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# Effect of the SOX Act on IT Governance

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# Effect of the Sarbanes Oxley Act on IT Governance

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## ABSTRACT

Sarbanes-Oxley (SOX) Act stipulates specific roles for the CEO, CFO, and the Auditor. However, the role of the Chief Information Officer (CIO), usually in charge of IT governance (ITG), is implicit. This is despite the fact that in many firms, accounting and financial information and reporting systems either incorporate or are embedded in sophisticated information systems. Through a discussion of the literature, this paper argues that CIOs contribute to the design, implementation, and governance of these information systems which are fundamental to the SOX Act Compliance success. Hypotheses are generated and tested using panel data on the hiring of CIOs between 1999-2005. The results reveal that, after the enactment of the SOX Act in 2002, many firms created new CIO positions and staffed them with internal hires. Many of these new hires reported to the CEOs and had a strong business background characterized by graduate degrees in business administration (MBAs).

**Key words:** IT governance (ITG), Sarbanes Oxley (SOX) Act, Chief Information Officer (CIO), MBA, CEO, CFO.

## INTRODUCTION

The potential pay-offs from Information Technology (IT) continues to drive firms to make huge investments in IT resources (Liu and Ravichandran, 2008; Luftman and Ben-Zvi, 2010). In many firms, these investments are almost eight percent (8%) of the total revenue. Moreover, in the IT intensive industries they are almost forty percent (40%) of the firm's total capital expenditures (Karanja and Patel, 2012). For instance, in the 2009 report of the top 500 Information Systems (IS) innovators by *InformationWeek* magazine, IT budget levels in the Banking and Financial industry accounted for 8.0 and 7.6 percent of annual revenues in 2008 and 2009 respectively (Murphy, 2009).

However, a major impediment to the realization of the full economic benefits from these IT investments is the misalignment between IT and business strategies (Byrd, Lewis, and Bryan, 2006; Henderson and Venkatraman, 1993). For quite some time now, the appropriate ways to realize this elusive alignment has been a key concern for many IT executives and other members of the Top Management Teams (TMTs) (Armstrong and Sambamurthy, 1999; Preston and Karahanna, 2008). Numerous efforts have been made towards realizing this alignment although there is still more pressure especially due to the burden brought about by government legislation.

In order to regulate and protect investors in the public markets, the US federal government has enacted a number of legislation in the past. Sarbanes-Oxley (SOX) Act (SOX, 2002) is one of the most recent legislation. The promulgation of this Act led to a resurgence in the desire to achieve IT and business strategic alignment as part of firms' compliance efforts, albeit at a cost. A study from Emory University reported that the cost of SOX Act compliance is 148% of all the other compliance costs (Velichety et al., 2004). Although a considerable amount of research has been carried out exploring the IT and business strategy alignment phenomenon (Luftman, Papp, and Brier, 1999; Tallon and Pinsonneault, 2011), there seems to be a dearth of research work that investigates how to align IT to achieve the SOX Act compliance objectives of the firm.

One of the main components of the IT and business strategy alignment model is IT Governance (ITG) (Henderson and Venkatraman, 1993). Hence, the study seeks to investigate specifically the effects of the SOX Act and its impact on ITG. In the SOX Act compliance guidelines, the role of the ITG is implicit although in most firms, accounting information and financial reporting systems are embedded under sophisticated IT based systems. Nevertheless, the Act requires the TMT to document and test the relevant IT controls as means of insuring and guaranteeing the reliability of the accounting and financial information. Moreover there is, for instance, a widely held view that computer based information systems' security is a requirement, though implicit, of the internal control structures and mandates of the SOX Act. Therefore, the security, efficiency, and effectiveness of the IT unit in a firm will contribute towards ensuring the reliability of the financial reports more so due to the inherent characteristic of the digital records. The implementation of SOX and the role of IT are closely linked; this is evident from the fact that firms are benefiting from

improved information security from compliance efforts associated with SOX (Spears and Cole, 2006). Hence, the IT unit is viewed as a necessary but not a sufficient partner in the firm SOX Act compliance initiative.

This paper investigates the impact of the SOX Act on the corporate IT unit, hereby represented by the hiring or creation of the CIOs positions (CIO is used here to represent the subset of all Senior IT leaders in various organizations who are referenced using different names such as CIO, Chief Technology Officer, Vice President of IT, Director of IT etc.). The CIO has the utmost responsibility for IT in a firm and the associated responsibilities include setting IT strategy, directing IT investments, managing IT outsourcing initiatives, information security, ensuring data integrity, among others (CIO, 2002; Banker et al., 2011). Due to the IT and SOX Act relationship, it would be expected that firms would devote IT resources in meeting the compliance requirements. The responsibility and accountability of these resources would be under the office of the CIO.

This research makes a number of contributions. First, the researchers argue that while SOX Act does not explicitly require the CIOs to sign off on the accounting and financial statements and reports, their role is fundamental in ensuring that the firm meets the compliance standards. This is because, for the most part, the tools that are required for congregating, assessing, reporting, and implementing the financial statements are facilitated by and are under the control of the IT unit. Second, the researchers examine the relationship between the SOX Act and the ITG by illustrating how the various provisions of the SOX Act are implemented via IS. Third, the paper extends the debate of the relationship between the SOX Act compliance and corporate restructuring and transformation, which in this case is represented by the ITG. The rest of the paper is organized as follows. The next section contains background overview of the SOX Act followed by a section that illustrates the relationship between the SOX Act and ITG. Next, we present the methodology for data collection and the results. The article concludes with a discussion of the study's implications to both the academia and industry.

## **BACKGROUND**

### **Sarbanes Oxley (SOX) Act**

Firms serve a number of roles that include the creation of wealth to the stakeholders through transparent business practices and processes (Wheelen and Hunger, 2001; King, 2007). Likewise, among the various duties of the US Federal government, usually implemented through a number of agencies, such as the SEC (Securities and Exchange Commission), is to promote good business practices, level the playing field, protect investors, instill confidence in the capital markets, and ultimately facilitate the creation of wealth (Denis, 2001; La Porta et al., 2000). Following a number of accounting scandals, the SOX Act was enacted in 2002 to mitigate against future accounting malpractices as well as restore stakeholders' confidence in public companies accounting and reporting systems.

For the firms, potential benefits that accrue from compliance includes increased investor confidence in the financial reports, improved corporate disclosure, more reliable financial data as a result of effective internal control systems over the data as well as detection and deterrent of corporate financial fraud (Rezaee and Jain, 2006). However, the role of IT in the SOX compliance is not explicit and there are still different schools of thought with diverse opinions on the role of IT in the firm compliance initiatives. A review of the literature revealed that a number of researchers have carried out several studies investigating various dimensions of SOX Act and how they relate to the firm. A brief synopsis of some of these studies is shown in the following table, Table 1.

However, based on our literature review, there seems to be a dearth of literature that investigates how the enactment of the SOX Act has impacted the ITG component of the firms. It is this research gap that this study seeks to narrow.

### **IT Governance (ITG)**

Corporate governance encompasses the decision making processes, structures, and systems through which organizations are directed, managed, and controlled for the purpose of generating value to the stakeholders (Denis, 2001; Turnbull, 1997). ITG on the other hand, has been recognized as an integral part of corporate governance as espoused in its definition by the IT Governance Institute (ITGI, 2003, p.10), in which ITG "consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives". ITG "is about who is entitled to make major decisions, who has input, and who is accountable for implementing those decisions" (Broadbent and Weill, 2003, p.1). Also, ITG is defined as "the decision rights and accountability framework for encouraging desirable behaviors in the use of IT" (Weill and Richard, 2002, p.1-2; Weill and Ross, 2004, p. 4). IT organizational, leadership, accountability, and behaviors are manifested in multiple facets that includes directing IT endeavors of the firm, developing organizational visions, and setting IT strategic goals and directions.

Author (s)	Study Thesis	Results
Brown and Nasuti, 2005.	Relationship between ERP and SOX Act.	Competencies in project management, change management, and software integration are key to meeting SOX Act compliance.
Eldridge and Kealey, 2005.	Examine costs of the new internal control audit requirement of SOX Act.	On average, in the firms studied between 2003 and 2004, audit fees increased by \$2.3 million.
Leih, 2006.	Effect of SOX Act requirements on project management.	SOX Act results in increased project management formalization, increased project durations, and use of PM software to support auditing activities.
Ashbaugh-Skaife, Collins, Kinney, and LaFond, 2007.	Study the effect of SOX Act internal control deficiencies on firm risk and cost of equity.	Internal control deficiencies associated with significantly higher idiosyncratic risk, systematic risk, and cost of equity.
Hall and Liedtka, 2007.	How does SOX Act impact large scale IT outsourcing.	In responding to SOX Act, firms should avoid outsourcing IT projects outright due to the inherent risks associated with large IT projects, unless outsourcing is a profitable outcome.
Li, Lim, and Wang, 2007.	Internal and external factors that influence IT control governances.	Fewer material weaknesses found in firms with more experienced IT leaders, CIO positions, long tenured CEOs, and higher percentage of independent boards of directors.
Hammersley, Myers, and Shakespeare, 2008.	Market reaction to the disclosure of internal control weaknesses under section 302 of the SOX Act.	Negative price reactions to the disclosure of internal control weaknesses and material weaknesses.
Asthana, Balsam, and Kim, 2009.	Study how Enron, Andersen, and SOX Act impacted the US market for audit services.	Both average audit fees and premium charged by the Big Four audit firms increased significantly in 2002. Also bigger and riskier clients faced larger increases in their audit fees.
Masli, Peters, Richardson, and Sanchez, 2010.	Benefits associated with internal control monitoring technologies.	During the post SOX period, lower likelihood of material weakness occurrence, smaller increases in audit fees and audit delays in firms implementing internal control monitoring technology.
Haislip, Masli, Richardson, and Sanchez, 2011.	Impact of IT material weakness on executive and director turnover, and changes in IT governance.	Firms with higher IT material weakness experience more CEO, CFO, and director turnover rates and replacements have higher IT knowledge.
Morris, 2011.	Do ERPs implementations affect internal controls over financing reporting?	Firms implementing ERPs are less likely to report internal control weakness.
Wallace, Lin, and Cefaratti, 2011.	Examine extent to which IT security controls are implemented and integrated into firms internal controls environments.	IT controls implementations are premised on whether the firm is private or public, the size of the firm, industry affiliations, and training of internal auditors and IT personnel.

Table 1: A Sample of Prior IT Related Studies Investigating Various Dimensions of SOX Act

### *Role of ITG in the SOX Act compliance initiative*

The role of the IT unit in the firm SOX Act compliance efforts is evidenced by the fact that this legislation targets management accountability and operating efficiencies; two areas tightly coupled with ITG practices. The Committee of Sponsoring Organizations of the Treadway Commission (COSO) explicitly identifies the use of IT as a tool to enhance internal controls monitoring. IT can be used to monitor internal controls tasks like automation of routine control tests, enhancement of risk assessments, evaluation and documentation of controls, and management and communication of control assurance activities (COSO 2009). For example, Masli et al. (2010) found that IT related internal controls technologies assist in decreasing the number of material weaknesses in the financial statements. Moreover, the widespread use of IT within organizations implies that their internal controls are either fully automated by being embedded within the information systems or combine automated and manual controls (Braganza and Franken, 2007). One of the key roles of ITG is the management of IT investments.

According to Zuboff (1985) and Schein (1992), firms make IT investments in order to automate, informate, and/or transform business processes. Automation of IT investments mechanize business processes by replacing/complimenting the labor intensive, expensive, and often unpredictable human labor with IT infrastructures. Informate IT investments empower employees through the provision of IT infrastructures that facilitate the flow of information across the organizational hierarchical management and operations levels. Transformational IT-enabled initiatives on the other hand are geared towards changing or reshaping the industry rules of the game by restructuring and reengineering the business processes and thus altering both the firm and industry competitive forces. Transformational IT investments also alter how the firm interacts with its suppliers and other stakeholders along the value chain. The following table, Table 2, summarizes the relationship between some specific SOX Act sections and ITG and the impact of IT.

SOX Act Heading	Details	Role of IT Governance	Examples	IT Impact
<b>Section 302</b> Corporate Responsibility for Financial Reports.	Principal executive and financial officers (CEO and CFO) prepare and attach a statement to the periodic report attesting to the accuracy of the financial statements and disclosures therein.	Ensure IS systems supporting the financial reporting processes are auditable, complete, provide accurate data and information of when, where, and by who accounting and financial data was gathered, manipulated, shared, or stored.	Accounting IS, email management systems, POSs, MISs, HRMs, Secured IT networks.	Automate and Informate.
<b>Section 401</b> Disclosures in Periodic Reports.	Any off-balance sheet transactions and relationships involving unsolicited entities with the potential of affecting the current or future company financial standing must be included in the quarterly and annual reports.	Implement financial systems capable of providing timely, accurate, and consistent data both internal and external to the firm. Have efficient inter and intra-organizational ISs that enable data sharing and risk management with all the stakeholders along the value chain.	AIS, SCM, ERP, POSs, email management systems.	Informate and Transform.
<b>Section 404</b> Management Assessment of Internal Controls.	Auditors include an internal control report in the firm's annual financial statement certifying the management's responsibility in the creation, assessing, maintaining, and checking the effectiveness of the internal controls and processes.	Regularly document and audit the processes performed by the IT unit. Incorporate data and information security control mechanisms. CIO collaborates with CEO and CFO constantly to ensure alignment of IT and firm strategy and any IT changes/modifications.	IT Audit Systems, HRMs, Secured IT networks, Access control/Authentication systems.	Informate and Automate.
<b>Section 409</b> Real Time Issuer Disclosures.	Speedily and accurately report any material changes affecting firm's financial conditions or operations.	Invest in real time-based IT systems capable of gathering, assimilating, and reporting financial data, and reports or otherwise on a rapid and current basis.	POSs, AISs, MISs, ERP, Inter/Intranets, Cloud computing	Automate, Informate, and Transform.
<b>Section 802</b> Criminal Penalties for Altering Documents.	Intentional alterations, falsifications or destruction of financial data or information punishable by a fine/ 20 years in jail or both. Auditors must keep audit reports/reviews for 5 years or face 10 years and or fine for violations.	Guarantee the authenticity, consistency, and accuracy of financial records by setting and enforcing appropriate access control policies. Educate IT and related staff on importance of adhering to best practices when handling data and information. Report any data breaches on self or partners and ensure off site backup systems are in place.	POSs, MISs, ERPs, AISs, Secured IT Networks, IT Audit Systems, Access Control/Authentication Systems.	Automate, Informate, and Transform.
<b>Section 906</b> Corporate Responsibility for Financial Reports.	Principal executives (CEO, CFO), certifies that accounting and financial reports are an accurate reflection of the firm's financial position. Violations punishable by a fine and/or jail time.	Educate CIO and IT staff on role of IT in SOX Act compliance. Encourage IT investments that facilitate compliance while yielding business value.	IT training, Audit Systems, Access Control/Authentication Systems, Secured IT networks.	Automate and Informate.

Table 2: Relationship between a subset of SOX Act Sections and IT Governance

Although there are other IT investments that firms make that do not seem to fall into any of these categories, they are nevertheless aimed at supporting or managing the intended results of automation, informing, or transforming the business processes. For instance, the hiring of CIOs is aimed at providing the relevant organizational capability to govern the IT resources either at the automation, informing, or transformation stages with the aim of generating economic rents.

## RESEARCH FRAMEWORK AND HYPOTHESES

Although SOX Act, which regulates financial reporting, has very little direct relation or requirement for the corporate ITG, corporations rely heavily on IT processes in their daily financial management and periodic reporting activities. Thus, the role of ITG in the SOX compliance is a research domain that is increasingly getting more attention both in academia and in the business community (Schneier, 2004; Morris, 2011). High reliance on IT implies a very strong IT dependence for compliance with the SOX Act.

SOX Act does not specifically require that CIOs certify or attest to the effectiveness of the internal controls of their firms. However, CIOs' roles are implicit in that the responsibility of protecting the accounting and financial information

and the documents that the public relies on in making investments decisions rests with the IT unit. It is this business unit under the leadership of the CIO, which should guarantee that accounting data, financial documents, and business processes exhibit such traits as confidentiality, reliability, integrity, and are readily and only accessible to authorized users.



Figure 1: Research Framework Illustrating the Relationship between the CEO, CFO, Auditor and CIO in the SOX Act Compliance Initiative

From Figure 1 above, the facet of the SOX Act Compliance represented by the CIO takes the shape of a cloud to emphasize that it is not fixed in the matrix. As earlier acknowledged, SOX Act does not stipulate guidelines for the IT unit although we argue here that the role of CIO, who is in charge of ITG, is paramount in meeting the compliance requirements.

The role of the CIOs in the post SOX period is exacerbated by the fact that IT costs associated with compliance activities have far outpaced the expenses associated with the Y2K compliance. For instance, in a multi-tiered review of the costs of compliance and executives opinion on issues concerning the SOX Act, 147 high level executives indicated that the average audit fees have risen by a range of between 55% for the S&P 500 to 84% for the S&P Small-Cap companies (Hartman, 2007). Given the nature and role of IT function in these processes, there is little doubt that the CEOs and CFOs will turn to the CIOs for reassurances. In fact, the CIOs have a vested interest in ensuring that the financial statements are accurate and the firm's internal control are in compliance because any negative consequences of non-SOX Act compliance will indirectly affect them.

In the modern firms, IT infrastructure in forms of computers, emails, intranets, Internet, Web 2.0 tools, and IT personnel are the backbone of the day-to-day environment and it is only prudent for the IT personnel and Top Management Teams (TMTs) to comprehend the scope and the enforcement provisions of the SOX Act (Bequai, 2003). Since the SOX Act does not include IT compliance provisions, it is the role of the firms to devise strategies for meeting the compliance requirements. One of the IT oriented strategies is increased attention to the IT unit which can be inferred through a number of developments, such as the creation of CIO positions and their subsequent hiring to coordinate and manage the IT unit.

Consequently, we hypothesize as follows:

**Hypotheses 1a:** *The passage of the SOX Act of 2002 did result in changes in firms' ITG structures represented by the hiring of Senior IT executives (CIOs).*

**Hypotheses 1b:** *Following the enactment of the SOX Act of 2002, more firms created a new position of senior IT executives.*

**Hypotheses 1c:** *Of the Senior IT executives who were hired (to fill existing and newly created positions) following the passage of the SOX Act of 2002, many were hired from within the organization.*

### CIOs Reporting Structure

The various roles of a CIO involve interacting, either formally or informally, with other members of the TMT and require an individual well versed with the various facets of the organization (Preston and Karahanna, 2009). Since the CIO is the highest IT executive, the importance that firms place on IT can be reflected by the CIO's reporting structure.

The membership of the CIO in the TMT can also be interpreted to be an indicator of the role of IT in the overall organizational strategy, business and governance requirements, and ultimately value creation from IT. To facilitate the role of IT in the organizations, firms should have a formal and direct CIO reporting structure. The absence of a clear reporting structure hinders the role of a CIO, the alignment of IT and business strategy, and ultimately IT-based SOX Act compliance requirements.

Although the CIO position has been in existence for the last three decades, there seems to be a lack of consensus on the ideal CIO reporting structure (Talbot, 2008; Wilson, 2007). Two dominant reporting structures based on the differentiation and cost leadership strategies calls for a CIO-CEO and CIO-CFO reporting hierarchy respectively (Banker et al. 2011). Thus, given the risk factors associated with non-compliance on the firm governance structure, we would expect firms to hire more CIOs to manage and coordinate the IT infrastructures and also require these CIOs to report to the CEOs.

We hypothesize that,

**Hypotheses 2:** *Following the passage of the SOX act, firms hired CIOs and required them to report to the CEOs.*

### **CIOs Business Orientation**

CFOs are expected to have a good appreciation of both accounting and financial concepts, while marketing executives should be knowledgeable about sales. Likewise, a CIO is expected to have significant and deeper background in IT. However, since IT spans many spheres of the organization from accounting, marketing, research and development, to sales tracking and customer relationship management, CIOs are implicitly expected to be multi-talented. CIOs with more knowledge, experience, and skills that extend within and beyond the IT functions are better equipped to deliver business value through IT (Rasmussen, 2007). Such characteristics make them better and reliable partners, and not subordinates of the other top level executives who are key players in corporate governance.

As such, in addition to having a technical background, we would expect firms to have CIOs who have a business background. CIOs who are well versed with the IT technical skills and capabilities and have a better appreciation of the business environment would be more effective in achieving the alignment of IT and business strategy which is a precursor to achieving SOX Act compliance status.

**Hypotheses 3:** *Following the passage of the SOX act, firms hired Senior IT executives and many of these hired CIOs had, in addition to a technical background, a business orientation (MBAs).*

## **RESEARCH METHODOLOGY**

### **Sample Selection and Data Collection**

This research utilizes an empirical method to test and support the assertion that a relationship exists between the SOX Act and firms' ITG practices. An event study methodology was utilized to generate the data from Lexis Nexis wire index. Event study methodology has been used by many researchers to study specific issues. For example, Chatterjee et al. (2001) used a similar method in investigating the market reaction to the hiring of CIOs while Khallaf and Skantz (2011) extended their data and explored market reactions to the firm's IT expertise. The method was adopted based on the fact that many firms issue a press release when they hire senior executives (Fee and Hadlock, 2004). Searches using the keywords "new", or "create" together with various IT executives position titles were done.

Two distinct time periods were used with the "event" being the passage of the SOX Act in 2002. The time periods were 1999-2001 and 2003-2005. They were chosen to reflect the pre and post Year 2000 (Y2K), the dot-com boom and bust years, as well as the promulgation of the SOX Act; periods that have been shown to have had an impact on various aspects of ITG (Anderson, Banker, and Ravindran, 2006).

### **Results**

The search process generated hiring announcements and each entry was reviewed by the authors separately. The extracted data was recorded on a spreadsheet and some of the entries included company name, IT executive's title, hire date, newly created position or an existing position, internal or external hire, experience, and educational levels. The information was compared and where disagreements arose, the authors reviewed the announcements together and came to a consensus. The inter-rater reliability statistics were 0.86 (hiring IT executive), 0.96 (hire date), 0.93 (newly created position/existing position), 0.89 (external/internal hire), 0.93 (reporting structure), 0.95 (educational levels). Neuendorf (2002) argues that the reliability of content analysis studies using human coders should be based on the amount of agreement or correspondence among the coders. As such the values for the inter-coder reliability are well above the 0.8 which is considered sufficient (Cohen, 1960; Landis & Koch, 1977).



In total, the search process yielded 1219 announcements out of which 870 were retained after data cleaning. As shown in Table 3 below, 295 announcements were eliminated because they were not related to the hiring of IT executives (for example, the search returned information about AFL-CIO, the American Federation of Labor – Congress of Industrial Organizations, due to the occurrence of “CIO”), while 54 announcements were eliminated because the hired IT executive was not the highest IT executive in the firm (for example, VP of IS or VP of IT who reports to a CTO or to a CIO). However, the data for the firms where the highest IT executive position is the VP of IS or VP of IT is included.

Observations Based on Sample Selection Screening Criteria	
<b>Total number of announcements</b>	<b>1219</b>
<i>less announcements not related to hiring of IT executives</i>	(295)
<i>less announcements not related to the highest IT executive</i>	(54)
<b>Total number of valid IT related announcements</b>	<b>870</b>

Table 3: Sample Selection

From these 870 firm announcements, there were 16 different titles that were used to designate an organization’s top IT executive. Majority of these IT Executives had the title CIO, (56% - value includes subtitles such as VPs) and CTO (37%) with the other 7% representing titles such as VP of IT/IS; however, there were two positions that had President (CTO & P) title.

### Analysis

To empirically investigate the impact of SOX Act on the ITG represented by the hiring of top IT executives, an examination of the data on the hiring of CIOs from 1999 to 2005 (6 years of data) was done. A comparison sample was created by matching the sampled firms with their industry counterparts based on the 4-digit SIC codes. To create a matching sample, a list of all the firms in each 4-digit SIC code was generated from COMPUSTAT database and the list of all the firms that hired an IT executive was extracted. For instance, in 1999, there were 12,556 firms in all SIC codes in the COMPUSTAT database. Of these firms, 6,123 were represented in the group of 143 firms that hired an IT executive. To generate a comparison sample for the firms that hired an IT executive in 1999, 143 firms that hired an IT executive were eliminated from the total group sample to yield 5,980 firms that did not hire an IT executive. The procedure was repeated for all the other years (2000-2005). The process allowed the out of the effect of the large number of firms that were created pre-Y2K period and also enabled the comparison of the hiring and non-hiring practices of firms in the same 4-digit SIC Codes. The following table, Table 4, shows the annual distribution for both types of firms.

	Pre-SOX (1999-2001)				Post-SOX(2003-2005)			Total
	1999	2000	2001	2002	2003	2004	2005	
Firms not hiring	5980	5669	5431	4027	3647	3859	3919	32532
<i>Hiring firms</i>	<i>143</i>	<i>152</i>	<i>121</i>	<i>95</i>	<i>106</i>	<i>118</i>	<i>135</i>	<i>870</i>
Total	6123	5821	5552	4122	3753	3977	4054	33402

	Pre-SOX(1999-2001)	Post-SOX(2003-2005)	Total
Firms not hiring	17080	11425	28505
<i>Hiring firms</i>	<i>416</i>	<i>359</i>	<i>775</i>
Total	17496	11784	29280

Table 4: Number of Firms in the Study Period

In testing the hypotheses, two methods were used namely, frequency distribution of firms that hired and did not hire an IT executive during the Pre-SOX and Post-SOX time periods using a Chi-Square procedure and a proportions test for same periods following the methodology used by Gordon et al. (2006). The Chi-Square procedure was carried out to ascertain whether the distribution of the Pre and Post SOX values was due to chance. As shown in the following table, Table 5, the results indicate that the distribution of the firms that hired and did not hire an IT executive during the two time periods did not occur by chance ( $p\text{-value}<0.001$ ). The Chi-Square results are reiterated by the output from the Fisher’s exact probability test from the 2X2 contingency table.



Frequency distribution- $\chi^2$ and Fisher's exact							
	Pre-Sox	Post-Sox	Total	$\chi^2(1)$	Pr -Chi	Fisher	
						Two sided	one sided
Firms not hiring	17080	11425	28505	12.22	0.000	0.001	0.000
Hiring firms	416	359	775				
Total	17496	11784	29280				

Proportions of IT Executive hires							
Pre-Sox	Post-Sox	Diff Post-Pre	Z-Score	Diff>0 Pro(Z>z)	No. of observations		
416/17080	359/11425				Pre-Sox	Post-Sox	Total
2.44%	3.14%	0.71%	3.50	0.000	17496	11784	29280

Table 5: Comparing the Firms That Hired and did not Hire an IT Executive

The second test involves comparing the proportions of the firms before and after the SOX Act. As such, if the proportion of firms before the SOX Act is designated as  $P_{pre}$  and those after the SOX Act as  $P_{post}$ , the null hypothesis can be stated as  $H_0: P_{post} - P_{pre} = 0$ . The goal here is to investigate whether  $P_{post} > P_{pre}$ . Thus, the alternative hypothesis becomes,  $H_a: P_{post} - P_{pre} \neq 0$  and for a one sided test,  $H_a: P_{post} > P_{pre}$ . The proportions test for the two time periods provides statistical support for the argument that firms hired more IT executives after the SOX Act was enacted ( $P_{post}(3.14%) > P_{pre}(2.44%) p < 0.001$ ). The results support the hypothesis that SOX Act has an impact on the ITG as represented by the increased hiring of IT executives.

**Hypotheses Tests for Old and newly Created IT Executive Positions**

Figure 2 shows the trend for the IT executive positions that were filled between 1999-2005. In general, the old positions are more than the newly created positions. In the next table, Table 6, results are shown following the tests of the difference between the old positions and the new positions Pre and Post SOX. The Chi-Square test is significant ( $P < 0.1$ ) supporting the argument that these values are not a random occurrence. Also, the test of proportions is significant ( $P < 0.05$ ) supporting the hypothesis that firms created more new positions after the enactment of the SOX Act.

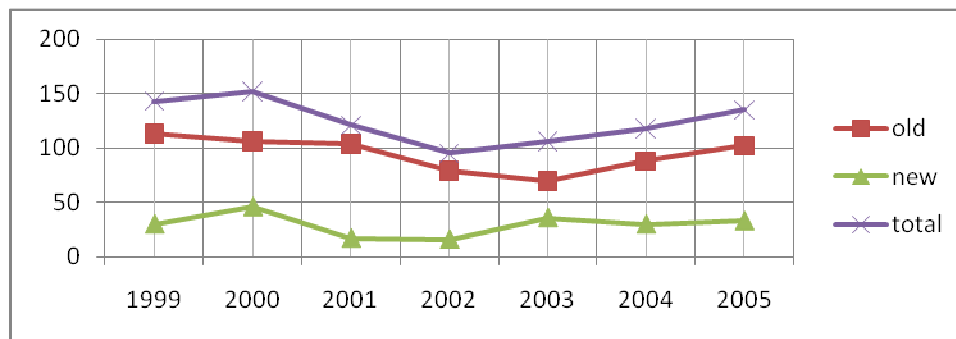


Figure 2: Trend for the IT executive positions that were filled between 1999-2005

Frequency distribution- $X^2$ and Fisher's exact							
	Pre-Sox	Post-Sox	Total	$X^2(1)$	Pr -Chi	Fisher	
						Two sided	one sided
Old Positions	323	260	583	2.82	0.093	0.096	0.055
New Positions	93	99	192				
Total	416	359	775				

Proportions of CIOs Hires following creation of a new or existing position							
Pre-Sox	Post-Sox	Diff Post-Pre	Z-Score	Diff>0 Pro(Z>z)	No. of observations		
93/323	99/260				Pre-Sox	Post-Sox	Total
28.79%	38.08%	9.28%	1.68	0.047	416	359	775

Table 6: Testing for the Difference between the Old and New Positions Pre and Post SOX

**Hypotheses Tests for IT Executives hired from within and Outside the Firm**

Figure 3 shows that firms hired more IT executives from outside the firm prior to 2002 but in 2003, there were an equal number of IT executives hired from outside and within the firm. However, after 2003, the hiring process reverted to the earlier trend.

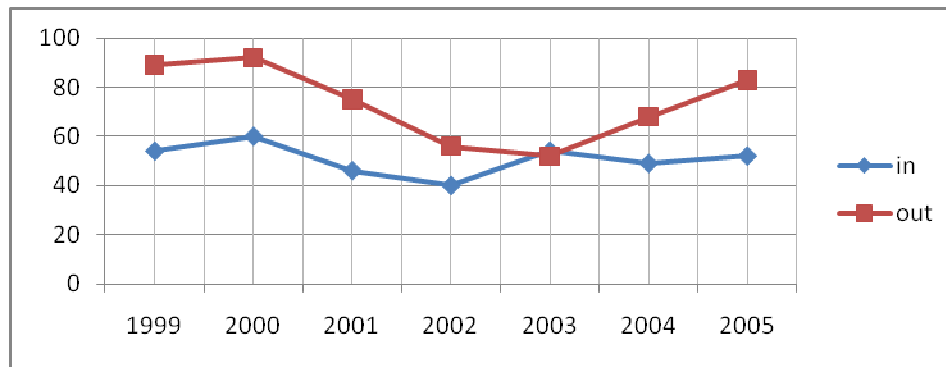


Figure 3: Comparing the Internal and External IT Executives Hires

To empirically test whether firms hired more IT executives from outside than inside the firm, a Chi-Square test and a proportions test were carried out. Table 7 shows that the results are inconclusive although the proportions of IT executives who were hired from outside the firm after the passage of the SOX Act is greater and significant ( $p < 0.1$ ) than the proportions of IT executives who were hired from inside the firm.

Frequency distribution- $X^2$ and Fisher's exact							
	Pre-SOX	Post-SOX	Total	$X^2(1)$	Pr -Chi	Fisher	
						Two sided	one sided
Outside Hires	256	203	459	1.863	0.172	0.187	0.098
Inside Hires	160	156	316				
Total	416	358	775				

Proportions of CIOs Hires from Within and Outside the firm							
Pre-SOX	Post-SOX	Diff Post-Pre	Z-Score	Diff>0 Pro(Z>z)	No. of observations		
160/256	156/203				Pre-SOX	Post-SOX	Total
62.50%	76.84%	14.35%	1.365	0.086	416	359	775

Table 7: Comparing the Internal and External CIO Hires

**Hypotheses Tests for Reporting Structures of hired IT executives**

Figure 4 shows the trend over the 1999-2005 periods for the reporting structure of the hired IT executives. There are two categories namely, IT executives who reported to the CEOs (includes Presidents, Chairmen, Chief Operating Officers) and CFOs & others. The 'others' includes IT executives who were reporting for instance to the VPs of Research and Development, Senior VPs of various departments and many more. Between 2001 and 2002, the data shows a decline in the number of IT executives that reported to the CEOs while the number of IT executives that reported to the CFOs and Others seem to rise. However, after this period, the chart shows a rise in the number of IT executives reporting to the CEOs while the values for the CFOs and others reverse back to the Pre-SOX period.

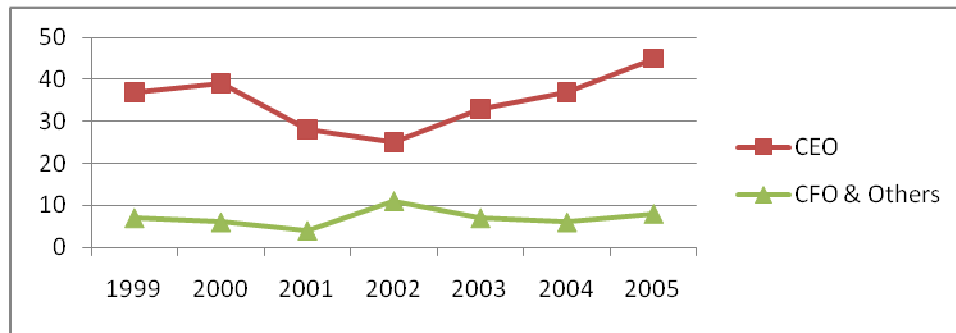


Figure 4: Comparing the Reporting Relationship of the Hired IT Executives CIOs

Frequency distribution- $X^2$ and Fisher's exact							
	Pre-SOX	Post-SOX	Total	$X^2(1)$	Pr -Chi	Fisher	
						Two sided	one sided
Non Reporting	295	211	515	5.94	0.015	0.015	0.009
CEOs	104	115	219				
Total	399	326	734				

Proportions of CIOs Hires Reporting Relationships							
Pre-SOX	Post-SOX	Diff Post-Pre	Z-Score	Diff>0 Pro(Z>z)	No. of observations		
					Pre-SOX	Post-SOX	Total
104/295	115/211						
35.25%	52.27%	17.02%	2.437	0.008	399	326	734

Table 8: Testing the Reporting Relationship between IT Executive Hires Over the Study Period

To generate a Pre and Post SOX comparison samples for testing the relationship between IT executive hires and reporting structure, the number of firms that detailed a reporting relationship (121 Pre and 136 Post) were subtracted from the total number of firms (416 Pre and 356 Post). The comparison samples are shown in Table 8. The results from the Chi-Square test support the argument that this data did not occur by chance ( $p < 0.05$ ) and also the hypothesis that the difference between the Pre and Post SOX is positive and significant ( $p < 0.05$ ).

**Hypotheses Tests for Business Backgrounds of Hired IT Executives**

To evaluate the business orientations of the hired IT executives, data was gathered (where available) about their bachelor's degrees, masters degrees, and doctoral degrees. Most of the hired IT executives had acquired bachelor degrees in Computer Science/Engineering and Technology. An IT executive was considered to have a business orientation if they had acquired a master's degree in a business related field (MBAs or MS in Finance/Accounting/MIS). Out of the 870 IT executives that were hired, there was available data about the master's degree for 343 IT executives.

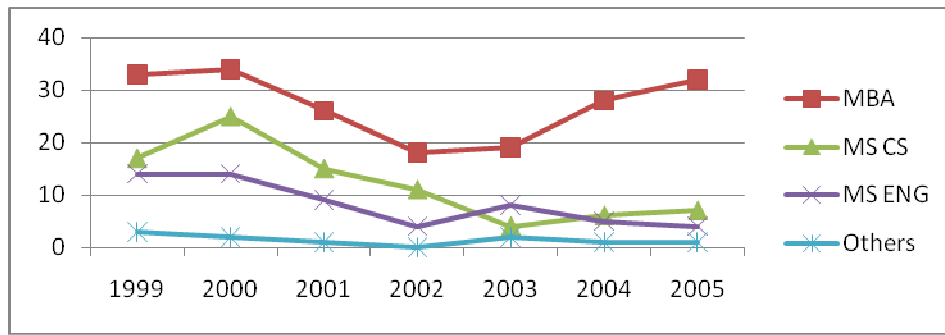


Figure 5: Masters Degrees Acquired by the Hired CIOs

As shown Figure 5, majority of these degree were MBAs (includes Executive MBAs, MS Accounting/Finance/MIS). The figure also shows three other groups of graduate degrees namely; MS Computer Science (MS CS), MS Engineering (MS ENG) which include computer, electrical, and general engineering, and the ‘Others’ category which includes MS degree in physics, chemistry, and biology. To test the hypotheses, a comparison was made between the values for the IT executives with MBAs against the other master’s degrees. As shown in the following table, Table 9, below, the Chi-Square test is significant ( $p < 0.001$ ). Also, the proportions test shows that the difference between the Pre-SOX and the Post-SOX is positive and significant ( $p < 0.001$ ).

Frequency distribution- $X^2$ and Fisher's exact							
	Pre-SOX	Post-SOX	Total	$X^2(1)$	Pr -Chi	Fisher	
						Two sided	one sided
Others	100	38	138	11.025	0.001	0.001	0.001
MBAs	93	79	172				
Total	193	117	310				

Proportions of CIOs hires with Business Background							
Pre-SOX	Post-SOX	Diff Post-Pre	Z-Score	Diff>0 Pro(Z>z)	No. of observations		
					Pre-SOX	Post-SOX	Total
93/100	79/38						
93.00%	207.89%	114.89%	3.32	0.000	193	117	310

Table 9: Comparing the Graduate Degrees of Hired CIOs Pre and Post Sox Period

## DISCUSSION

In many organizations, there is a direct relationship between IT effectiveness and business operational efficiency due to the automation and transformation of processes throughout the business value chain (Holmes and Neubecker, 2006). Thus, CIOs serve critical roles when firms embark on SOX Act compliance initiatives. Besides managing the automation and transformation processes, CIOs are tasked with the roles of oversight over data analysis, systems design, systems development, and maintenance. Hence, the security, reliability, tolerance, and disaster recovery capability of the firm’s IT Infrastructures is the responsibility of the CIO’s office. Such undertakings guarantee that critical financial information can be extracted at any time and at any place by authorized personnel only.

The role of CIOs in the SOX Act and the COSO framework is amplified by the fact that these legislations by themselves will never guarantee good corporate governance, but just like other laws, it is the efforts of people, organizational culture, business processes, firm control mechanisms, and strong management capabilities that ultimately determine compliance (Welch, 2005). In the modern firms, IT infrastructure represented by computers, emails, intranets, Internet, Web 2.0 tools, and IT personnel are the backbone of the day-to-day environment and it is only prudent for the IT unit and management to comprehend its scope and the enforcement provisions (Bequai, 2003). Since the SOX Act does not include IT compliance provisions, it is the role of the firms to devise means of meeting the compliance requirements. One of these means is increased attention to the IT unit which can be inferred through a number of scenarios. One of

these scenarios is an increased focus on the IT unit which would prompt firms to hire or create CIO positions to coordinate and manage the IT unit.

A CIO is mandated with the role of heading the IT-unit (Gottschalk & Taylor, 2000) and is usually an IT-focused peer who can associate with other members of the top management team (TMT) on an equal footing. Thus by being part of the “inner circle”, the CIO is more likely to effectively educate, advise, and influence other Senior Executives (Armstrong and Sambamurthy 1999; Ross and Feeny 2000). Research has demonstrated that CIOs add value to their firms through a number of strategies that include building relationships with senior executives, gaining the CEO confidence as well as making IT a major business competitive tool (Armstrong and Sambamurthy 1999; Bharadwaj, 2000). From the extant literature, it is evident that, firms cannot afford to ignore their IT executives while making SOX Act compliance decisions. In the modern firms, IT infrastructure in the form of computers, emails, intranets, Internet, Web 2.0 tools and other technologies are the backbone of the day-to-day environment and the ITG should play a leading role in aiding the IT and non-IT staff and management to comprehend their scope and the enforcement provisions as it pertains to the SOX Act. As earlier stated, SOX Act does not include IT compliance provisions and therefore it is the role of the firms to devise means of meeting the compliance requirements.

Critics have argued that SOX Act is a financial legislation but this study has made a case for the fact that the role of IT in the compliance is inseparable since IT systems play a critical role in generating, changing, storing, and transporting data and information. Also, the researchers have illustrated through the research model that the role of ITG in dealing with the impact of SOX compliance, though implicit, is evidenced by the fact that SOX targets management accountability and operating efficiencies, which are two areas tightly coupled with the IT function. Moreover, many firms are actually inadvertently incorporating their CIOs in the SOX Act compliance committees as well as making direct investments in information systems meant to aid in SOX compliance.

## CONCLUSION AND FUTURE RESEARCH

The researchers hope that this research will further the debate on the role of ITG in the post SOX Act and spur more discussions. In fact, this research reinforces the anecdotal evidence that points to the fact that firms are spending more on IT to meet compliance standards but there is limited empirical research to support this assertion. An extension of this study should include a study seeking to confirm or debunk this assertion. Another extension would also include analyzing the new CEO hires to find out whether they are more biased towards IT. In light of the SOX Act, it would seem that more IT knowledgeable CEOs would seemly comprehend the IT requirements implicitly stated in the compliance requirements and be better at championing the ITG role.

The IS literature has mainly used surveys or field interviews to investigate the various facets of ITG; however this study uses panel data spanning seven years from many firms which is a demonstration of the robustness and external validity of the study. However, there is still room for improvements in future studies. Additionally, this study focuses on the hiring trends and other CIO characteristics and we acknowledge that there are other characteristics associated with CIOs that might have an impact on corporate ITG. Future studies should investigate these characteristics such as the salary, firm size, firm industry reporting structures, and firm’s use of IT. Future studies should also investigate if CIOs abilities such as education, functional background, and experience closely match those of the other members of the TMT such as CEOs, CFOs, and COOs and how they impact firm performance.

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