material weaknesses suffer, and they will not perform as well as companies without IC material weaknesses. This study further refines prior studies by classifying material IC weaknesses related to control environment and control activities into seven major types. We then test the impact of each type of IC weakness on firm performance. The results reveal that each of the seven major types has a different degree of impact on firm

performance and that, in period t (beginning in 2004), IC material weaknesses in control design and the control environment have the greatest impact on both *ROA* and *TQ* simultaneously.

Two other types of IC material weakness (IT controls and end-of-period adjustments) also have a significant but lesser impact on ROA. Regarding the impact on TQ for period t, the most significant variables are accounting documentation, policy, and/or procedures and year-end adjustments, in addition to control design. It must be stressed again that in today's firms' operating environment, accounting processes are embedded in business processes and thus weaknesses in accounting documentation, policy, and/or procedures as well as year-end adjustments can cause interruptions in business processes, which can lead to inefficiency and ineffectiveness in operations. Next in importance is IT control, whose weaknesses can easily stifle the smooth operations of business processes. In subsequent years, the impact on performance of all these significant variables disappears, except for IT controls and accounting documentation, policy, and/or procedures. The only logical explanation is that these weaknesses were corrected and removed from business processes in year t+1. Weaknesses in journal entries, account reconciliations, non-routine transactions, and restatements of financial statements, once eliminated, have no impact at all on firm performance, since they are not directly related to business processes in the value chain. Finally, this study confirms that delaying remedial actions addressing IC weaknesses will continue to hamper financial performance.

The above findings have practical implications for firms considering strengthening their IC systems and auditing practices. First, pay the greatest attention to those areas with the greatest impact on firm performance, that is, control design and control environment. In addition, accounting documentation, policies, and procedures can also affect operations in business processes and their possible negative impact on firm performance must be considered. All these control weaknesses point out that general controls should be foremost in the design and audit of an IC system. If general controls fail, application controls do not matter much. Effective IC reviews by internal and external auditors must be designed with detecting devices to unearth IC material weaknesses in these general control areas. From the management perspective, it is obvious that an effective management control system must be in place to strengthen management and business process controls.

Second, since delays in remedial action to eliminate control weaknesses will continue to hamper firm financial performance, firms must immediately eradicate any material weaknesses suggested by internal auditors. The responsibilities of correcting and eliminating IC material weaknesses lie with the management. Therefore, good management today must possess a thorough understanding of the business processes.

Finally, the results of our study indicate that inadequate controls over business processes and management governance structure affect operational efficiency and effectiveness, leading to poor firm performance. Our paper therefore has strong implications for internal audit practices. Internal audit practices should review, evaluate, and recommend controls over not only financial reporting, but also the quality (efficiency and effectiveness) of ongoing operations in business and management processes. If external auditors, as normally assumed, are responsible for evaluating firm efforts to accomplish the COSO's IC objectives of reliable financial reporting and compliance with government regulations, internal auditors should then be responsible for the objective of promoting firm efficiency and effectiveness in business processes.

This study focuses on the time period of 2004-2007, just shortly after the enactment of SOX in 2002. For future research, additional years of data (which we lack) should be examined to validate the results, to understand the IC material weakness trend at different economic time periods and to strengthen its implications for practice. In addition, dependent variables may be expanded to cover costs and revenues in business processes since they are the essence of operational efficiency and effectiveness.

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