

SENIOR EXECUTIVES' IT MANAGEMENT RESPONSIBILITIES: SERIOUS IT-RELATED DEFICIENCIES AND CEO/CFO TURNOVER

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Appendix A

The Sarbanes-Oxley Act of 2002 and CEO/CFO Accountability

The Sarbanes-Oxley Act of 2002 (SOX) was established to strengthen internal controls over financial reporting by U.S. public firms and, as a consequence, to increase investor and stakeholder confidence in published financial reports. Among the many SOX provisions, SOX 404 requires an annual assessment by the firm's executive management and external auditor of the firm's internal controls over financial reporting (SEC 2003). The U.S. Securities and Exchange Commission (SEC) formally defines internal controls over financial reporting as (SEC 2003: Section II.A.3.):

A process designed by, or under the supervision of, the registrant's principal executive and principal financial officers, or persons performing similar functions, and effected by the registrant's board of directors, management and other personnel, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles.

The SOX regulation, thus, requires a firm's executive management to make an annual assessment on the effectiveness of the firm's internal controls. This process typically consists of the following: (1) identifying significant financial systems (i.e., identify systems that process accounts exceeding materiality thresholds); (2) documenting each system's internal controls using narratives, questionnaires, and/or flowcharts; (3) confirming an understanding of step 2 by conducting walkthroughs (i.e., follow transactions through the systems and all control points to make sure that all internal controls are working); (4) assessing the risk of material misstatement within each financial system; (5) identifying the key controls over financial reporting; and (6) testing these key controls. Management documents its assessment on the effectiveness of controls, including the existence of material weaknesses, in the Annual Report in Item 9A, "Management's Report on Internal Controls over Financial Reporting." If one or more material weaknesses exist, internal controls are not considered to be effective.

For accelerated and large accelerated firms, SOX 404 also requires that external auditors attest to management's assessment of internal controls as part of the annual financial statement audit. Auditors follow the same basic steps described in the prior paragraph and may rely on documentation provided by management. Auditors must issue their own report on the effectiveness of internal controls and, if any material weaknesses exist, the auditor must express an adverse opinion on internal controls over financial reporting and identify these material weaknesses in the audit report. The presence of a material weakness, thus, should first be identified by management and then verified by the external auditor.

The SOX provisions require that the CFO and CEO be held responsible for executing their *fiduciary duties* (i.e., establishing and maintaining their firm's internal controls regarding financial reporting) (Hoitash et al. 2012). The executive management of firms for which material weaknesses have been reported is likely to be seen as having underperformed these fiduciary responsibilities and, as a result, may face disciplinary actions including legal sanctions and nonlegal penalties (e.g., job terminations and subsequent difficulties in obtaining comparable managerial positions). The SOX regulations can impose legal sanctions of up to a \$5 million fine and/or up to 20 years in prison (Geiger and Taylor 2003) on CEOs and CFOs implicated in fraudulent financial reporting. Nonlegal penalties can also affect CEOs and CFOs of firms disclosing SOX-related material weaknesses. For example, Beneish et al. (2008) found firms identified as having disclosed material weaknesses to have experienced significant stock price declines, and Li et al. (2010) find such firms to have experienced a significantly higher rate of CFO turnover.

Appendix B

Exploratory Factor Analysis and COBIT Mapping

Using count variables for each of the 16 identified IT material weaknesses, we applied principal component analysis with varimax rotation. Only factors with an eigenvalue greater than 1 were retained, and an IT material weakness was associated with a factor if its loading was greater than 0.40. Two of these 16 IT material weaknesses (*lack of control* and *lack of documentation*) were observed to load on multiple factors; these two IT material weaknesses were consequently dropped from further factor analysis. The factor analysis of the remaining 14 IT material weaknesses produced the factor structure presented in Table B1. Bolded and underlined IT material weakness coefficients indicate those associated with each IT material weakness category (or, factor).

Table B1. Exploratory Factor Analysis

IT Material Weakness Items	Exploratory Factor Structure				
	IT Control Oversight–Internal	IT Capability	Software Development	IT Architecture	IT Control Oversight–External
Segregation of Duties	<u>0.723</u>	0.14	-0.114	-0.081	-0.096
Backup/Recovery/Security	<u>0.579</u>	-0.152	0.171	-0.077	0.24
Access Control	<u>0.759</u>	0.048	-0.159	-0.071	-0.098
IT Management Oversight	<u>0.645</u>	0.244	0.204	-0.024	0.173
IT Skillbase	0.28	<u>0.655</u>	0.115	-0.013	-0.143
Business Analysis	-0.248	<u>0.493</u>	0.234	0.008	0.273
Infrastructure/Operations	0.129	<u>0.768</u>	-0.222	0.054	-0.083
Software Development	0.395	0.311	<u>0.494</u>	0.27	-0.036
System Implementation	0.043	-0.112	<u>0.61</u>	0.212	0.021
Data Integrity	-0.115	0.091	<u>0.767</u>	-0.242	-0.189
Nonintegrated applications/systems	-0.116	0.119	-0.009	<u>0.646</u>	-0.013
Too complex systems	-0.048	-0.079	0.078	<u>0.746</u>	-0.026
Spreadsheet Integrity	-0.076	0.046	-0.063	-0.214	<u>0.739</u>
Outsourcing	0.137	-0.107	-0.068	0.143	<u>0.571</u>

We validated this factor structure by mapping it to the COBIT framework. Table B2 provides top-down and bottom-up mappings. Three issues are noteworthy. First, the top-down mapping indicates that the five IT material weakness categories derived in the factor analysis map reasonably well with the four high-level IT process domains: Plan and Organize, Acquire and Implement, Deliver and Support, and Monitor and Evaluate. This suggests that our five IT material weakness categories provide adequate coverage of the COBIT framework. Second, the bottom-up mapping suggests that considerable overlap (in terms of IT-related activities) occurs across the COBIT framework's high-level IT process domains. The further analysis summarized as Table B3 corroborates (via COBIT's indication of how IT process components serve as input to other IT process components) this overlap. This overlap is indicative of an inherent difficulty, if not impossibility, in deriving a "clean" one-to-one mapping of SOX 404 IT material weaknesses from existing frameworks, such as the COBIT framework. Third, the COBIT framework is largely silent with regard to the derived *IT Control Oversight-External* IT material weakness category, most notably with regard to spreadsheet development/use by an organization's non-IT professionals. Nonetheless, explicit statements of IT problem areas associated with the use of spreadsheets in the processing of financial transaction processing and reporting were quite evident in the collected SOX 404 reports.

Finally, the third column of Table B4 provides a mapping of these five IT material weakness categories to the three IT management responsibility domains (global, demand-side, and supply-side) applied in developing Hypothesis 3 and Hypothesis 4. Justifications (see the fourth column of Table B4) for this mapping refer to explanations developed earlier regarding senior executive responsibilities regarding these three IT management responsibility domains.

Table B2. Mapping the IT Material Weakness Categories to the COBIT Framework			
IT Material Weakness Categories	Description	Top-Down Mapping to COBIT High-Level Process Domains	Bottom-Up Mapping to COBIT Component IT Processes
IT Control Oversight-Internal	Ensuring that proper internal controls have been established for financial information systems and associated technology services.	Monitor & Evaluate (ME)	PO4: IT Processes, Structure & Relationships PO6: Internal Control Aims & Directions PO9: IT Risk Framework DS4: Ensure Continuous Service DS5: Ensure Systems Security DS12: Manage Physical Environment ME1: Monitor & Evaluate IT Performance ME2: Monitor & Evaluate Internal Control ME3: Ensure Compliance with External Requirements ME4: Provide IT Governance
IT Capability	Ensuring that appropriate capabilities (e.g., employees' knowledge, work practices and processes, etc.) exist to analyze, design, build, implement, operate and maintain financial information systems and associated technology services.	Acquire & Implement (AI) Deliver & Support (DS)	PO7: IT Human Resources AI1: Identify Automated Systems AI3: Acquire & Maintain Technology Infrastructure AI6: Change Management DS3: Manage Performance and Capacity DS8: Manage Service Desk DS11: Manage Data DS13: Manage Operations
Software Development	Ensuring the effective design, development, testing, installation, and maintenance of financial information systems and associated data.	Acquire & Implement (AI)	PO10: Manage Projects AI2: Acquire & Maintain Application Software AI7: Install & Accredited Solutions DS7: Educate & Train Users
IT Architecture	Ensuring that enterprise and technology architectures exist to rationalize and integrate an organization's portfolio of information systems.	Plan & Organize (PO)	PO2: Information Architecture PO3: Technology Direction
IT Control Oversight-External	Ensuring that proper controls have been established for financial information systems and associated technology services developed and/or operated by entities other than an organization's internal IT function.	Monitor & Evaluate (ME)	AI5: Procure IT Resources DS2: Manage Third-party Services

Table B3. Mapping the Bottom-Up IT Process Components to the Top-Down IT Process Domains					
IT Material Weakness Categories	Bottom-Up Mapping	Plan & Organize	Acquire & implement	Deliver & Support	Monitor & Evaluate
IT Control Oversight – Internal	PO4: IT Processes, Structure & Relationships	X ^a	X	X	X
	PO6: Internal Control Aims & Directions	X	X	X	X
	PO9: IT Risk Framework	X		X	X
	DS4: Ensure Continuous Service	X		X	X
	DS5: Ensure Systems Security	X	X	X	X
	DS12: Manage Physical Environment				X
	ME1: Monitor & Evaluate IT Performance	X		X	X
	ME2: Monitor & Evaluate Internal Control	X			X
	ME3: Ensure Compliance with External Requirements	X			X
	ME4: Provide IT Governance	X			X
IT Capability	PO7: IT Human Resources	X	X	X	X
	AI1: Identify Automated Systems	X	X	Y ^b	
	AI3: Acquire & Maintain Technology Infrastructure	X	X	X	X
	AI6: Change Management	X	X	Y	X
	DS3: Manage Performance and Capacity		X	X	X
	DS8: Manage Service Desk		Y	X	X
	DS11: Manage Data		Y	X	X
	DS13: Manage Operations				X
Software Development	PO10: Manage Projects	X	X	X	X
	AI2: Acquire & Maintain Application Software		X	X	
	AI7: Install & Accredite Solutions	X	X	X	X
	DS7: Educate & Train Users		X		X
IT Architecture	PO2: Information Architecture	X	X	X	
	PO3: Technology Direction	X	X	X	
IT Control Oversight–External	AI5: Procure IT Resources		X	X	Y
	DS2: Manage Third-party Services	X	X		X

^aX indicates the IT process serves as a *direct input* to at least one of the IT processes representing a top-down IT process domains.

^bY indicates the IT process serves as an *indirect input* (i.e., via a 'bottom-up' IT process) to at least one of the IT processes representing a top-down IT process domain.

Table B4. Mapping the IT Material Weakness Categories to Our IT Management Responsibility Domains

IT Material Weakness Categories	Description	IT Management Responsibility Domains	Mapping Justification
IT Control Oversight – Internal	Ensuring that proper internal controls have been established for financial information systems and associated technology services.	Demand-Side	Fiduciary responsibilities regarding financial systems are core responsibilities of the CFO (Hoitash et al. 2012; Hsu and Liao 2012; Li et al. 2010; Wang 2010).
IT Capability	Ensuring that appropriate capabilities (e.g., employees' knowledge, work practices and processes, etc.) exist to analyze, design, build, implement, operate and maintain financial information systems and associated technology services.	Demand-Side	The CFO provisions the financial expertise to determine the requirements for and to assess the integrity of installed financial systems (Li et al. 2010).
		Supply-Side	The CIO provisions the technical expertise to analyze, design, build, operate and maintain financial systems (Chen et al. 2011; Martin et al. 1995; Zmud and Sambamurthy 2012),
Software Development	Ensuring the effective design, development, testing, installation and maintenance of financial information systems and associated data.	Demand-Side	The CFO and the CFO's direct reports possess the knowledge and experience to determine the requirements for and to assess the integrity of installed financial systems (Li et al. 2010).
		Supply-Side	The CIO and the CIO's direct reports possess the technical expertise to analyze, design, build, operate and maintain financial systems (Chen et al. 2011; Martin et al. 1995; Zmud and Sambamurthy 2012),
IT Architecture	Ensuring that enterprise and technology architectures exist to rationalize and integrate an organization's portfolio of information systems.	Global	It is the responsibility of the CEO to ensure that an organization's enterprise architecture (reflected in installed business and technology platforms) enables, rather than obstructs, significant financial system changes implemented in support of current and future business strategies (Hirschheim et al. 2010; Nadkarni and Hermann 2010; Smith et al. 2010)..
IT Control Oversight– External	Ensuring that proper controls have been established for financial information systems and associated technology services developed and/or operated by entities other than an organization's internal IT function.	Supply-Side	It is the responsibility of the CIO to provide oversight ensuring that applicable policies and procedures are followed when financial information systems and the technology services enabling these information systems are developed and/or operated by entities other than the internal IT function (Chen et al. 2011).

Appendix C

IT Weaknesses and CIO Turnover

	Model 1 ^a	Model 2 ^b
IT Control Oversight–Internal	-0.051	0.079
IT Capability	0.452	0.430
Software Development	0.218	0.029
IT Architecture	0.082	0.335
IT Control Oversight–External	0.569**	0.748*
CIO Reporting Probability	0.004	0.003
Number of Non-IT Weaknesses	-0.202	-0.231
Size	0.211**	0.206**
Profit	-0.016**	-0.016**
Leverage	0.086	0.064
Restatement	-0.000	0.006
Going Concern	-0.571	-0.581
Growth	-0.062	-0.065
Institutional Ownership	-0.439	-0.435
Audit Committee Effective	-0.825	-0.768
CEO as Chairman	0.061	0.060
Board Size	-0.059	-0.050
Board Independence	1.405*	1.415*
CEO Pay Slice	-0.488	-0.422
CFO Pay Slice	3.876	3.807
Intercept	-2.817**	-2.827**
Year Indicators	Yes	Yes
Number of observations	216	216
p-value for Wald Chi2	0.054	0.085
ROC Curve	0.721	0.720

^aIndicator operationalization

^bCount operationalization

Note: ***p < 0.01, **p < 0.05, *p < 0.10

Appendix D

Correlation Matrix

		1	2	3	4	5	6	7	8	9	10
1	CEO Turnover	1.00									
2	Number of IT Weaknesses	0.13	1.00								
3	Number of Non-IT Weaknesses	0.14	0.28	1.00							
4	IT Control Oversight–Internal	0.05	0.62	0.22	1.00						
5	IT Capability	0.04	0.37	0.10	0.24	1.00					
6	Software Development	0.06	0.59	0.10	0.38	0.26	1.00				
7	IT Architecture	0.13	0.18	-0.01	0.09	0.14	0.22	1.00			
8	IT Control Oversight–External	0.09	0.42	0.20	0.25	0.10	0.12	-0.01	1.00		
9	CIO Reporting Probability	-0.07	0.01	0.00	-0.01	0.05	0.04	0.01	0.06	1.00	
10	CIO Turnover Probability	0.19	0.21	0.19	0.11	0.08	0.03	0.04	0.42	-0.21	1.00

Note: p-values of significance below 0.05 are bolded.

		1	2	3	4	5	6	7	8	9	10
1	CFO Turnover	1.00									
2	Number of IT Weaknesses	0.12	1.00								
3	Number of Non-IT Weaknesses	0.17	0.29	1.00							
4	IT Control Oversight–Internal	0.16	0.63	0.22	1.00						
5	IT Capability	0.07	0.41	0.11	0.23	1.00					
6	Software Development	0.09	0.59	0.11	0.38	0.28	1.00				
7	IT Architecture	-0.02	0.20	0.00	0.08	0.16	0.24	1.00			
8	IT Control Oversight–External	-0.03	0.44	0.18	0.25	0.12	0.12	-0.01	1.00		
9	CIO Reporting Probability	-0.06	0.00	0.01	-0.01	0.05	0.04	0.01	0.06	1.00	
10	CIO Turnover Probability	0.09	0.23	0.18	0.10	0.07	0.03	0.05	0.43	-0.21	1.00

Note: p-values of significance below 0.05 are bolded.

Table D3. CEO Turnover and Other Control Variables (n = 546)																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	CEO Turnover	1.00																
2	CEO IT Expert	0.08	1.00															
3	Size	-0.08	-0.11	1.00														
4	Profit	-0.20	-0.21	0.36	1.00													
5	Restatement	0.02	0.04	0.01	-0.03	1.00												
6	Going Concern	0.08	0.07	-0.20	-0.39	0.04	1.00											
7	Growth	0.01	-0.05	0.01	-0.04	0.02	-0.01	1.00										
8	Leverage	0.04	-0.15	0.07	-0.18	0.04	0.14	-0.10	1.00									
9	Institutional Ownership	0.03	-0.07	0.46	0.25	0.06	-0.08	-0.14	0.01	1.00								
10	Audit Committee Effective	0.03	0.02	0.00	-0.06	0.03	0.02	0.12	0.03	-0.01	1.00							
11	CEO as Chairman	-0.11	-0.02	-0.01	0.12	-0.04	-0.01	0.00	-0.02	0.00	0.03	1.00						
12	Board Size	0.02	-0.19	0.36	0.10	-0.03	-0.06	-0.15	0.20	0.09	-0.04	-0.09	1.00					
13	Board Independence	0.09	0.00	0.12	0.10	0.03	0.01	-0.03	0.07	0.16	0.03	-0.05	0.11	1.00				
14	CEO Pay Slice	0.02	-0.07	0.02	0.10	-0.06	-0.06	-0.07	0.02	0.08	0.01	0.00	0.09	0.09	1.00			
15	CEO Age	-0.14	-0.23	0.05	0.13	0.01	-0.02	0.06	0.06	-0.02	0.02	0.23	0.14	-0.02	0.11	1.00		
16	CEO Tenure	-0.17	-0.11	0.06	0.18	-0.02	-0.09	0.00	-0.10	0.02	-0.05	0.40	0.00	-0.14	0.02	0.41	1.00	
17	Prior CXO Turnover	-0.03	-0.01	0.02	-0.01	0.03	0.00	-0.03	0.02	0.01	0.04	0.03	-0.02	0.05	0.02	-0.06	0.00	1.00

Note: p-values of significance below 0.05 are bolded.

Table D3. CFO Turnover and other control variables (n = 518)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	CFO Turnover	1.00																	
2	CFO IT Expert	0.14	1.00																
3	Size	0.02	-0.10	1.00															
4	Profit	-0.13	-0.23	0.35	1.00														
5	Restatement	0.13	0.04	0.00	-0.03	1.00													
6	Going Concern	0.06	0.07	-0.20	-0.40	0.07	1.00												
7	Growth	0.04	0.06	0.01	-0.02	0.01	0.01	1.00											
8	Leverage	-0.04	-0.18	0.06	-0.18	0.04	0.17	-0.10	1.00										
9	Institutional Ownership	-0.03	-0.09	0.45	0.25	0.06	-0.10	-0.14	0.00	1.00									
10	Audit Committee Effective	0.05	-0.04	0.00	-0.08	0.04	0.03	0.13	0.04	-0.01	1.00								
11	CEO as Chairman	-0.10	-0.02	0.00	0.10	-0.04	0.00	0.02	0.00	0.02	0.02	1.00							
12	Board Size	0.02	-0.12	0.38	0.10	-0.02	-0.07	-0.16	0.20	0.09	-0.02	-0.10	1.00						
13	Board Independence	-0.03	0.01	0.11	0.10	0.04	0.01	-0.03	0.07	0.16	0.01	-0.05	0.12	1.00					
14	CEO Pay Slice	-0.01	-0.09	0.01	0.10	-0.07	-0.05	-0.08	0.01	0.07	0.00	0.01	0.07	0.11	1.00				
15	CFO Pay Slice	-0.04	0.03	-0.07	-0.06	-0.01	0.06	0.03	0.00	0.02	0.13	-0.08	-0.05	-0.03	-0.28	1.00			
16	CFO Age	0.00	-0.05	0.13	0.09	-0.02	0.00	0.02	-0.01	0.09	-0.04	0.04	0.08	0.05	0.10	0.03	1.00		
17	CFO Tenure	-0.14	-0.24	0.10	0.16	-0.08	-0.10	-0.05	-0.05	0.10	0.04	0.14	0.03	-0.05	0.02	0.02	0.25	1.00	
18	Prior CXO Turnover	-0.01	-0.02	-0.01	0.02	0.06	0.07	-0.01	0.08	0.01	-0.02	-0.02	0.01	-0.03	0.00	-0.03	0.00	-0.01	1.00

Note: p-values of significance below 0.05 are bolded

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