

# Understanding IT Governance Effectiveness in Asia: An Event Study

**Josephine L. L. Chong**  
Nanyang Technological University  
Singapore  
[josephinechong@singnet.com.sg](mailto:josephinechong@singnet.com.sg)

**Linh N. K. Duong**  
Auckland, New Zealand  
[linh.n.k.duong@gmail.com](mailto:linh.n.k.duong@gmail.com)

## **Abstract**

*The study seeks to examine the impact of Information technology (IT) governance structure, process and relational mechanisms on firm performance. Using an event study, we collected a sample of 70 announcements of IT governance adoption investments. We found that most firms adopt all three types of IT governance mechanisms. IT governance structural mechanisms have a positive impact on firm's profitability. In contrast, IT governance process and relational mechanisms have a negative association with firm performance. More interestingly, the findings provide insight for organizations that they should realize the potentially negative impact of the controls requirements of Sarbanes-Oxley Act Section 404 and IT leadership on firm performance.*

**Keywords:** IT Governance, Financial Performance, Event study

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## Introduction

The business value of Information Technology (IT) governance has captured the attention of both practitioners and academics over the last two decades (IT Governance Institute, 2003; Lunardi et al., 2014; Pang, 2014). IT governance emphasizes on policies and procedures that define how organizations manage and control the use of IT to align with business strategies. Effective IT governance is described as an appropriate combination of structures, processes and relational mechanisms (De Haes and Van Grembergen, 2009; Peterson, 2004).

The impact of IT governance effectiveness on firm performance has been well established in previous studies, yet there still remains a gap explaining exactly how various IT governance mechanisms influence firm's profitability (Bowen et al., 2007; Lunardi et al., 2014; Wu et al., 2015). This study is motivated by the need for further empirical research into the relationship between IT governance mechanisms and firm performance. Overall, this study has two objectives. The first research objective is to explore how organizations typically utilize a mixture of IT governance mechanisms to facilitate IT-business alignment. The second research objective is to explore which IT governance mechanisms can lead to better firm performance.

This study provides valuable insights into what are the IT governance mechanisms that used by organizations across Asia in enhancing their financial performance. Prior research that studied IT governance effectiveness was generally conducted in United States (e.g., Bradley et al., 2012; De Haes and Van Grembergen, 2009; Huang et al., 2010; Sambamurthy and Zmud, 1999). There is not much empirical research studying the impact of IT governance mechanisms on firm's profitability within an Asian context. Asia has become the fastest growing economic region over the last decade. Foreign direct investments and

international trading agreements play an important role in driving the rapid economic growth. More and more organizations are expanding their operations into the Asian region that contributed to a tremendous demand on IT. As a result, organizations are implementing IT governance to ensure that their IT investments can generate potential business benefits (Weill and Ross, 2005).

While many studies in IT governance typically use case study and survey research methods, this study investigates the business value of IT governance mechanisms using an event study methodology. This is a commonly used method that help IS researchers to evaluate the business performance of IT investment (Im et al., 2001). We used Tobin's q as a market-based performance measurement to study the impact of IT governance mechanisms on firm's profitability. The advantage of Tobin's q is that it combines the capitalized value from many industries. Our study is one of the few empirical research examining at the relationship between IT governance mechanisms and firm performance using public announcements of IT governance adoption. These announcements were collected over the period 2004–2014.

The paper has six sections. This section introduces the background of the research. In Section 2, we discuss theoretical development. A discussion on research design is in Section 3. In Section 4, we present our empirical results. In Section 5, we provide a discussion of the findings. The last section concludes the paper with contributions, limitations and future research.

## Theoretical Development

### *IT Governance*

IT governance is a subset of corporate governance (Van Grembergen and De Haes, 2009). Corporate governance entails a "set of mechanisms that influence the decisions made by managers when there is a

separation of ownership and control.” (Larcker et al., 2007). Governance mechanisms encompass board of directors, corporate policies, organizational processes and procedures. They play an important role in aligning the actions of managers with the interests of shareholders when evaluating investment decisions. Similarly, IT governance provides mechanisms for facilitating strategic decisions regarding IT investments that are responsible by the board of directors.

Over the years, associations such as Information Systems Audit and Control Association (ISACA) as well as regulatory bodies such as United Kingdom's Office of Government Commerce (OGC) and United States Securities and Exchange Commission (SEC) have introduced various IT governance standard-based frameworks to promote IT governance best practices. These IT governance frameworks include COBIT (Control Objectives for Information and Related Technology) and ITIL (Information Technology Infrastructure Library). In 1996, the ISACA first released COBIT which is an IT control and security framework that addresses risk management and mitigation. In particular, the framework defines 34 IT control and security processes which have categorized into four IT domains including Plan and Organize, Acquire and Implement, Deliver and Support, and Monitor. ITIL is a framework that provides set of concepts and policies on the management of IT infrastructure, processes, operations, functions, roles and responsibilities in better managing IT service delivery. The ITIL framework addresses five specific components related to delivering IT service and support. These components are Service Strategy, Service Design, Service Transition, Service Operation and Continual Service Improvement. Sarbanes-Oxley Act of 2002 (SOX) was implemented by the SEC to provide guidance to public companies for their reporting on the effectiveness of internal IT controls over financial reporting.

Numerous studies have discussed the definitions of IT governance. One of the earliest definitions of IT governance in the literature is “IT governance is the responsibility of the Board of Directors and executive management. It is an integral part of enterprise governance and 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” (IT Governance Institute, 2003, p. 10). Subsequently, authors conceptualize the definition of IT governance based on the different IT governance mechanisms which include structures, processes and relational. For instance, Weill (2004) and Peterson (2004) emphasize on IT governance decision-making mechanism. In particular, how the distribution of IT decision rights and responsibilities between IT and organizational units can align the structural aspects of IT related decision-making procedures. While Ali and Green (2012) underline that IT governance mechanisms include top management support that facilitates the implementation of an IT strategy as well as processes mechanisms to produce behaviours in achieving organization's strategy and objectives. Another common IT governance mechanism found in the literature is the relational dimension which entails leadership, culture and communication (Chong and Tan, 2012; Ko and Fink, 2010; Huang et al., 2010). For this study, we define IT governance as a framework in specifying the allocation of IT related decision-making rights and responsibilities between IT and organizational units and deploying processes and relational mechanisms to support the alignment between business objectives and IT.

### ***IT Governance Mechanisms***

Prior research has mainly focused on how the deployment of a combination of structure, process and relational mechanisms can influence the effectiveness of IT governance. Therefore, it is vital to have an understanding of the IT governance

mechanisms as they define the scope of IT governance effectiveness.

IT governance structural mechanisms are concerned with the allocation of IT decision-making rights and responsibilities among different stakeholders within an organization (De Haes and Van Grembergen, 2009; Peterson, 2004). According to Sambamurthy and Zmud (1999), there are three forms of decision-making structures: centralized, decentralized, and federal. A centralized IT decision-making structure is one where the top management is responsible for making any IT related decisions. A decentralized decision-making structure is one where divisional business units or functional IT units have the decision-making rights and responsibilities. A federal decision-making structure is one where the top management is accountable for making any IT infrastructure related decisions, while divisional business units are responsible for making any business deployment of IT related decisions.

IT governance process mechanisms emphasize on the implementation of IT management techniques in supporting the alignment between business objectives and IT strategies (Bowen et al., 2007). Organizations deploy IT governance standard-based frameworks and performance management systems to manage business-IT alignment. COBIT and ITIL provide management tools including critical success factors and maturity models are used by organizations in aligning their IT investments to business strategies (Ko and Fink, 2010). Performance management systems such as balanced scorecards and strategic information systems planning provide performance metrics for measuring the business values of IT investments (Nfuka and Rusu, 2011).

IT governance relational mechanisms focus on “the active participation of, and collaborative relationships among, corporate executives, IT management, and business management” (Peterson, 2004, p. 15). According to De Haes and Van Grembergen

(2009), relational mechanisms are crucial enabler for implementing an IT governance project at the initial stage. Top management and IT people must work together cohesively so that IT tasks and activities can be facilitated in a more effective manner. Importantly, a shared understanding between business and IT people is vital for a better alignment between business objectives and IT goals.

### **IT Governance Mechanisms and Firm Performance**

The relationship between IT governance and firm performance is of interest to many scholars. More specifically, the impact of IT governance mechanisms on business-IT alignment that can create business value from IT investments. Lunardi et al. (2014) demonstrated that there was a strong positive relationship between the three forms of IT governance mechanisms and firm performance. In contrast, Luftman et al. (2015) found that IT governance moderated the influence of business-IT alignment on firm performance. Pang (2014) studied how IT governance structural mechanism moderated the relationship between IT spending and cost efficiency. Wu et al. (2015) showed that decision-making structures, formal processes and communication modes enabled better alignment between IT and business strategies, which in turn, had a positive impact on firm performance.

There are extant studies measuring the effect of various IT governance mechanisms on firm performance. In studying the relationship between IT governance mechanisms and firm performance, researchers tend to focus on IT steering committee, decision-making structure, strategic role, communication, IT leadership, top management commitment, IT governance frameworks, and metric and compliance processes (Table 1). Given that each organization has different business strategy, it will deploy using different combination of IT governance mechanisms for business-IT alignment. Thus, the first

research objective is to explore how organizations typically utilize a mixture of IT governance mechanisms.

Although there are various of IT governance mechanisms, not many of them explain which IT governance mechanism has the most impact on firm performance (Wu et al., 2015). There is no “single best IT governance model” as it is constrained by organizational and environmental contexts (Weill and Ross, 2005). Therefore, our second research objective is to explore the relationship between each IT governance mechanism and firm performance. In addition, we seek to understand which IT governance mechanism can lead to better firm performance.

## Research Method

This study adopts an event study methodology with the aim to investigate the impact of an event as assessed by reactions in stock prices. It draws upon the theory of efficient markets, asserting that stock prices fully reflect all available information (Fama, 1970). Event research methodology has been used widely in disciplines such as accounting and finance. For example, accounting researchers tend to use event research methodology to investigate how accounting information disclosure can impact a firm’s future earnings; while finance researchers deploy it to study how mergers and acquisitions can impact a firm’s market value (Im et al., 2001). In the IS discipline, researchers use this methodology to examine the effect of adoption, implementation, procurement and deployment of information systems technology (Konchitchki and O’Leary, 2011). This research also aims at investigating the effects of IT governance on firm performance; therefore, the use of event-study is justified.

In general, an event study follows four steps (MacKinlay, 1997). The first step is to determine an event of interest. The second step is to identify a number of firms with such events and compile a list of dates. The third step is to select an estimation window. The fourth step is to calculate the financial performance within the event window. According to the review of event-study methodologies in IS research, despite that there are some difference between event studies in IS and other disciplines; the steps proposed by MacKinlay (1997) have been widely used in IS research (Konchitchki and O’Leary, 2011), for example, the work of Aggarwal et al. (2006).

### **Identification of events of interest**

In this study, we define the event as a firm’s public announcement of its IT governance adoption. We obtained public announcements of investments in Asia using Factiva as the main database. The target news sources were Mena Report, Business Wire, China Business Newswire, China Weekly News, Investment Weekly News, PR Newswire, Nikkei Report, SinoCast China Business Daily News, Telecompaper Asia and The Electronic Times (Korea). Our data includes 70 announcements of IT governance adoption investments.

### **Selection of Sample**

To be included in this study, each firm’s public announcement must satisfy three criteria. First, a firm must obtain a listing on the stock exchange. It must meet specific exchange standards that include a minimum net income, a minimum market value for shares outstanding and a certain minimum number of investors. Second, firms must report their financial data that can obtain from Datastream. Third, the firm announced explicitly that it had adopted one of the three IT governance mechanisms or combination.

**Table 1 - Summary of Studies**

Authors	Types of IT Governance Mechanism	Operationalization
Bowen et al. (2007)	Structural and Process	Decision-making structure; IT strategies and policies
De Haes and Van Grembergen (2009)	Structural, Process and Relational	IT steering committee; IT strategy committee; IT budget control and reporting; IT leadership; Strategic information systems planning; CIO structural power
Prasad et al. (2010)	Structural and Process	IT steering committee; Top management commitment
Lazic et al. (2011)	Structural, Process and Relational	IT steering committee; IT strategy committee; Performance measurement; COBIT; ITIL; IT budget control; IT reporting; IT leadership; Informal meetings; Corporate internal communication
Stoel and Muhanna (2011)	Process	Sarbanes–Oxley Act of 2002
Bradley et al. (2012)	Structural, Process and Relational	CIO structural power; CIO–TMT membership; CIO reporting level; Enterprise management methodologies; Metric and compliance processes
Smith et al. (2013)	Structural	CIO structural power; CIO reporting structure; CIO turnover; IT steering committee
Dong (2012)	Structural, Process and Relational	Top management commitment; Quality of internal communication and co-ordination; Performance measurement
Lunardi et al. (2014)	Structural, Process and Relational	IT steering committee; COBIT; ITIL Sarbanes–Oxley Act of 2002; Strategic information systems planning; Effective communication
Pang (2014)	Structural	CIO structural power
Luftman et al. (2015)	Structural, Process and Relational	Strategic business planning; IT budget control and reporting; relationship and trust between IT and the business; Metric and compliance processes; IT steering committee
Wu et al. (2015)	Structural, Process and Relational	Decision-making structure; Formal processes; Communication;

We collected public announcements for firms investing in IT governance from 2004 to 2014, including the announcement with the earliest date. To generate the search, we used keywords such as 'IT governance', 'COBIT', 'ITIL', 'Sarbanes-Oxley Act', 'IT strategy', 'IT management', 'Chief

Information Officer', 'IT processes', 'IT steering committee', 'IT compliance', 'IT leadership', 'systems planning', 'enterprise architecture' and 'communication'. Our sample consisted of 70 public listed firms (Appendix A). Table 2 provides examples of public announcements used in this study.

**Table 2 - Example of Announcements in the Sample**

China Ritar Power Corporation, a leading Chinese manufacturer of lead acid batteries, today announced that it engaged Ernst & Young to assist the Company in complying with the financial reporting and control requirements of <b>Sarbanes-Oxley Act Section 404 ("SOX 404")</b> . PR Newswire, 15 October 2009
The Bank of Communications uses <b>ITIL best practices</b> to streamline IT process and improve efficiency. Business Wire, 26 January 2010
China Unicom started making direct reports to the board about <b>IT internal control</b> . China Business Newswire, 5 September 2007
StarHub aims to drive significant efficiency improvements across the different IT teams, while ensuring the <b>new systems and processes</b> provide the flexibility and scalability to meet present and future business requirements. Telecompaper Asia , 1 September 2011

### **Selection of event window**

The event window refers to the number of days before and after the date of announcement over which the abnormal returns is accumulated. Most event studies generally use a three-day event window to observe market reaction to investment announcements. That is, the day before the event, the day of the event and the day after the event. However, this study used a longer event window to allow for a considerable time lag between IT governance investment and firm performance. Firms may take a long time to realize the potential financial benefits from IT governance adoption (Bharadwaj et al., 1999). In this study, a two-year event window was used to observe the impact of IT governance adoption on firm performance. We coded the year of the announcement as year zero ( $t = 0$ ) and the year after the IT governance adoption as year one ( $t = 1$ ).

### **Calculation of financial performance**

In general, an event study analysis on financial performance can follow two

approaches. The first approach uses abnormal stock returns as a basis to measure firm performance. It is associated with a specific event such as releasing investment announcements to the public. The market value of the announcement is measured by whether there are any abnormal or excess returns. Researchers typically use cumulative abnormal return as a market-based measure of firm profitability. However, firms may not able to realize fully the potential financial benefits within a short period of time (Bharadwaj et al., 1999). The second approach is to use longitudinal financial data to evaluate firm profitability. Importantly, longitudinal financial data is sensitive to the time lags for realizing the potential of capital investments. This study adopted the second approach that used Tobin's q to evaluate the impact of the IT governance adoption on firm performance.

Tobin's q is a forward-looking and risk adjusted market-based performance measure of firm profitability. In general, Tobin's q can be used explain the relationship between different types of business activities and firm performance,

including market capitalization, diversification returns, brand equity and value creation from technological and intangible assets. As for the Information Systems discipline, researchers typically utilize Tobin's  $q$  to examine the role of IT investments on firm performance (e.g., Bharadwaj et al., 1999; Hitt et al., 2002; Kohli et al., 2012; Otim and Grover, 2012). In this study, we used Tobin's  $q$  not only because of its ability to measure firm performance, but also it gives a better reflection of IT's contribution to firm performance.

There are several methods to measure Tobin's  $q$ . Tobin (1978) measured Tobin's  $q$  as a ratio of the market value of a firm to the replacement cost of its asset. Market value is defined as the sum of all outstanding shares of stock and debt. Replacement cost is defined as the cost to replace the firm's assets. Chung and Pruitt (1994) used a combination of financial and accounting information to calculate Tobin's  $q$ . It was computed as a ratio of market value [(fiscal year end market value of firm) + (liquidating value of the firm's outstanding preferred stock) + (current liabilities) – (current assets) + (book value of inventories) + (long term debt)] to book value of total assets. In this study, we adopted Chung and Pruitt's method to calculate Tobin's  $q$  as it uses data readily available from public sources. Based on the econometric model of Bharadwaj et al. (1999), we argue that IT governance mechanisms are components of a firm's Tobin  $q$ . As discussed earlier, empirical studies have shown that IT governance mechanisms can have a positive impact on firm performances.

### Control Variables

We used firm-specific and industry variables as controls to evaluate the impact of IT governance adoption on firm performance. These selected control variables are consistent with prior literature that used Tobin's  $q$  as the firm performance variable (e.g., Bharadwaj et al., 1999; Kohli et al., 2012; Otim and Grover, 2012). We

considered firm size as the firm-specific control variable that represents the number of employees. According to Kohli et al. (2012), firm size can influence the market value of a firm. The natural logarithm of the number of employees in a firm served as the proxy for firm size. We also controlled for industry type as the industry-level control variable. Industrial characteristics can influence the performance of firms within the industry (Bharadwaj et al., 1999). A list of industry dummy variables was used as control variables in the regressions.

### Regression Model

An ordinary least square (OLS) regression analysis was used to examine how IT governance adoption influences firm performance. It assumes that the errors are normally distributed and homoscedastic (Cohen et al., 2003). We used the following regression model to evaluate the effect of the various IT governance mechanisms on Tobin's  $q$ , while controlling for firm and industry specific variables.

$$Tobin's\ q = \beta_0 + \beta_1ITGS + \beta_2ITGP + \beta_3ITGR + \beta_4Size + \beta_5Industry + e$$

where ITGS is the IT governance structural mechanism; ITGP is the IT governance process mechanism; ITGR is the IT governance relational mechanism; Size is the firm size (log (number of employees)) and Industry is the dummy variable for type of industry.

### Results

Table 3 provides the distribution of the announcements by year, industry and type of IT governance mechanism. Industries that undertook IT governance adoption during the period of 2004-2014 comprised of utility; pharmaceutical; agriculture; manufacturing; telecommunication; entertainment and software; financial and transportation. Among the industries, entertainment and software (23%) had the highest IT governance adoption rate while agricultural (3%) had the lowest rate. The



next higher concentration was in financial (19%) then followed by manufacturing (17%), telecommunication (14%) and utility (13%).

The results in table 4 reflect that IT governance process mechanism (87%) was the most highly preferred governance mechanism as compared to both IT governance structural (26%) and relational mechanisms (26%).

Table 5 shows the types of IT governance mechanisms that were adopted by the 70 Asian firms. The most commonly deployed IT governance mechanism was the IT governance process mechanism, followed by relational and structural mechanisms. Most firms used the controls requirements of Sarbanes-Oxley Act Section 404 (19%) to report on the effectiveness of internal IT controls. In addition, firms announced that the allocation of decision making rights (16%) was crucial for an effective implementation of IT governance. It is also evident from the results that IT leadership (13%) as an IT governance relational mechanism was vital for contributing to effective IT governance. In contrast, IT governance structural mechanism was less frequently reported in the firms' announcements as compared to the other two mechanisms. The results indicate that half of the firms deployed using structural, process and relational IT governance mechanisms (48%) collectively for business-IT alignment. While the other firms utilized a combination of IT governance structural and process mechanisms (27%), and process and relational mechanisms (21%) as their IT governance framework.

On the other hand, the adoption of structural and relational mechanisms (4%) was the least preferred mix of IT governance mechanisms.

Table 6 presents the means, standard deviations, and correlations for all the dependent and independent variables in the study. The mean for Tobin's q is 2.21. The mean for IT governance structural mechanism is 0.23, IT governance process mechanism is 0.92 and IT governance structural mechanism is 0.35. The results show that Tobin's q is significantly positively correlated to IT governance structural mechanism, while it is significantly negatively correlated to IT governance process and relational mechanisms. It is observed that there is a significant correlation between the IT governance mechanisms.

Table 7 presents the results of our regression analysis. The results indicate that 14 percent of the variation in Tobin's q is explained by the IT governance mechanisms. The coefficients for the control variables are not significantly different from zero. We also checked for multi-collinearity using variance inflation factors (VIF) which did not exceed the cut-off criteria of 10. Therefore, it did not pose a problem in the regression analysis. The industries have a positive coefficient with the Tobin's q. It is because different industries have different intensities of IT use. This result supports the empirical study of Bardhan et al. (2013) which tested the relationship between IT and Tobin's q over a range of industry types. Their results showed that an industry type has significant positive effect on Tobin's q.

**Table 3 - Distribution of Announcements by Industry types**

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total	Percent
Utility	0	0	1	1	2	2	3	0	0	0	0	9	13%
Pharmaceutical	0	0	0	0	1	0	2	0	0	0	0	3	4%
Agricultural	0	0	1	0	0	0	1	0	0	0	0	2	3%
Manufacturing	1	1	0	0	2	1	5	0	2	0	0	12	17%
Telecommunication	0	1	1	2	1	1	1	2	0	0	1	10	14%
Entertainment and software	5	0	4	1	2	2	0	0	0	2	0	16	23%
Financial	0	0	1	2	1	3	2	0	0	2	2	13	19%
Transportation	1	0	0	0	1	1	0	0	0	2	0	5	7%

**Table 4 - Distribution of Announcements by Governance Mechanism**

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total	Percent
ITGS	0	0	6	3	3	4	0	0	0	2	0	18	26%
ITGP	7	2	3	4	10	9	14	2	2	5	3	61	87%
ITGR	1	0	1	4	2	4	0	1	1	2	2	18	26%

**Table 5 - IT Governance Mechanisms Adopted by Firms**

Type of IT governance mechanism	Percent
Structural Mechanism: Decision-making power	16%
Structural Mechanism : IT infrastructure	9%
Structural Mechanism: IT steering committee	3%
Process Mechanisms: IT management systems	4%
Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404	19%
Process Mechanisms: IT control procedures	8%
Process Mechanisms: ITIL best practices for standardizing processes	6%
Process Mechanisms: Management and planning process	7%
Process Mechanisms: Management and planning systems	7%
Process Mechanisms: Operations and risk management processes	3%
Relational Mechanism: Communication tool	3%
Relational Mechanism: IT leadership	13%
Relational Mechanism: IT training skills	2%
Combination of IT governance mechanisms	Percent
Structural and Process and Relational Mechanisms	48%
Structural and Process Mechanisms	27%
Structural and Relational Mechanisms	4%
Process and Relational Mechanisms	21%

**Table 6 - Summary Statistics and Correlation Matrix**

	Mean	Standard deviation	Correlations between variables					
			1	2	3	4	5	6
1. Tobin's q	2.21	5.15	1.000	0.164*	-0.349***	-0.125*	0.084	0.010
2. ITGS	0.23	0.42	0.164*	1.000	-0.185**	0.208**	0.114	-0.120
3. ITGP	0.92	0.27	-0.349***	-0.185**	1.000	-0.198**	-0.135*	-0.126*
4. ITGR	0.35	0.48	-0.125*	0.208**	-0.198**	1.000	0.093	0.246**
5. Firm Size	3.81	1.01	0.084	0.114	-0.135*	0.093	1.000	0.172*
6. Industry	4.99	1.99	0.010	-0.120	-0.126*	0.246**	0.172*	1.000

Note: \*\*\* Significant at  $p \leq 0.01$ ; \*\* significant at  $p \leq 0.05$ , \* significant at  $p \leq 0.1$

**Table 7 - Results of Regression**

	Standard Coefficient	t-stats	VIF
ITGS	0.183	1.645*	1.063
ITGP	-0.377	-3.387***	1.061
ITGR	-0.246	-2.125*	1.147
Firm Size	0.032	0.285	1.057
Industry	0.020	0.174	1.103
R square	0.195		
Adjusted R square	0.137		
F-statistics	3.344		
p-value	0.009***		

Note: \*\*\* Significant at  $p \leq 0.01$ ; \*\* significant at  $p \leq 0.05$ , \* significant at  $p \leq 0.1$

## Discussion

Our first research objective seeks to explore how organizations typically utilize a mixture of IT governance mechanisms. We found that most firms adopt all three types of IT governance mechanisms. This finding is aligned with the literature that an organization typically deploys a mixture of structures, processes and relational mechanisms to ensure that its IT initiatives sustain and extend the organization's strategy and goals (De Haes and Van Grembergen, 2009; Dong, 2012; Lunardi et al., 2014; Luftman et al., 2015; Wu et al., 2015). In particular, IT governance was coordinated using a combination of allocation of IT decision-making rights and responsibilities (ITGS), control requirements of SOX (ITGP), IT infrastructure (ITGP), and IT leadership (ITGR).

Researchers have found that there is a relationship between an IT decision-making structure and IT governance effectiveness. According to Weill (2004, p.2), strong governance involves "systematically determining who makes each type of decision, who has input to a decision, and how these people (or groups) are held accountable for their role". The empirical study of Ko and Fink (2010) showed that CIOs preferred a centralized governance structure which had a stronger control over IT related activities and services. Top management team typically define IT initiatives while CIO make strategic decision making for achieving organization's strategies and objectives. Similarly, Ferguson et al. (2013) provided empirical support for centralizing IT decision-making control in improving IT governance. Centralization of IT decision making can increase ease of communication between the top management team and IT people. A high level of communication between the relevant representatives from both levels would enhance enterprise-wide operational efficiencies and synergies that are crucial for supporting business-IT alignment (Huang et al., 2010).

Prior research has studied the influence of SOX on the implementation of IT investments in compliance with established IT strategies and policies. Under Section 404 of SOX, it is mandatory for management of public companies and their auditors to disclose any IT material weaknesses in internal control. Companies have to specify the domains where technologies play a crucial role and how they can have an impact on financial reporting process. Furthermore, companies must report on the effectiveness of their internal IT controls and procedures that are associated with business processes for financial reporting. Boritz and Lim (2008) showed that the disclosure of material IT control weakness is significantly correlated to the strength of IT governance. The emphasis of SOX is to define organizational practices and structures that enable effective alignment of IT initiatives with business strategies and goals. Their finding reflected that organizations have better IT governance when they have fewer IT control weakness. While the case study finding of Chang et al. (2014) emphasized that a well-crafted internal IT control framework can enhance IT governance effectiveness. The framework included a list of comprehensive of IT internal control objectives for specific organizational processes that serves as a basis for strong IT governance.

A vast of research has studied IT governance relational mechanisms (e.g., De Haes and Van Grembergen, 2009; Lazic et al., 2011; Bradley et al., 2012; Lunardi et al., 2014; Luftman et al., 2015). Some of these studies emphasized on IT leadership. According to De Haes and Van Grembergen (2009), IT leadership is an "ability of CIO or similar role to articulate a vision for the role of IT in the company and ensure that this vision is clearly understood by managers throughout the organization". Their empirical evidence asserted that organizations should have IT leadership as a minimum baseline of practices. The role of CIO in IT leadership is crucial in articulating IT vision and

communicating IT related policies to relevant stakeholders within the organization. In fact, Nfuka and Rusu (2011) empirically affirmed that IT leadership as one of the critical success factors for effective IT governance.

The extant studies have been conducted in various contexts such as Belgium in De Haes and Van Grembergen (2009) or Taiwan in Wu et al. (2015). Our paper found that most firms in Asia adopted all three types of IT governance mechanisms. This finding supports our theoretical argument that firms that have adopted a mixture of IT governance mechanisms could improve financial metrics and organizational performance (Lunardi et al., 2014).

Our second research objective is to understand which IT governance mechanism can lead to better firm performance. In contrast to prior studies that examined the overall effectiveness of IT governance on financial performance, our study highlights the impact of respective IT governance mechanism. Perhaps unsurprisingly, ITGS mechanisms have a positive impact on Tobin's q. From the collected announcements, organizations typically deployed three types of mechanisms to define the scope of IT governance structure. They are decision-making power, IT infrastructure and IT steering committee. According to De Haes and Van Grembergen (2009), IT governance structure involves the determination of determine an appropriate IT decision-making structure that delegates defined responsibilities to respective IT steering committees to better co-ordinate and manage IT initiatives. Furthermore, a strong IT infrastructure is vital in facilitating IT-related activities across the organization. More importantly, these three ITGS mechanisms form the basis for IT governance effectiveness that bring about better alignment between IT and business goals, and which in turn enhance firm performance.

An interesting finding from our study is that ITGP and ITGR mechanisms have a negative effect on a firm's profitability. From the collected announcements, organizations typically deployed SOX, IT control procedures and ITIL best practices as ITGP mechanisms. The scope of IT governance structure mechanism is to have IT procedures and best practice frameworks in place to manage the implementation of IT initiatives in order to support business-IT alignment. IT control procedures encompass relevant and appropriate techniques and policies to enhance processes effectiveness and efficiency. ITIL is a framework that provides techniques in how to improve process management practices by controlling IT through processes (Iden and Eikebrokk, 2014). Prior research shows that both IT control procedures and ITIL best practices have positive impact on firm performance (Lazic et al., 2011; Lunardi et al., 2014; Weill and Ross, 2005). In contrast, SOX has a negative correlation with firm performance fewyears after SOX implementation. Though SOX can enhance IT governance effectiveness, there are costs associated with the provisions of SOX. Such costs encompass accounting, auditing, and compliance. As SOX is widely deployed by organizations as one of the ITGP mechanisms, it strongly influenced the overall firm performance.

A plausible reason is that the perceived costs of SOX outweigh the perceived benefits derived from the ITGP mechanism. Thus, our result show that ITGP mechanisms have a negative association with Tobin's q. SOX imposes direct and indirect costs and is most costly for small firms (Ahmed et al., 2010). With respect to indirect costs, SOX relates to the opportunity cost of managers and staffs whose time and concentration were diverted to compliance with new internal controls. Managers and staffs whose attention have diverted from the firm's business activities, may be unsuccessful to define profitable opportunities. Furthermore, they do not

have adequate time to properly complete their business plan. This is consistent with the belief that indirect costs associated with managerial diversion.

The study showed a negative correlation between IT leadership and firm performance. CIOs' abilities to ensure that IT initiatives are well aligned with the organizational strategies can have a positive effect on firm's profitability (De Haes and Van Grembergen, 2009). The empirical study of Sobol and Klein (2009) found that CIOs with technical background are associated with enhanced firm performance. Investors are expecting that CIOs have competencies to lead the organization to achieve IT/business alignment. In the context of our study, it is probable that the announcements of new appointments of CIOs did not come from an IT background. It is possible since Asian companies are usually family-owned. This means that they prefer the appointment of an internal CIO who does not have a strong IT background. As a result, our finding indicates that ITGR mechanisms have a negative association with Tobin's  $q$ .

## Conclusion

The effect of IT governance on firm performance has attracted significant interest from scholars over the years. However, to our best knowledge, little studies have examined the influence of each IT governance mechanism on firm value of firms. This study used an event study methodology and a sample of 70 announcements of IT governance adoption investments to investigate the impact of IT governance mechanisms on the firm's profitability.

This study offers two contributions to the existing literature in the IT governance area. First, our event study provides an empirical understanding about the types of IT governance mechanisms that deployed by organizations from the period of 2004-2014. We further contribute to the IT governance literature by identifying contextual IT

governance mechanisms that have an influence on IT governance effectiveness. Second, we extend the IT governance literature on the importance of IT governance mechanisms on firm performance. Our empirical evidence sheds new light on IT governance mechanisms that are crucial for IT governance effectiveness, however they may have a negative effect on firm value of firms. This contributes new evidence to IT governance effectiveness may not always lead to improved firm performance.

Our work is subject to some limitations due to the nature of the event-study methodology. First, it is important to take note that the lag effect observed for our study is only one year. Other empirical research has suggested that the lag effect may show up after few years. Future researchers could build on our work and examine the lag effects over a longer period. Second, we have conducted the study among Asian firms. This limits the generalization of our results. Future researchers may replicate our findings to examine the relationship between IT governance mechanisms and firm performance in other economies. Third, our collected public announcements may not sufficiently cover all types of IT governance mechanisms as we only used Factiva as our primary data source. Fourth, future research can perform a sensitivity analysis to test the effects of industries or firm size on the Tobin's  $q$ .

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**Appendix A: List of Companies and Announcements**

No.	Date	Source	Company Name	Industry	Firm size	Type of IT Governance Mechanism
1	31 May 2013	Mena Report	Agricultural Bank of China Limited	Financial	478,980	Process Mechanisms: Management and planning systems
2	26 January 2010	Business Wire	Bank of Communications	Financial	90,149	Process Mechanisms : ITIL best practices for standardizing processes; IT management systems
3	4 January 2010	Business Wire	Bank of East Asia	Financial	12,238	Process Mechanisms: Management and planning systems; IT control procedures
4	18 July 2008	China Business Newswire	BMC Software	Software/Entertainment	6,100	Process Mechanisms: ITIL best practices for standardizing processes
5	30 July 2013	China Weekly News	Cathay Pacific Cargo	Transportation	32,900	Process Mechanisms: Management and planning processes
6	5 August 2009	PR Newswire	China Bio Energy Holding Group Co Ltd	Utility	402	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
7	21 December 2010	China Business Newswire	China Botanic Pharmaceutical	Pharmaceutical	568	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
8	12 April 2010	PR Newswire	China Gerui Advanced Materials Group Limited	Manufacturing	331	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
9	5 April 2004	China Business Newswire	China Great Wall Computer Shenzhen Co Ltd.	Software/Entertainment	2,935	Process Mechanisms: IT control procedures

10	11 December 2010	Investment Weekly News	China Green Agriculture Inc.	Agricultural	634	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
11	15 December 2010	China Business Newswire	China Intelligence Information Systems	Manufacturing	90	Process Mechanisms: IT infrastructure
12	8 June 2007	SinoCast China Business Daily News	China Life Insurance Company Limited	Financial	104,535	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
13	11 September 2006	SinoCast China Business Daily News	China Mobile	Telecommunication	127,959	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
14	15 December 2006	China Business Newswire	China National Chemical Corporation	Agricultural	51,704	Process Mechanisms: Management and planning processes
15	7 September 2010	PR Newswire	China Natural Gas	Utility	537	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
16	5 September 2007	China Business Newswire	China Netcom Ltd	Telecommunication	142,110	Structural Mechanism: Decision-making power; Defined responsibilities Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404 Relational Mechanism: IT leadership
17	22 September 2010	PR Newswire	China North East Petroleum Holdings Ltd	Utility	715	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404; Operations and risk management

						processes
18	15 October 2009	PR Newswire	China Ritar Power Corp	Utility	1,700	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
19	5 September 2007	China Business Newswire	China Unicom	Telecommunication	205,000	Structural Mechanism: Decision-making power; Defined responsibilities. Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404. Relational Mechanism: IT leadership
20	5 October 2010	PR Newswire	China XD Plastics Company Limited	Manufacturing	634	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
21	16 October 2008	PR Newswire	China-Biotics Inc	Utility	513	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
22	8 November 2007	PR Newswire	CNinsure Inc	Financial	197	Relational Mechanism: IT leadership
23	18 September 2006	The Electronic Times (Korea)	Compuware Company	Software/Entertainment	6,344	Structural Mechanism: Decision-making power. Process Mechanisms: Management and planning Systems
24	18 July 2008	China Business Newswire	Digital China Holdings Ltd	Software/Entertainment	156,781	Process Mechanisms: ITIL best practices
25	30 June 2014	Business Wire	EastWest Bank	Financial	4,714	Process Mechanisms: Management and planning Systems; IT infrastructure. Relational Mechanism: IT leadership

26	4 April 2004	Dow Jones International News	Fujitsu	Manufacturing	170,111	Process Mechanisms: Management and planning Systems;
27	2 April 2009	SinoCast China Business Daily News	Giant	Software/Entertainment	1,844	Process Mechanisms: ITIL best practices for standardizing processes
28	21 March 2008	The Edge Financial Daily	Great Eastern	Financial	2,286	Structural Mechanism: Defined responsibilities. Process Mechanisms: Management and planning systems; Relational Mechanism: Communication tool
29	12 November 2013	China Weekly News	Haitong International	Financial	7,464	Structural Mechanism: IT management systems
30	23 April 2009	The Electronic Times (Korea)	Hana Financial Group	Financial	1,100	Structural Mechanism: Defined responsibilities. Process Mechanisms: Management and planning process. Relational Mechanism: IT leadership
31	5 April 2004	China Business Newswire	Hisense Company Limited	Software/Entertainment	5,426	Process Mechanisms: IT control procedures
32	28 October 2009	Business Wire	Hong Kong Aircraft Engineering Company	Transportation	13,078	Process Mechanisms: IT infrastructure
33	12 April 2007	China Business Newswire	Huaneng Power International	Utility	28,130	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
34	1 August 2011	Financial Times	Huawei	Telecommunication	1,386	Process Mechanisms: IT control procedures. Relational Mechanism: IT leadership
35	10 June 2014	Mena Report	ICBC	Financial	462,282	Process Mechanisms: IT infrastructure capability. Relational Mechanism: Communication tool
36	19 July 2005	Nikkei Report	Kawasaki Kisen Kaisha Ltd	Manufacturing	7,041	Process Mechanisms: ITIL best practices for

						standardizing processes
37	23 April 2009	The Electronic Times (Korea)	KB Financial Group	Financial	155	Structural Mechanism: Defined responsibilities. Process Mechanisms: Management and planning process. Relational Mechanism: IT leadership
38	14 August 2012	Nikkei Report	Komatsu	Manufacturing	47,208	Process Mechanisms: IT infrastructure
39	5 April 2004	China Business Newswire	Konka Group	Software/Entertainment	20,124	Process Mechanisms: IT control procedures
40	18 September 2006	The Electronic Times (Korea)	Korea Life Insurance	Software/Entertainment	5,481	Structural Mechanism: Decision-making power. Process Mechanisms: Management and planning Systems
41	19 February 2009	PR Newswire	KT	Telecommunication	30,987	Structural Mechanism: IT steering committee. Process Mechanisms: IT infrastructure. Relational Mechanism: Communication tool
42	31 March 2006	The Electronic Times (Korea)	KYOBO Life Insurance	Financial	943	Structural Mechanism: IT steering committee. Process Mechanisms: IT infrastructure. Relational Mechanism: IT training
43	5 April 2004	China Business Newswire	Legend Group Limited	Software/Entertainment	119	Process Mechanisms: IT control procedures
44	28 June 2007	SinoCast China Business Daily News	Lenovo	Software/Entertainment	25,100	Structural Mechanism: CIO. Relational Mechanism: IT leadership
45	3 December 2010	The Electronic Times (Korea)	LG Electronics	Manufacturing	35,286	Process Mechanisms: Management and planning Systems
46	1 March 2010	PR Newswire	Lotus Pharmaceuticals	Pharmaceutical	1,070	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act

						Section 404
47	6 May 2014	Business Wire	M1 Limited	Telecommunication	1,540	Process Mechanisms: IT control procedures
48	21 December 2012	PR Newswire	Mitsubishi Heavy Industries	Manufacturing	80,583	Process Mechanisms: Management and planning Systems. Relational Mechanism: Working in collaboration with business units
49	3 August 2013	Mena Report	Oki Data Corporation	Software/Entertainment	20,653	Process Mechanisms: IT infrastructure. Relational Mechanism: Co-location
50	20 November 2008	Business Wire	Orient Overseas Container Line	Transportation	7,748	Process Mechanisms: : IT infrastructure
51	26 January 2009	Business Wire	Pansoft Company Limited	Software/Entertainment	614	Process Mechanisms: IT control procedures
52	8 January 2008	Business Wire	PetroChina	Utility	539,168	Process Mechanisms: : IT infrastructure capability; IT management systems
53	18 September 2006	The Electronic Times (Korea)	Samsung Electronics	Software/Entertainment	84,721	Structural Mechanism: Decision-making power. Process Mechanisms: Management and planning Systems
54	12 October 2006	China Business Newswire	Shanda Interactive Entertainment Limited	Software/Entertainment	2,564	Structural Mechanism: IT steering committee. Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
55	30 July 2013	China Business Newswire	Shanghai International Port	Transportation	19,044	Process Mechanisms: : IT infrastructure; IT management systems
56	23 April 2009	The Electronic Times (Korea)	Shinhan Financial Group	Financial	145	Structural Mechanism: Defined responsibilities. Process Mechanisms: Management and planning process. Relational

						Mechanism: IT leadership
57	26 October 2004	Business Wire	Singapore Airline	Transportation	28,343	Process Mechanisms: IT infrastructure capability. Relational Mechanism: IT training skills
58	18 May 2010	China Business Newswire	Sino Clean Energy Inc	Utility	176	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
59	6 December 2006	SinoCast China Business Daily News	Sinochem Corporation	Utility	3,080	Structural Mechanism: Decision-making power; Defined responsibilities. Process Mechanisms: ITIL best practices for standardizing processes; Management and planning process. Relational Mechanism: IT leadership
60	29 February 2008	The Electronic Times (Korea)	SK Telecom	Telecommunication	4,441	Structural Mechanism: Decision-making power; Process Mechanisms: : IT infrastructure; IT management systems
61	19 July 2005	Nikkei Report	Softbank Corporation BB	Telecommunication	17,804	Process Mechanisms: ITIL best practices for standardizing processes
62	14 January 2013	China Business Newswire	Sohu Incorporation	Software/Entertainment	13,657	Structural Mechanism: CIO. Process Mechanisms: Strategic planning process. Relational Mechanism: IT leadership
63	1 September 2011	Telecompaper Asia	Starhubs	Telecommunication	3,724	Process Mechanisms: : IT infrastructure; Management and planning process
64	5 April 2004	China Business Newswire	TCL Corporation	Software/Entertainment	65,506	Process Mechanisms: IT control procedures



65	28 April 2010	PR Newswire	Telestone Technologies Corporation	Telecommunication	97	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
66	14 June 2010	PR Newswire	Tri-Tech Holding Corporation	Manufacturing	1,063	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
67	20 November 2008	PR Newswire	Yanglin Soybean	Manufacturing	472	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404.
68	17 November 2009	PR Newswire	Yayi International Corporation	Manufacturing	973	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404
69	9 Jan 2008	China Business Newswire	WuxiPharm	Pharmaceutical	4,202	Structural Mechanism: Defined responsibilities. Process Mechanisms: Management and planning process. Relational Mechanism: IT leadership
70	9 May 2008	PR Newswire	Zhongpin Incorporation	Manufacturing	6,256	Process Mechanisms: Financial reporting and controls requirements of Sarbanes-Oxley Act Section 404

## About the Authors

**Josephine Chong** obtained her PH.D from the Auckland University of Technology. Her research interests cover collaborative networks, resources and capabilities, IT governance, e-Health and research methods. Her work has been published in *Journal of Business Research*, *Australian Journal of Information Systems*, *Americas' Conference on Information Systems*, *Australasian Conference on Information Systems*, *Pacific-Asian Conference on*

*Information Systems and European Academy of Management*.

**Dr Linh N. K. Duong** has worked in Supply Chain Management field since 2007. He also has joined many projects on Distribution Management Systems, Inventory Management, and Production Management. His research and teaching experiences are in the area of operations and supply chain management, decision makings, and inventory management. Dr Linh can be contacted at [linh.n.k.duong@gmail.com](mailto:linh.n.k.duong@gmail.com).