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The Interplay of IT Governance Mechanisms, Value and Performance: The Case of Cloud Computing Investment

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Abstract

Background: *Digital acceleration coupled with unprecedented work disruption (e.g., a Pandemic) have amplified the need for mature IT governance practices to generate planned value from organizations' digital investments. Although the pairwise relationship between mature governance practices, value derived from IT investments, and organizational performance have been examined previously, all three have rarely been simultaneously investigated. Therefore, this paper examines the role of value in the relationship between IT governance mechanisms and organizational performance.*

Method: *A research model that comprehensively conceptualizes the governance mechanism construct is developed and validated. The model is examined using data collected from 250 United States organizations that have invested in cloud computing for over a year.*

Results: *The results reveal that the value generated from an IT investment is germane to understanding the relationship between governance mechanisms and organizational performance. Specifically, the result explains that governance mechanisms help improve organizational performance through cost reduction in IT services, create agility through flexibility in technology service, strengthen IT security and privacy, and effectively redirect IT resources. The results show the more critical role of the relational mechanism and practices related to IT security and privacy in the cloud computing context.*

Conclusion: *The study contributes to IS literature by providing a more unified conceptualization of governance mechanisms and theoretically establishing the importance of governance in effectively governing cloud computing. By providing a guideline to help organizations achieve more value from cloud computing, the study provides implications for practice. The findings empirically show the relational mechanism has the most critical role in creating value from cloud computing. The governance practices help bridge the gap between business and IT, gradual transformative change in the roles and responsibilities, control cloud expenses, security and privacy risks. The findings show that competency is more likely to be achieved from cloud computing investment.*

Keywords: IT Governance, Structural Mechanism, Procedural Mechanism, Relational Mechanism, Cloud Computing.

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Introduction

Governance is pivotal to achieving benefits from the investment in information technology (IT) (De Haes & Van Grembergen, 2005; Weill & Ross, 2004). Amid the Pandemic, within a matter of weeks, organizations accelerated their investment in IT (Hamit, 2021; Lu et al., 2021; Wang & Lovelock, 2020). Such digital acceleration, coupled with the unprecedented work disruption, amplified the need for mature governance practices that allow organizations to adapt rapidly, continue business operations, and maintain the availability of IT resources to compete effectively in the market (De Haes et al., 2020; ISACA, 2018).

Essentially, mature IT governance provides a mechanism for effectively aligning IT with business in strategic, operational, and social dimensions (Benbya et al., 2019), which ensures organizational performance. To achieve maturity, organizations have to institutionalize effective structural, procedural, and relational mechanisms in the form of best practices (hereafter referred to as IT governance mechanisms) (De Haes & Van Grembergen, 2009a; Weill & Ross, 2004). Mature governance practices help align IT with the organization's business strategy to ensure IT is working as effectively as possible to maximize cost savings and benefits while minimizing the risks of each IT investment.

However, the cost, benefits, and risks differ for different kinds of IT investments, such as cloud computing, ERPs, and blockchain (ISACA, 2018; Xue et al., 2008). Therefore, the nature and magnitude of the value derived from a certain kind of investment (hereafter referred to as IT value) also varies. We argue that how IT governance mechanisms (ITGM) contribute to positive business outcomes by enhancing performance (hereafter referred to as organizational performance) can be understood through the intermediate outcome of value derived from a specific kind of IT investment.

The mediating role of value derived from a certain kind of IT investment in the relationship between ITGM and organizational outcomes, such as performance, has not been empirically established. Although the relationships between the three constructs mentioned above (ITGM, IT value, and organizational performance) have been discussed and tested pairwise in previous studies, all three have not been examined and validated simultaneously, which limits our understanding of the role ITGM plays in influencing organization performance through the creation of value from IT investments. To better understand these relationships, this study examines the following research question: *What is the role of IT value in the relationship between IT governance mechanisms and organizational performance?*

To investigate this research question, we posit that ITGM enhance organization performance by facilitating the creation of value from IT investments. Specifically, by identifying the value of IT as an intermediate variable, we are able to explain that ITGM indirectly contribute to organizational performance through reducing the cost of IT services, creating agility through flexibility in technology service, strengthening IT security and privacy in technology service, and/or effectively redirecting IT resources. Such value created by IT improves the organization's financial position, operational efficiencies, and/or customer expectations, which collectively make the organization more competitive.

The nature and magnitude of IT value can serve as a mediating mechanism through which IT governance affects organizational performance. The impact of IT governance on performance is facilitated by the inherent nature and scale of IT value, but this relationship is also contingent upon the technical characteristics of IT investments. Therefore, we specifically examine this relationship within the context of cloud computing as a representative type of IT investment.

A survey was designed and validated, and the model was tested using primary data from 364 firms (114 in the pilot study and 250 in the full launch) in the United States and three key findings, consistent with our theorizing, were obtained. Specifically, the results suggest that mature ITGM, i.e., structural, procedural, and relational mechanisms, are important antecedents of the value derived through investment in cloud computing. In addition, the value achieved from cloud computing investment enhances organizational performance. Lastly, the findings empirically confirm the mediating role of *IT Value* in enhancing *Organizational Performance* through mature *ITGM*.

This study contributes to research in multiple ways. Constructs are the building blocks of theory. By providing a more complete and unified conceptualization of the ITGM construct, this work advances IT governance knowledgebase. In addition, it provides an alternative nomology by validating the intermediate role of IT value in understanding the relationship between ITGM and organizational performance. Furthermore, by situating this work within the context of cloud computing, it theoretically establishes the importance of governance in effectively governing cloud computing investment.

Building on the existing knowledge, this study reveals how organizations can successfully exploit cloud computing investment. This new look into cloud computing governance contributes to the Pacific Asia Journal of the Association for Information Systems (PAJAIS) by expanding the knowledge in "IS/IT Strategy, Leadership, and Governance" topic which is one of five top topics published in PAJAIS (Jiang et al., 2019).

The remainder of this paper is organized as follows: first, the research model, theoretical underpinning for the research model, and hypotheses are developed, followed by the research method and the data analysis results. The study concludes with a discussion regarding the contribution to research and practice as well as limitations and suggestions for further research.

Research Background

IT governance is a dynamic framework that determines who should make IT decisions in organizations as well as how those decisions should be made (Weill & Ross, 2004). IT governance is different from management. Governance considers what specific decisions should be made and how they should be implemented (Weill & Ross, 2004). While the goal of IT management is to effectively supply IT services and products and execute IT operations, IT governance focuses on performing and transforming IT to meet the present and future demands of the business (De Haes & Van Grembergen, 2004). Implementing good governance requires institutionalizing *mature* mechanisms based on three major elements: effective structures, effective processes, and effective relations (De Haes & Van Grembergen, 2009a; Weill & Ross, 2004). These three elements, collectively referred to as ITGM and comprising structural, procedural, and relational mechanisms, enhance an organization's ability to make better IT decisions by facilitating connection, coordination, and collaboration in the decision-making process (De Haes & Van Grembergen, 2009a; Peterson, 2004). In addition, IT governance drives decision-making about IT investment in key IT functions that support the business (Gregory et al., 2018), including principle, security and privacy, architecture, infrastructure, skills, procurement, business needs, and financial investment.

Implementing appropriate mechanisms to coordinate decision-making within and among all functional areas will create holistic and integrated structure, process, and relation practices (De Haes & Van Grembergen, 2009a, 2009b; Weill & Ross, 2004), allowing organizations to govern effectively by adjusting and reacting to unique elements of a specific class of IT investment (Xue et al., 2008). Such a comprehensive approach will provision a framework for deriving the most value from an IT investment by maximizing cost savings and benefits (i.e., by leveraging the properties unique to a certain IT investment) while simultaneously minimizing the risks associated with that investment (Sambamurthy & Zmud, 1999; Xue et al., 2008). Optimizing the value derived from an IT investment through good governance will, in turn, strengthen organizational performance (Wu et al., 2015). Our analysis of the current literature illustrates that such a comprehensive and integrated approach is missing. Specifically, this study is motivated by three factors that will advance the current knowledge of the role IT value plays in the relationship between effective governance of IT investments and organizational performance.

First, although the research on decision rights is extensive (Saunders et al., 2020), relatively fewer studies have examined ITGM (e.g., De Haes & Van Grembergen, 2009a; Héroux & Fortin, 2018; Hiekkanen, 2015). For instance, limited research has examined the dyadic link between ITGM and organizational performance (e.g., Abdollahbeigi & Salehi, 2020; Benaroch & Chernobai, 2017; Bradley et al., 2012; Chong & Duong, 2017; Lazic et al., 2011; Prasad & Green, 2015; Prasad et al., 2012; Prasad et al., 2010; Raymond et al., 2019; Vejseli et al., 2020; Vejseli et al., 2022; Wu et al., 2015; Zhang et al., 2016) and even fewer (e.g., Huang et al., 2009; Ilmudeen, 2022; Kearns & Sabherwal, 2006; Kearns & Sabherwal, 2007; Weill & Ross, 2004; Zhen et al., 2021) have theoretically and empirically examined the dyadic relationship between ITGM and IT value. However, as illustrated in Table 1, the most significant gap is the absence of empirical evidence regarding the interrelationship among these three variables: *ITGM*, *Organizational Performance*, and *IT Value*. Explaining how ITGM influence organizational performance through value derived from IT investment needs to be understood. As more companies turn to IT in the year of digital acceleration (Accenture, 2023; Hamit, 2021; Johnson et al., 2023; Kappelman, Johnson, et al., 2020; Kappelman et al., 2021; Kappelman, Torres, et al., 2020; Kappelman et al., 2022; Wang & Lovelock, 2020) the interrelationships among these three key variables must be systematically and fully examined (Joshi et al., 2022). In doing so, we will be able to understand how the pattern of structural, procedural, and relationship mechanisms designed to direct and oversee key decisions within key IT functions create value from IT investments to realize the desired organizational outcomes of financial returns, operational excellence, and/or customer expectations.

Table 1 – Literature Review Summary

Study	ITGM			Functions	Examined Relationships		
	Structural	Process	Relational		Association Between ITGM & ITV	Association Between ITGM & OP	Association Among ITGM, ITV & OP
Current study	C	C	C	C	C	C	C
De Haes & Van Grembergen (2009a)	C	C	C	C		I	
Hiekkanen (2015)	C	C	C	C		I	
Héroux & Fortin (2018)	C	C	C	C		I	
Joshi et al. (2022)		C			C	C	C
Ilmudeen (2022)	P	P	P		P	C	
Wu et al. (2015)	P	P	P	P		C	
Prasad et al. (2010)	P					C	
Lazic et al. (2011)	P	P	P			C	
Bradley et al. (2012)	P		P			C	
Prasad et al. (2012)	P	P	P			C	
Prasad & Green (2015)		P	P			C	
Zhang et al. (2016)	P					C	
Benaroch & Chernobai (2017)	P					C	
Vejseli et al. (2020)	P	P	P			C	
Ali & Green (2007)	P	P	P			I	
Ali & Green (2012)	P	P	P			I	
Chong & Duong (2017)	P	P	P			I	
Ferguson et al. (2013)	P	P				I	
Raymond et al. (2019)	P	P	P			I	
Syailendra (2019)	P	P	P			I	
Abdollahbeigi & Salehi (2020)	P					I	
Mikalef et al. (2021)	P					I	
Trang et al. (2015)	P					I	
Vejseli et al. (2022)	P	P	P			I	
Weill & Ross (2004)	P	P	P	P	C		
Kearns & Sabherwal (2006)	P				C		
Kearns & Sabherwal (2007)	P				C		
Tiwana (2009)			P	P	C		
Huang et al. (2010)	P		P		C		
Tiwana & Konsynski (2010)	P				C		
Zhen et al. (2021)	P	P	P		C		
Chang et al. (2022)	P	P	P		C		
Bowen et al. (2007)	P	P	P				
Janssen & Joha (2011)	P	P					
Chong & Tan (2012)	P	P	P				
Herz et al. (2012)	P	P	P				
Hsu (2012)	P	P	P				
Prasad et al. (2013)	P						
Khalil et al. (2016)	P	P	P				
ITGM: IT Governance Mechanisms; ITV: IT Value; OP: Organizational Performance; C: Construct conceptualization is comprehensive; P: Construct conceptualization is partial. I: Organization Performance is implied.							

Second, as summarized in Table 1, among the few studies of ITGM, the conceptualization of this construct is partial (e.g., Abdollahbeigi & Salehi, 2020; Ali & Green, 2007, 2012; Benaroch & Chernobai, 2017; Bowen et al., 2007; Bradley et al., 2012; Chang et al., 2022; Chong & Duong, 2017; Chong & Tan, 2012; Herz et al., 2012; Hsu, 2012; Huang et al., 2009; Ilmudeen, 2022; Janssen & Joha, 2011; Kearns & Sabherwal, 2006; Kearns & Sabherwal, 2007; Khalil et al., 2016; Lazic et al., 2011; Mikalef et al., 2021; Prasad & Green, 2015; Prasad et al., 2010;Prasad et al., 2012; Prasad et al., 2013; Raymond et al., 2019; Syailendra, 2019; Trang et al., 2015; Vejseli et al., 2020; Vejseli et al., 2022; Weill & Ross, 2004; Wu et al., 2015; Zhang et al., 2016; Zhen et al., 2021) because most of the studies have selected specific instances of practices/mechanisms [e.g., strategy and steering committee (Ali & Green, 2012), chief information officer (CIO) structural power (Bradley et al., 2012)]. Failing to incorporate a comprehensive set of practices that includes all three mechanisms (i.e., structural, procedural, and relational) results in an incomplete conceptualization of this construct, which can unwittingly result in mixed or misleading findings (Wilkin & Chenhall, 2020).

Third, among the studies that have examined ITGM, very few (e.g., De Haes & Van Grembergen, 2009a; Héroux & Fortin, 2018; Hiekkanen, 2015) have included mechanisms to represent all key IT functions (principle, security and privacy, architecture, infrastructure, skills, procurement, business needs, and financial investment), where governance drives decision making. This lack of comprehensive coverage can lead to an inaccurate representation of the ITGM construct.

The present study aims to address the aforementioned three missing elements by developing a research model that explains the role of IT value of a certain kind of IT investment in the relationship between ITGM and organizational performance. The kind of IT investment used to test the posited model is cloud computing. The comprehensive conceptualization of ITGM that is developed fully captures practices for effective structures, processes, and relations. To ensure that all IT functions are represented, a minimum of one item related to each IT function is included in the ITGM measurement model. A survey was designed and validated, and the model was tested using primary data from 364 firms (114 in the pilot study and 250 in the full launch) in the United States and three key findings, consistent with our theorizing, were obtained. Specifically, the results suggest that mature ITGM, i.e., structural, procedural, and relational mechanisms, are important antecedents of the value derived through investment in cloud computing. In addition, the value achieved from cloud computing investment enhances organizational performance. Lastly, the findings empirically confirm the mediating role of IT Value in enhancing Organizational Performance through mature ITGM.

Theoretical Development

The thesis of this study is that a more mature ITGM increase the level of value derived from certain IT investment, which in turn increases organizational performance (De Haes & Van Grembergen, 2009a; Weill & Ross, 2004; Wu et al., 2015). ITGM are conceptualized as complementary IT resources that deliver value to organizations (Wu et al., 2015) by facilitating decision-making about IT investment in all IT functions, i.e., principle, security and privacy, architecture, infrastructure, skills, procurement, business needs, and financial investment. Specifically, expanding on Wu et al. (2015), the resource-based view (RBV) is used as a theoretical lens through which to explain the proposed relationships in our research model, which is in a nomological network. According to the RBV, organizations' resources are the main predictors of organizational performance (Bharadwaj, 2000). IT resources are the routines or practices that enable IT investment to deliver value to organizations (Aral & Weill, 2007; Melville et al., 2004). Following Wu et al. (2015), ITGM are conceptualized as practices employed by the board, executives, and IT management to control and govern IT investment that enable executives to create IT and business alignment (Weill & Ross, 2004). Specifically, ITGM offer a unified conceptualization of mature practices that assist organizations in making better decisions, which in turn enhance the efficiency and effectiveness of the business processes (e.g., Prasad et al., 2012). Previous studies have shown how ITGM assist in market responsiveness and agility (Tiwana & Konsynski, 2010), risk management (Bradley et al., 2012), cost efficiency, and strategic competency (Lee et al., 2004).

We contribute to this body of research by advancing current knowledge by positing that IT Value is a key linchpin that explains how ITGM assists in enhancing Organizational Performance. The mediating role of the value of the IT investment in the relationship between ITGM and the performance of an organization has been implied, but not fully explored empirically, in prior IT governance studies that suggest that the initial effect of ITGM occurs at the level of the business processes (Prasad et al., 2010 ;Prasad et al., 2012). Therefore, to fully measure and explain the process underlying the relationship between governance and organizational performance, the current study develops a research model to reveal how *ITGM*, *IT Value*, and *Organizational Performanc*e interact with each other (see Figure 1). Next, we define and conceptualize these three constructs.

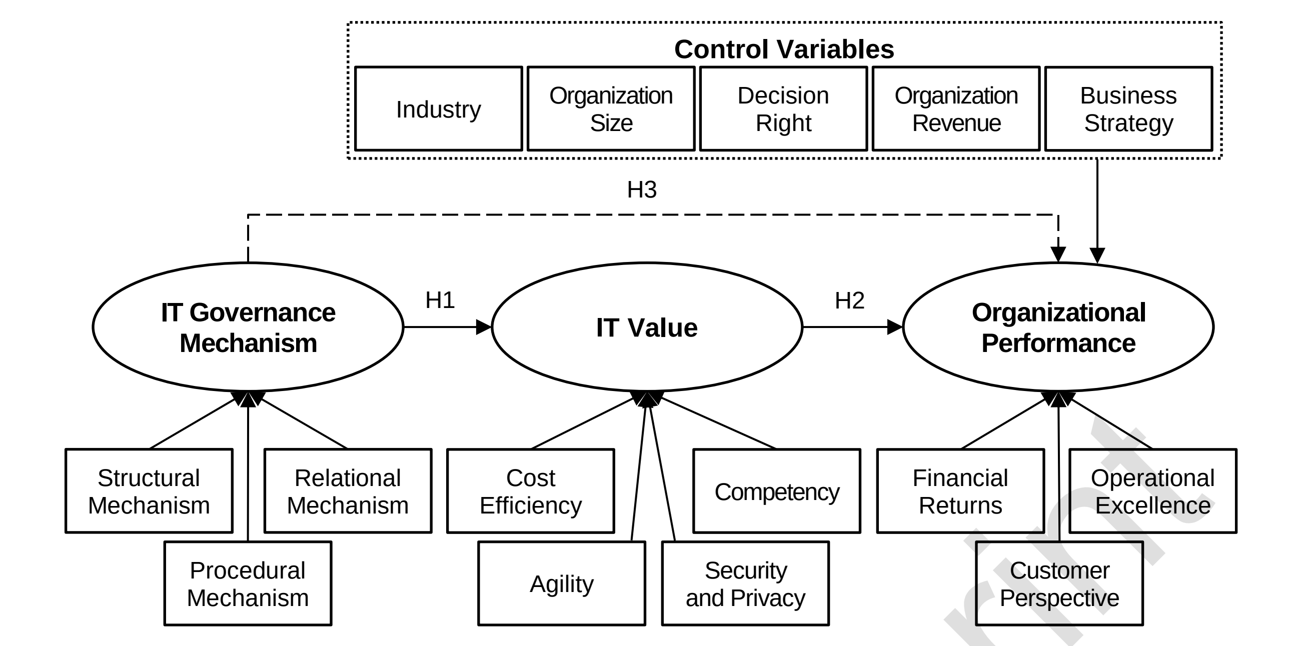

Figure 1 – Research Model

Constructs Conceptualization

IT Governance Mechanisms

ITGM, which are composed of structural, procedural, and relational mechanisms, increase the ability of the organization to make effective IT decisions by facilitating connection, coordination, and collaboration within the organization. Structural, procedural, and relational mechanisms collectively enable an organization-wide shared responsibility, understanding, and knowledge among all business and IT units. Such unified mechanisms help in clarifying the roles in making, monitoring, and disseminating IT decisions.

ITGM should be conceptualized as a set of *practices* that span decision-making about IT investment in all IT functions, i.e., principle, security and privacy, architecture, infrastructure, skills, procurement, business needs, and financial investment. A more complete conceptualization of ITGM, one that accurately captures an organization's ability to effectively make, monitor, and disseminate decisions, depends collectively on the representation of practices in *all* of the IT functions (Cram et al., 2016; De Haes & Van Grembergen, 2009a; Weill & Ross, 2004). Next, we describe how this study achieves a more complete conceptualization of each of the three mechanisms (see Table 2).

Table 2 – IT Governance Mechanisms and the Subcomponents

Construct	Definition
Structural Mechanism	• Configuration and composition of IT governance committees • Strategic role of the CIO • IT integration and standardization
Procedural Mechanism	• Formalized processes for key IT functions • Monitoring and controlling progress and performance • Service level agreements (SLAs)
Relational Mechanism	• Communication • Knowledge sharing

Structural Mechanism

The structural mechanism is a set of practices that connect IT and business to achieve better alignment in decision-making processes. It creates organization-wide integrated structures which clarify the responsibility of each individual, group, and unit within the organization and effectively inform people responsible for making IT-related decisions of the business concerns and needs and the IT risks and benefits. We conceptualize the structural mechanism practices recommended in the literature (see De Haes and Van Grembergen (2009a)) broadly into three categories: Configuration and composition of IT governance committees, Strategic role of the CIO, and IT integration and standardization.

Configuration and composition of IT governance committees: This category conceptualizes the types of committees and the membership on key committees needed to effectively govern IT investments. Such committees consider diverse perspectives in evaluating whether the IT-related decision is appropriate and effective. The practice of establishing formal committees to steer IT strategy, architecture, projects, and security jointly by business and IT functions ensures that all IT functions are represented and their needs are met collaboratively. Previous studies examined the role of some but not all of the committees (De Haes & Van Grembergen, 2009a). In addition, the composition of these committees should include high-level IT and business representatives, such as the board of directors, IT and business executives, domain knowledge experts, and the CIO, not only to provide credibility and legitimacy but also to help integrate various perspectives (De Haes & Van Grembergen, 2009a; Weill & Ross, 2004). Diversity in the composition of committees creates a structure in which experts on the committees can assess the concerns of both IT and business and the business opportunities and risks of a certain type of IT investment.

A strategy committee at the board of directors' level ensures that the IT decisions link IT strategy to business strategy (Ali & Green, 2012). When a report related to IT is a regular item on the agenda of such a committee, the board can be kept informed of IT investment issues. Such a practice can help in quickly adjusting decisions to resolve such issues proactively. Such a practice is crucial when different interpretations and expectations about IT investment exist among business and IT executives (Khalil et al., 2017). For example, the board of directors may not be fully aware of the risks related to a certain IT investment. Thus, regularly reporting on IT issues can keep the board informed regarding IT risks. An IT executive steering committee at the executive/senior management level helps in building a common understanding regarding IT-related business investments (Ferguson et al., 2013). A shared understanding about IT investments is developed when business executives determine business needs and IT executives determine the cost, risks, and benefits of the IT investment.

An IT project steering committee prioritizes and manages projects by including both IT and business perspectives, skills, and experiences to ensure their successful completion. Prioritizing and/or managing IT projects without involving the business units can result in end-user dissatisfaction (Khalil et al., 2017), which, over time, can not only result in IT losing the trust of the business units but can also foster high-risk behaviors where business units make IT investment decisions without involving the IT unit. This issue is more likely to arise for less expensive IT investments or those that require less-technical skills to implement and thus do not require budget or IT approval. An IT project steering committee with members from both IT and business units can harmonize the needs of the business and the concerns of the IT unit.

The other steering committees, such as IT architecture and IT security and privacy, are also crucial. For instance, one challenge in the IT services that are outsourced, such as cloud computing, is that IT/business roles and responsibilities may change, and the changes are not transparent because a third party is responsible for providing IT services (Khalil et al., 2016). By establishing IT policies and standards, the IT architecture steering committee can help overcome the transparency issue. The IT security and privacy committee is essential in establishing policies to standardize the assessment of the risks and opportunities of IT investments.

Strategic role of the CIO: An explicit and defined strategic role of the CIO is critical in creating value from IT investments. The presence of the CIO as a full member in the strategy and the executive steering committees, coupled with the CIO's having a direct reporting line to the chief executive officer (CEO), assists in balancing IT and business perspectives. Such a balance generates IT services that are aligned with business requirements (De Haes & Van Grembergen, 2009a). The CIO's full membership assures that he/she can directly take part in strategy planning, and the direct reporting line empowers the CIO in informing, guiding, and influencing the CEO regarding IT investment risks and benefits.

IT integration and standardization: Functional integration between business and IT requires that each group have a clear understanding of its roles and responsibilities in IT governance. Undefined and unstandardized roles are hard to integrate because role ambiguity can generate conflict between the two groups in making joint IT decisions. Defined roles distribute and delegate responsibilities and accountability to promote integration and drive collaboration.

Procedural Mechanism

The procedural mechanism is a set of practices that define processes and expectations to cooperatively control, monitor, and adjust IT decisions in key IT functions, i.e., principle, security and privacy, architecture, infrastructure, skills, procurement, business needs, and financial investment. These practices provide standardized procedures for evaluating and adjusting organization-wide IT-related decisions in an integrated fashion to assure that decisions are aligned with the overall business strategy (De Haes & Van Grembergen, 2009a). We conceptualize the procedural mechanism practices recommended in the literature (see De Haes and Van Grembergen (2009a)) broadly into three categories: Formalized processes for key IT functions, Formalized processes for monitoring and controlling progress and performance, and Formalizing processes for service level agreements (SLA).

Formalized processes for key IT functions: Practices in this category include formalizing standards, rules, and procedures to define and update IT strategies, prioritize IT investments and projects, charge IT costs back to business, govern and manage IT projects, and control and report on budgets for IT investments and projects (De Haes & Van Grembergen, 2009a). Such standardized procedures not only allow business and IT leaders to take coordinated action on any changes needed to keep control over their IT investments but also provide flexibility in accounting for changing demands (Tafti et al., 2013; Tiwana & Konsynski, 2010). Adopting well-defined and established best practices such as COBIT (Control Objectives for Information and Related Technologies), COSO/ERM, ISO 27002 for internal controls and risk management, and/or PMBOK (Project Management Body of Knowledge) for managing IT projects, practices which are widely accepted as industry standards, allows organizations to assess the maturity of their processes using maturity modeling techniques (De Haes & Van Grembergen, 2009a; De Haes et al., 2013).

Formalized processes for monitoring and controlling progress and performance: This category focuses on establishing key performance indicators that allow regular assessment of IT decisions to ensure they are consistent with business needs. Doing so requires that the practices of monitoring, reporting, and controlling regularly measure progress and performance (e.g., using IT balance scorecards) to ensure that IT investments are meeting the planned objectives and addressing current business needs. Such established processes also allow for corrective action if the objectives are not met. Using IT balance scorecards to safeguard against sub-optimization of some decisions at the expense of others is critical (Kaplan & Norton, 1998; Van Grembergen & De Haes, 2009). For instance, low-cost IT services that fall under the funding approval thresholds and need minimum IT competence to implement (for example, a cloud-based application compared to an on-premise application) could go unmonitored. However, without monitoring the IT budget, these situations can result in shadow IT, security risks, and incompatible IT systems, which carry heavy hidden costs.

Formalized processes for SLAs: SLAs are a crucial procedural governance mechanism that facilitates the performance management of outsourced IT services. Such agreements can be between the organization and an external service provider or be a service agreement between two units within an organization. They ensure that outsourced IT services (such as cloud computing services) comply with the performance standard (e.g., quality and timeliness) stipulated in the agreement (Hsu, 2012). SLAs help define each party's roles and responsibilities and the scope of the work, provide transparency regarding service assessment, and establish mutual accountability.

Relational Mechanism

The relational mechanism is a set of practices that create a collaborative environment for a shared organization-wide understanding of IT and business objectives. These practices help business and IT people communicate, share, and integrate their knowledge, experience, and perspectives. They allow active participation by both IT and business units in resolving divergent perspectives and finding integrative and broader solutions to arrive at decisions that are congruent with business objectives. We conceptualize the relational mechanism practices recommended in the literature (see (De Haes & Van Grembergen, 2009a; Van Grembergen et al., 2004)) broadly into two categories: Communication and Knowledge sharing.

Communication: Communication entails the dissemination of IT principles and policies, along with IT governance outcomes. Examples of such practices include the use of communication systems such as electronic bulletin boards, the intranet, blogs, internal corporate communication, placing business and IT people physically close to each other, and arranging an awareness campaign. Along with such formal communication systems, informal communication can also be helpful in addressing IT and business issues on a regular basis. For example, one of the informal roles of the CIO can be to ensure that managers throughout the organization clearly understand the IT vision. In addition, senior business and IT managers can meet informally (e.g., during informal lunches), with no agenda, to discuss the general activities and directions of the organization and IT's role in it.

Knowledge sharing: The development of a shared understanding requires active participation and interaction between IT and business, where knowledge is shared through learning and coaching. Shared learning activities such as cross-functional business/IT training, job rotation, and continual education can be institutionalized to promote knowledge sharing. Educating employees about IT-related risks and governance processes is important and should start from the bottom to the top with an ongoing learning process across the organization (Hsu, 2012).

IT Value

IT Value is conceptualized using three strategic foci (Kathuria et al., 2018; Lacity & Willcocks, 2000; Lee et al., 2004): financial restructuring, core competence, and technology catalyst. Financial restructuring focuses on cost efficiency and refers to organizations' efforts at improving the business' financial position. Core competence refers to organizations' efforts at redirecting the business and IT into key competencies. Technology catalyst refers to organizations' efforts at strengthening resources and flexibility in technology service to determine strategic business directions. The technology catalyst focus is captured using agility and security/privacy. Agility refers to organizations' efforts to strengthen their flexibility in technology services to determine strategic business directions. Security and privacy refer to organizations' efforts to strengthen IT security and privacy to determine strategic business directions.

Organizational Performance

Organizational performance is defined as a multidimensional construct that consists of financial returns, operational excellence, and customer perspectives (Rai et al., 2006; Wu et al., 2015). Financial returns is defined as revenue and profits, which are captured using ROI, return on equity (ROE), return on assets (ROA), new revenue streams, and sales of existing products. Operational excellence is defined as responsiveness and the generation of productivity improvements which are captured using production cycle time, customer service timeline, and productivity improvements. The customer perspective captures the quality of products and services, customer satisfaction, and the organization's image from the buyer's viewpoint.

Hypothesis Development

IT Governance Mechanisms Enable IT Value

IT governance is about making IT decisions that positively impact value creation (Weill & Ross, 2004). Specifically, the *maturity* of ITGM practices determines the nature and the magnitude of the value derived from IT investments (De Haes & Van Grembergen, 2009a). The maturity of ITGM is achieved by systematically and exhaustively institutionalizing an effective structure, process, and relation in the form of best practices (De Haes & Van Grembergen, 2009a; Weill & Ross, 2004). More mature ITGM practices provide consistent structures, repeatable processes, and coherent communications that are needed for flexible and competent IT operations at the lowest possible cost within compliance requirements. Mature ITGM provide a stable frame for prioritizing scarce resources, and tradeoffs can be used optimally to achieve an organization's most valued goals.

Mature structural mechanism safeguards against structural silos. IT and business units are unlikely to collaborate effectively if they are working in silos. When organizations are locked in silos, cross-cutting high-risk decisions are unlikely to be fully aligned with the organization's strategic goals. For instance, silos encourage opportunistic behaviors, where managers are free to make IT decisions to meet their unit's goals at the expense of the overall strategic goals of the organization. Mature structural mechanism practices are designed to integrate all perspectives to break down structural silos and control opportunistic behaviors that lead to better collective IT-related decisions. The high level of maturity established through integrated and standardized organization-level structures and roles lowers agency conflicts and hence lowers agency costs.

Designing structures that break down silos is necessary but not sufficient for fully realizing the value from IT investments. Bad decisions can be made within good structures if the process for making decisions is ill-defined. Procedural adhocracy that lacks consistent, open, and clear agreements regarding IT decision-making protocols and policies leads to poor decisions even when structural silos are eliminated. Mature procedural mechanism establishes uniform and standardized practices for making decisions quickly, controlling cost, and mitigating risks. These practices institutionalize metrics to constantly evaluate and adjust organization-wide IT-related decisions in an integrated fashion to assure the decisions are creating planned value for the organization (De Haes & Van Grembergen, 2009a). For instance, organizations can be agile in provisioning technology services if they have the flexibility to make decisions with speed. However, a stable decision-making frame is necessary for making good decisions quickly because fast decision-making cannot be achieved without standardized and repeatable processes. When the IT or business employees at lower levels, close to the customer, are individually empowered to make decisions, they need stable and coherent processes that ensure that the decisions are aligned with the overall strategic objectives of the organization. Mature procedural mechanism, through its uniform and standardized practices, offer just that kind of stability in the decision-making processes.

Relational distrust between IT and business units can result in IT decisions that compromise the true value derived from IT investments despite structural and procedural alignment that forces IT and business to work together. Effective collaborations on cross-cutting risky IT investment decisions between IT and business are unlikely if they don't communicate and interact with each other in an authentic fashion to form trusting relationships. For instance, a lack of trust can amplify shadow IT at the business unit levels. Business units can simply disregard the IT unit's input if they do not trust the IT unit's analysis of the security and privacy risks and simply interpret its input as IT's inability to understand their business needs. On the other hand, in order to protect a organization's assets, IT can build inflexible and hidden control mechanisms into the architecture to prevent shadow IT. Such actions will limit collaboration and amplify distrust. Mature relational mechanism allows IT and business to engage authentically. Such engagement can help foster a deep and rich understanding, resulting in the mutual respect necessary to derive the most value from IT investments.

In sum, ITGM enhance the effectiveness of IT decisions (De Haes & Van Grembergen, 2009a; Weill & Ross, 2004). Establishing ITGM helps organizations enhance the value derived from IT investment not only by avoiding investments in inappropriate resources and IT services but also by making IT investments that align with the organization's business needs and strategy. ITGM, in turn, reduce the risk of the IT investment and enable the creation of more value from IT investments. The level of the value enabled by ITGM depends on the maturity of the ITGM, which is the degree to which ITGM practices are systematically and exhaustively addressed and implemented (Peterson, 2004). Altogether, it is posited that:

H1: IT governance mechanisms maturity is positively associated with the IT value derived from the IT investment.

IT Value Enhances Organizational Performance

The association between IT value and organizational performance is well-established in the literature (Kohli & Grover, 2008). However, to preserve and test the relationships in this nomological network, the association between IT value and organizational performance is included in the research model. Successfully improving the financial position, strengthening the flexibility and security in technology service, and redirecting the business and IT into core competencies through certain types of IT investment improves organizational performance through financial returns, operational excellence, and/or customer perspective (Prasad et al., 2010 ;Prasad et al., 2012). Thus, it is posited that:

H2: IT value is positively associated with organizational performance.

IT Value as a Mediator

The intermediate value derived from IT is the mediating factor considered to be necessary in the chain of IT value creation (Kohli & Grover, 2008). We premise that to extract value from IT, organizations need to develop mature ITGM that allow organizations to make and monitor decisions in an integrated manner at all levels so as to enhance organizational performance. ITGM enhance organizational performance by facilitating IT value creation in the form of agility, reduced cost, enhanced security and privacy, and robust competency and by reducing the risks of IT investment.

ITGM are exercised by the board, executives, and IT management to control and monitor IT investments using best practices to align IT and business (Weill & Ross, 2004). Such alignment ensures that IT's role is to make organizations more competitive from financial, customer, and operational perspectives. Organizational performance goals of financial returns, operational efficiencies and/or customer experiences are attained by governing IT investments systematically and exhaustively through effective structures, processes, and relations. Specifically, by identifying IT Value as an intermediate variable, we explain that ITGM help improve the financial position through cost reduction in IT services, create agility through flexibility in technology service, strengthen IT security and privacy, and effectively redirect IT resources, which collectively enhance organizational performance. Thus, it is posited that:

H3: IT value mediates the positive impact of IT governance mechanisms on organizational performance.

Control Variables

The external environment, such as the industry type (Brown, 1997; Chong & Duong, 2017) and internal contexts, such as IT governance decision rights along with organization size (Chong & Duong, 2017; Sambamurthy & Zmud, 1999; Sarkar et al., 2017), business strategy (Wiengarten et al., 2013), corporate governance structure (Leewis et al., 2021; Sambamurthy & Zmud, 1999), and business competency (Xue et al., 2008) may impact organizational performance (Sambamurthy & Zmud, 1999). While decision rights association with IT value and organizational performance has been well studied (Saunders et al., 2020), understanding how ITGM impacts IT and organizational value creation is limited. Therefore, in the posited model, decision rights are controlled for in order to focus on the impact of ITGM on value creation. For instance, the centralized mode is more effective for small organizations following a cost-efficiency-focused business strategy and is characterized by a centralized corporate governance structure, high environmental stability, and low business competency and skills in managing IT (Peterson et al., 2000). Furthermore, the decentralized mode is more effective for large organizations following an innovation-focused business strategy and is characterized by a decentralized corporate governance structure, low environmental stability, and high business competency and skills in managing IT (Peterson et al., 2000). Lastly, in complex, uncertain, and competitive financial industries that force organizations to focus on both cost efficiency and product/service innovation, the federal decision right is more effective (Peterson et al., 2000). Therefore, this study controls for industry, decision rights, organization size, business strategy, and organization revenue.

Research Method

The posited research model is tested within the context of cloud computing investment. Therefore, from here onwards, the IT value refers to the value derived from cloud computing. Cloud computing investment provides an interesting and appropriate context because in spite of the growth in investing in cloud computing (Johnson et al., 2023; Kappelman, Johnson, et al., 2020; Kappelman et al., 2022; Wang & Lovelock, 2020), a systematic understanding of the role of IT governance in deriving value from cloud computing investment is limited (Choudhary & Vithayathil, 2013; Hodosi et al., 2023; Hsu, 2012; Iyer & Henderson, 2010, 2012; Janssen & Joha, 2011; Loukis & Kyriakou, 2018; Marston et al., 2011; Sarkar & Young, 2011; Vithayathil, 2018; Winkler et al., 2011; Winkler & Brown, 2013). Organizations are struggling to exploit their cloud computing investment to derive maximum benefit, and practitioners believe that the organization should leverage ITGM to increase value (Accenture, 2023; Cearley, 2015; Scott, 2016; Smith, 2016).

The survey designed to gather data is described next. Survey Instrument is included under Appendix A. By applying the domain sampling approach (Gerow et al., 2015), the scales for the variables were adopted from the existing literature. The constructs and subconstructs to measure these variables are summarized in Table 3. A pre-pilot (29 samples) study was used to evaluate and refine the appropriateness of the language and content of the measurement items.

Table 3 – Operationalization of Constructs

Construct		Definition	Literature Foundation
IT Governance Mechanisms (ITGM)	***Structural Mechanism (SM)***	The degree to which the organization has established organizational units and roles to be responsible for making IT decisions	(De Haes & Van Grembergen , 2009a; Héroux & Fortin, 2018; Hiekkanen, 2015; Wu et al., 2015)
	Procedural Mechanism (PM)	The degree to which the organization has established formal processes to monitor and ensure that IT governance is consistent with organizational strategy	
	Relational Mechanism (RM)	The degree to which the organization has established channels to ensure proper communication and to disseminate IT governance	
IT Value from Cloud Computing (ITV)	***Cost Efficiency***	The degree of achievement at improving the financial position through cloud computing investment	(Hoberg et al., 2012; Lee et al., 2004; Tiwana & Konsynski, 2010)
	Agility	The degree of achievement at strengthening flexibility in technology services to determine the business strategic direction through cloud computing investment	
	Security and Privacy	The degree of achievement at strengthening IT security and privacy in technology services to determine business strategic direction through cloud computing investment	
	Competency	The degree of achievement at redirecting the business and IT into core competencies through cloud computing investment	
Organizational Performance (OP)	***Competency***	The degree to which the organization's performance is better than its competitors in terms of conventional financial measures	(Rai et al., 2006; Wu et al., 2015)
	Financial Returns	The degree to which the organization's performance is better than its competitors from the perspective of customers	
	Customer Perspective	The degree to which the organization's performance is better than its competitors in its responsiveness and the generation of productivity improvements	

To measure all three ITGM, the construct was separated into three sub-measures: (1) *Structural Mechanism (SM)*, (2) *Procedural Mechanism (PM)*, and (3) *Relational Mechanism (RM)*. All practices developed by previous studies (e.g., De Haes & Van Grembergen, 2009a) that are aligned with our theoretical conceptualization were adopted. A minimum of one best practice related to each IT function was included in the instrument. A 13-item *Structural Mechanism* scale represents best practices in three subcategories, i.e., configuration and composition of IT governance committees, strategic role of the CIO, and IT integration and standardization, used to conceptualize this subconstruct. A 12-item *Procedural Mechanism* scale represents best practices in three subcategories, i.e., formalized processes for key IT functions, for monitoring and controlling progress and performance, and for service level agreement, used to conceptualize this subconstruct. An 11-item *Relational Mechanism* scale represents best practices in two subcategories, communication and knowledge sharing, used to conceptualize this subconstruct (see Table 2 for ITGM subcategories).

The degree to which these practices are institutionalized in an organization, i.e., their level of maturity, demonstrates how capable an organization is of deriving value from its IT investments. Therefore, ITGM is measured using a maturity scale. A maturity scale captures an evolutionary path of increasingly organized and systematically more mature processes. Most maturity models have six levels, with the lowest level of 0 representing the least organized or mature organizations and the highest level of 5 describing the most organized and mature organizations. In practice, the maturity scale is widely accepted as a reliable measurement of good governance. Research scholars have advocated the use of a maturity scale to measure ITGM (e.g., De Haes & Van Grembergen, 2009a).

To mitigate the common method bias caused by the commonalities in the scale endpoints, different endpoints suggested in previous studies are used to capture the remaining constructs. A seven-point response anchor, i.e., 1-strongly disagree to 7-strongly agree, is used to measure a 4-item *Cost Efficiency*, 6-item *Agility*, 4-item *Security and Privacy*, and a 3-item *Competency* scale to capture IT Value (ITV) construct. A five-point response anchor, 1-much less than average to 5-much better than average, is used to measure a 6-item *Financial Returns*, 5-item *Customer Perspective*, and 3-time *Operational Excellence* scales to capture Organizational Performance (OP).

> "*Even if a researcher is using measures previously validated and used in other research studies, the relationship between the measures and construct should still be closely examined to determine if the construct is reflective, formative, or mixed*" (Petter et al., 2007, pp. 632-633).
>
> *Decision rules to identify a construct as formative or reflective includes four major criteria: (1) direction of causality from construct to measure implied by the conceptual definition, (2) interchangeability of indicators/items, (3) covariation among indicators, and (4) nomological net of the construct indicators* (Petter et al., 2007, p. 635).

Constructs should be modeled as formative if (1) the direction of the causality is from items to constructs, indicators are defining characteristics of the construct, changes in the indicators cause changes in the constructs, and changes in the constructs do not cause changes in the indicators; (2) the indicators do not need to be interchangeable, indicators do not need to have the same or similar content or share a common theme, and dropping an indicator may alter the conceptual domain of the construct, (3) it is not necessary for indicators to covary with each other, and a change in one of the indicators is not necessarily associated with changes in the other indicators, and (4) the indicators are not required to have the same antecedents and consequences although the nomological net of the indicators may differ (Petter et al., 2007). Constructs should be modeled as reflective if the opposite conditions apply (Petter et al., 2007).

These reflective/formative decision rules (Petter et al., 2007) suggest that all the constructs and their subconstructs should be modeled as formative. For example, while the increase in the maturity level of structural, procedural, and relational mechanisms enhances the maturity level of ITGM, these three aspects of governance are certainly not interchangeable and do not necessarily covary. Similarly, the logic is applicable to IT value from cloud computing and organizational performance. Also, all the items to measure the constructs are formative items. Table 4 summarizes the latent constructs, their subconstructs, the type, and the number of indicators associated with each subconstruct. The constructs are all multidimensional and second-order formative/first-order formative.

Because the constructs are formative, the research model cannot be specified through covariance-based structural equation modeling (CB-SEM). The identification problem is often an issue when testing the models with formative constructs using CB-SEM (Petter, 2018; Petter et al., 2007). "*Measurement models that consist solely of formative indicators are not identified*" (Brown, 2014, p. 323). The identification problem can be addressed if (1) two reflective indicators are added to the formative construct; however, adding two reflective indicators should not be employed simply without a compelling conceptual argument, or (2) the formative construct emits paths to two or more latent constructs defined by reflective indicators (Brown, 2014). None of these two remedies are applicable to the research model of the present study. All the indicators to measure the first-order constructs and the second-order constructs in the structural model are formative. In such situations, the CB-SEM measurement and structural model are under-identified. Thus, the partial least squares structural equation modeling (PLS-SEM) was used to validate the instrument and test the research model.

The external environment, such as the industry (Brown, 1997) and internal contexts such as decision rights, along with organization size (Sambamurthy & Zmud, 1999), business strategy (Wiengarten et al., 2013), corporate governance structure (Sambamurthy & Zmud, 1999), and business competency (Xue et al., 2008) may significantly influence organizational performance (Sambamurthy & Zmud, 1999). Therefore, this study controls for these variables: decision rights, industry, organization size, business strategy, and organization revenue (as a proxy for business competency).

Table 4 – Measurement of Constructs

Latent Construct	Type	Sub-Construct	Type	Number of Items
IT Governance Mechanisms	Formative-2nd Order	Structural Mechanism	Formative-1st Order	13
		Procedural Mechanism	Formative-1st Order	12
		Relational Mechanism	Formative-1st Order	11
IT Value from Cloud Computing	Formative-2nd Order	Cost Efficiency	Formative-1st Order	4
		Agility	Formative-1st Order	6
		Security and Privacy	Formative-1st Order	4
		Competency	Formative-1st Order	3
Organizational Performance	Formative-2nd Order	Financial Returns	Formative-1st Order	6
		Customer Perspective	Formative-1st Order	5
		Operational Excellence	Formative-1st Order	3

Data Collection and Sample Characteristics

Qualtrics, a third party data-collection service provider, was employed to design and distribute the survey. To address the issues related to the latency in the process of value creation (Kohli & Grover, 2008), the unit of analysis was considered a firm that has invested in cloud computing for more than one year. The definition of cloud computing provided by the National Institute of Standards and Technology was embedded in the survey to give participants an identical definition of cloud computing investment. The research instrument targeted small/mid-sized (fewer than 250 employees), and large-sized (more than 250 employees) firms in the United States.

Both high-level IT and business executives and senior and middle managers who had been working at their current positions for more than one year were recruited to complete the survey. The respondents' positions indicated that they were likely to be well-informed about ITGM, IT value, and the organizational performance within their firms. Establishing quotas for the data collection ensured that the instrument was evenly distributed among firms of different sizes and between IT and business executives[1]. The data were gathered in two steps so that the scales could be refined and purified. First, samples were gathered for a pilot study and used to evaluate the goodness of fit of the measurement model, assess the validity of the set of indicators at the construct level, and eliminate problematic indicators. After refining the scale based on the results of the pilot,

[1] In order to understand whether the path coefficients are significantly different for two groups of respondents, i.e., IT executive and non-IT executives, a permutation test is performed. The result shows that the structural model for IT executives is not significantly different than for non-IT executives.

new samples were gathered, and the scale properties were reexamined and validated (Churchill Jr, 1979; MacKenzie et al., 2011).

In the pilot, 120 participants passed the screening questions and completed the survey. However, after evaluating the dataset, six samples were eliminated because of incomplete values, leaving 114 completed surveys. In the full launch, 250 of 2140 participants passed the screening questions and completed the survey. The sample group consists of 117 executives, 114 managers, and 19 middle managers. More than half of the respondents (51.6%) were from IT units, while the rest (48.4%) were from business units. The average work experience was 12.37 years, and the average cloud computing experience was 6.20 years. Participating firms comprised a variety of industries, including manufacturing, services, and IT. Also, more than half of the participating firms (59.6%) had fewer than 250 employees, and the rest had more than 250 employees. See Appendix B for more details about the data collection process and the control variables.

Measurement Model Validation

A summary of first and second-order constructs and descriptive statistics are provided, respectively in Table 4 and Table 5. To calculate the value of the first-order constructs, the formative first-order indicator values were multiplied by their individual weights estimated via the PLS-SEM model and then summed (Diamantopoulos & Siguaw, 2006; Hair Jr et al., 2016). Because all the constructs are formative, the high correlations among items are not necessary (Diamantopoulos & Siguaw, 2006). Thus, the conventionally used internal consistency measures and common factor analysis are useless (Diamantopoulos & Siguaw, 2006). Therefore, the measurement model was assessed through two stages suggested by (Diamantopoulos & Siguaw, 2006; Hair Jr et al., 2016): (1) assessing the formative measurement model for a collinearity issue by looking at the variance inflation factor (VIF) values of the formative indicators, and (2) assessing the significance and relevance of the formative indicators by means of bootstrapping. No indicators have VIF higher than the conservative threshold value cutoff of 3.3 (Hair Jr et al. (2016) consider 5 as the threshold value) (Diamantopoulos & Siguaw, 2006). VIF values are uniformly below 3 (the highest value is 2.9). Therefore, the collinearity does not reach critical levels in any of the formative constructs and is not an issue for the estimation of the PLS path model.

To estimate the significance of the indicator outer weights and loadings, we used a bootstrapping technique with 5000 subsamples, a No Sign Change option, Bias-corrected, an Accelerated (BCa) Bootstrap, two-tailed testing, and a significance level of 0.05. The weights of 20 indicators (8 of the 13 items related to the structural mechanism, 4 of the 12 items related to the procedural mechanism, 6 of the 11 items related to the relational mechanism, 1 of the 6 items related to the financial returns, and 1 of the 5 items related to the customer perspective) were not significant at the level of 0.05. However, all items with nonsignificant weights were retained because their corresponding loadings were substantial and significant ($\rho < 0.001$) (Hair Jr et al., 2016). See Appendix C for more details about the measurement model validation.

Although there is an assumption that formative indicators are free of errors and are thus incompatible with data that can contain common method variance (Rönkkö & Ylitalo, 2011), three methods were employed to assess the potential common method bias: (1) Harman's single-factor test (Podsakoff et al., 2003), (2) the latent method factor approach (Liang et al., 2007), and (3) marker variable (Simmering et al., 2015). In addition, in the process of the instrument development and data gathering, several techniques, such as removing the ambiguous questions and negative words, different scale anchors for measuring each construct, and anonymity and item randomization, were employed to reduce the effect of common method bias. Given the results of three methods, the common method bias is unlikely to be a serious concern. See Appendix D for more details about the common method bias assessment.

In sum, the assessment results of the formative measurement determine that the instrument is conceptually coherent and the construct validity is sufficient to proceed to the structural tests of the model.

Table 5 – Construct Descriptive Statistics

Latent Construct	Sub-construct	N	Missing	Mean	Min	Max	Standard Deviation	Excess Kurtosis	Skewness
IT Governance Mechanism	Structural Mechanism	250	0	3.372	-0.01	4.98	0.994	0.876	-1.035
	Procedural Mechanism	250	0	3.37	0.26	5	1.021	0.742	-1.021
	Relational Mechanism	250	0	3.358	0.28	5	1.050	0.667	-0.923
IT Value from Cloud Computing	Cost Efficiency	250	0	5.564	2.71	7	0.866	-0.140	-0.420
	Agility	250	0	5.6	3.25	7	0.817	-0.724	-0.260
	Security and Privacy	250	0	5.505	2.74	7	0.957	-0.122	-0.552
	Competency	250	0	5.567	2.54	7	0.927	-0.029	-0.572
Organizational Performance	Financial Returns	228	22	3.897	1.00	5	0.741	1.803	-1.211
	Customer Perspective	229	21	4.006	1.06	5	0.643	4.242	-1.527
	Operational Excellence	236	14	3.935	1.00	5	0.732	2.060	-1.173
Marker Variable	Benefit Administration	250	0	5.278	2.90	7	0.771	0.505	-0.488

Hypotheses Testing

A combination of the repeated indicators approach and the use of latent variable scores in a two-stage hierarchical component model analysis was applied to examine the structural model (see Figure 2). To evaluate the structural model, first, the collinearity issue was assessed by checking VIF. The levels of collinearity between each set of predictor variables, i.e., (1) *ITGM* and IT Value, and (2) IT Value and Organizational Performance, were 1.000 and 1.103, respectively, below the conservative critical level of 3.3 (Hair Jr et al., 2016). After assuring that there is no collinearity issue, the hypothesized relationship was tested by assessing the significance and relevance of the path coefficients and the level of the R^2 values (Hair Jr et al., 2016).

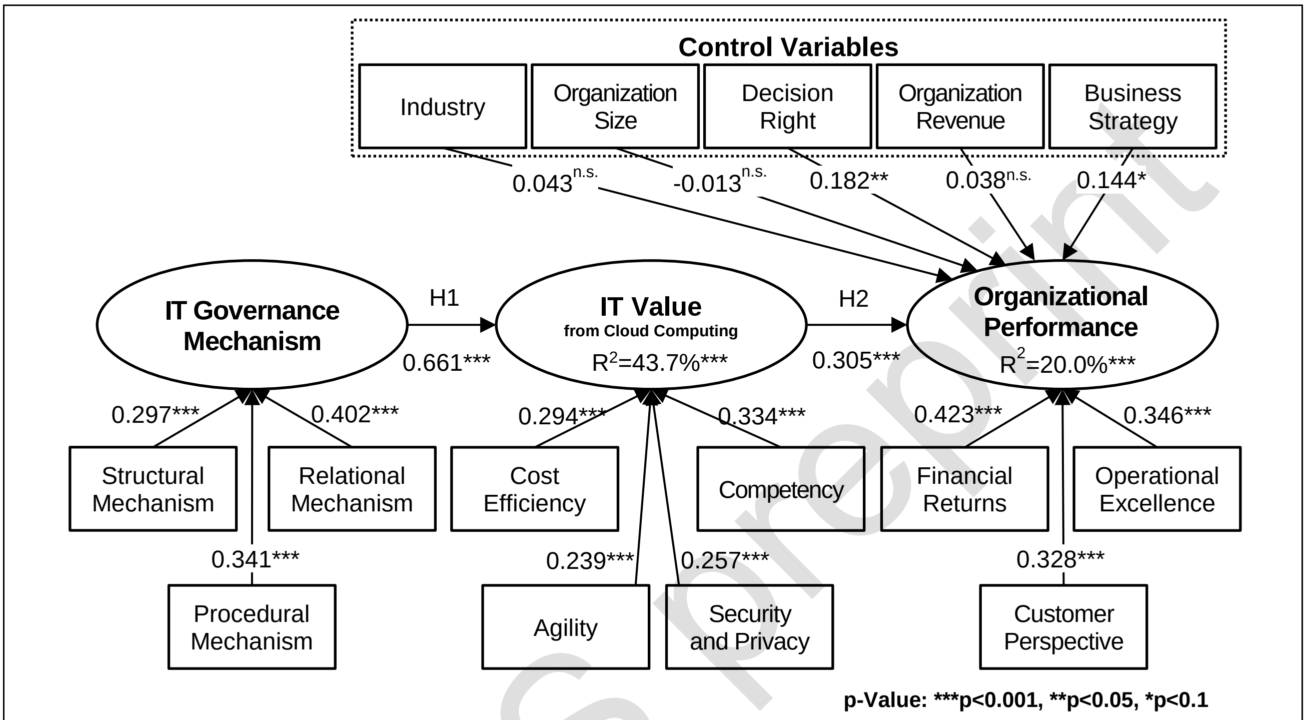

Figure 2 – Result of Path Analysis without Direct Effect

Testing the Mediating Effect of IT Value

A two-step Sobel test (Wu et al., 2015) and bootstrapping for indirect effect were performed to assess the significance of the mediating effect of IT Value and determine whether it partially or fully mediates the relationship between *ITGM* and Organizational Performance. An alternative model in which the direct effect of *ITGM* on Organizational Performance was included was used to test the mediating effect. First, the path coefficients and the standard errors of the direct paths among *ITGM* (independent variable), IT Value (mediating variable), and Organizational Performance (dependent variable) were examined (see Figure E-1). Second, the direct effect of *ITGM* on Organizational Performance after removing the mediator (i.e., IT Value) was examined (see Figure E-2).

Post Hoc Analysis

To understand how differently the four formative sub-constructs of IT Value (Cost Efficiency, Agility, Security and Privacy, and Competency) mediate the link between ITGM and Organizational Performance, a post hoc analysis was conducted. Four alternative models were created for the post hoc analysis. In each model, IT Value was operationalized as a single-order construct by being represented using only one sub-contract. The effect of each dimension of IT Value was examined in each model (see Table F.1).

Results and Discussion

The research findings provided support for the hypothesis (H1), stating that an increase in the maturity of *ITGM* would result in a corresponding increase in the value obtained from IT investment (0.661, ρ < 0.001). The research findings also provided support for the hypothesis (H2), suggesting that higher levels of IT Value are associated with increased Organizational Performance (0.305, $\rho < 0.001$). The hypothesis (H3) that IT Value mediates the positive impact of *ITGM* on Organizational Performance was also supported because the indirect effect of *ITGM* on Organizational Performance is significant (0.283, $\rho = 0.002$); however, the direct effect is not significant (0.132, $\rho = 0.206$). Plus, the direct effect of *ITGM* on Organizational Performance when the mediator (i.e., IT Value) is removed from the model changes from insignificant to positive and significant (0.289, $\rho = 0.001$). These results suggest that when *ITGM* effectively shape and guide the creation of IT value within a firm, they contribute to improved organizational performance. This implies that the impact of *ITGM* on organizational performance is indirect, mediated by the extent to which they foster and enhance IT value.

Overall, the results of this study suggest, at about 44 percent and 20 percent explained variance levels and substantive path coefficients (supporting H1 and H2), that ITGM enable IT value, which in turn influences organizational performance. The findings empirically establish an alternative nomology that explains the role of IT value in the relationship between ITGM and organizational performance. The results suggest that the ITGM is an important antecedent of the value achieved from the cloud computing investment, which in turn improves organizational performance. The results empirically indicate that to extract more IT value from cloud computing, firms need to develop more mature ITGM that allow firms to make, monitor, and disseminate decisions in an integrated manner at all levels so as to enhance organizational performance. ITGM enable IT value created from cloud computing investment by reducing the risks. The positive path coefficient associated with the four formative subconstructs of IT value indicates ITGM help achieve more IT value from cloud computing through cost reduction in IT services, more agility through flexibility in technology service, strengthening IT security and privacy, and/or effectively redirecting IT resources.

ITGM are exercised to align IT and business to ensure that IT's role is to make firms more competitive from financial, customer, and operational perspectives. The result empirically indicates that organizational performance goals of financial returns, operational efficiencies and/or customer experiences can be attained by governing IT investments through more effective structural, procedural, and relational mechanisms. Specifically, by identifying IT Value as an intermediate variable, the result explains that ITGM help improve the financial position through cost reduction in IT services, create agility through flexibility in technology service, strengthen IT security and privacy, and effectively redirect IT resources, which collectively enhance organizational performance.

The results reveal that Structural Mechanism, Procedural Mechanism, and Relational Mechanism are distinct and collectively provide a more complete and comprehensive conceptualization of ITGM construct. The path coefficients associated with the three formative subconstructs of *ITGM* are significantly different [pairwise test: SM vs. PM ($t(9998) = 71.47$, $\rho < 0.001$); SM vs. RM ($t(9998) = 179.71$, $\rho < 0.001$); PM vs. RM ($t(9998) = -101.06$, $\rho < 0.001$)]. The stronger relational mechanism path coefficient may suggest that the practices associated with this mechanism have greater importance in the cloud computing context. Therefore, despite the findings of previous studies that show that well-balanced ITGM lead to effective IT governance (Weill & Ross, 2004), the results of the current study show empirically that the importance of these three mechanisms may vary based on the characteristics of the IT investment. A comprehensive conceptualization of ITGM that captures all three mechanisms makes it possible to uncover such nuanced findings.

The results also indicate that among the IT governance functions, practices related to IT security and privacy are perceived as most critical. In particular, practices that help firms reduce the security and privacy issues related to cloud computing investment have the highest weights among the formative indicators used to measure the procedural mechanism. Such a comparative finding is only possible by using the comprehensive conceptualization of ITGM, where all IT functions are represented.

The path coefficients associated with the four formative subconstructs of IT Value, i.e., Cost Efficiency, Agility, Security and Privacy, and Competency, are 0.294, 0.239, 0.257, and 0.334, respectively. While the loading of the path coefficients for all subconstructs on IT value is significant, pair-wise differences exist. The significant pair-wise differences among these four path coefficients emphasize that while value derived from agility, security, and privacy are vital, the competency and cost efficiency factors, in this specific context, stand out as contributing more to shaping the value derived from cloud computing [pairwise test: Cost Efficiency vs. Agility ($t(9998) = 134.05$, $\rho < 0.001$); Cost Efficiency vs. Security and Privacy ($t(9998) = 92.95$, $\rho < 0.001$); Cost Efficiency vs. Competency ($t(9998) = -98.13$, $\rho < 0.001$); Agility vs. Security and Privacy ($t(9998) = -40.88$, $\rho < 0.001$); Agility vs. Competency ($t(9998) = -232.40$, $\rho < 0.001$); Security and Privacy vs. Competency ($t(9998) = -191.08$, $\rho < 0.001$)]. The result of the post hoc analysis confirms this result by indicating the higher effect of Competency and Cost Efficiency on Organizational Performance [Cost Efficiency -> OP (0.274, $\rho = 0.003$), Agility -> OP (0.202, $\rho = 0.036$), Security and Privacy -> OP (0.213, $\rho = 0.017$), Competency -> OP(0.301, $\rho = 0.000$). Therefore, while the findings of this study confirm the findings of previous studies (Hoberg et al., 2012; Lee et al., 2004; Tiwana & Konsynski, 2010) that show firms invest in IT because of increasing cost efficiency, agility, security, and privacy, and competency, the findings of this study indicate that in cloud computing context, the value derived from IT is driven more by competency and cost efficiency.

Theoretical Contributions

This study contributes to research in three ways. First, it contributes to IT governance literature by providing a more complete and unified conceptualization of the ITGM construct that safeguards against the creation of measures that are deficient (e.g., ignoring one or more mechanisms) or underrepresenting the conceptual domain (by not capturing all key IT functions). As illustrated in the Research Background, a comprehensive conceptualization of the constructs of ITGM that fully captures the practices of effective structures, processes, and relations to provide a holistic coverage for all three ITGM is missing. In addition, among the studies that use ITGM, the representation of all IT functions (principle, security and privacy, architecture, infrastructure, skills, procurement, business needs, and financial investment) is inadequate. Although some studies (e.g., Wu et al., 2015) have used practices identified by De Haes and Van Grembergen (2009a) to measure the ITGM construct, most have considered and validated only 9 of the 33 best practices they identified. In contrast, in this study, all 33 best practices are used. By capturing practices in all IT functions in each of the three ITGM to empirically validate the ITGM construct, we advance IT governance literature. Inadequate construct conceptualization undermines the credibility of a study's findings by compromising the validity of its conclusions. A more complete and well-developed conceptualization of the ITGM construct is imperative for developing a coherent theoretical IT governance knowledge base because constructs are the building blocks of theory.

Second, this study contributes to IT value literature by formulating and empirically validating an alternative nomology where IT Value, i.e., value derived from a certain kind of IT investment, is germane to understanding the relationship between ITGM and organizational performance. The relationship between decision rights and organizational performance has been examined comprehensively in prior studies, but our understanding of how ITGM contribute to organizational performance is relatively less understood. While some previous studies have shown that the ITGM has a direct effect on organizational performance, we seek to identify and explain the process that underlies this observed relationship by formulating an alternative nomology in which the value of a certain type of IT investment, i.e., IT Value, fully mediates the link between an ITGM and organizational performance. Our study empirically establishes that ITGM, including structural, procedural, and relational mechanisms, are important antecedents of the value derived from an IT investment and that IT value fully mediates the impact of ITGM on organizational performance. By identifying and empirically establishing IT value as an intermediate outcome between ITGM and organizational performance, we throw light on how ITGM contribute to organizational performance. Specifically, we are not only able to explain that ITGM help in deriving value from IT investments through cost reduction in IT services, by creating agility through flexibility in technology service, by strengthening IT security and privacy in technology service, and/or by effectively redirecting IT resources, but also connect the value generated by IT to improvements in financial position, operational efficiencies, and/or customer expectations. Such findings strengthen the arguments that IT investments are strategic resources valuable in making firms more competitive. Moreover, our findings show that the nature and magnitude of IT value and its downstream effects on subsequent business performance are contingent upon the technical characteristics of the IT investment (here, the characteristics of cloud computing).

Third, this research contributes to cloud computing research by theoretically establishing the importance of governance in effectively governing cloud computing investment. While Wu et al. (2015) have examined the role of ITGM in organizational performance, they applied a monolithic view of IT. The monolithic approach makes it difficult to generalize the findings of such studies to specific IT investments, particularly cloud computing investment, which has unique characteristics. Specifically, this study reveals the role of mature ITGM in generating value from cloud computing and challenges the misconception that IT self-service sourcing models such as cloud computing services require little or no governance. This study just begins to explore the connection between self-service sourcing and governance, but it provides a new avenue for future research to shed more light on the nature of this link. Furthermore, by decoupling IT governance functions from ITGM and examining the role of the mechanisms related to each governance function, future studies can provide more insight into the process of creating value from cloud computing investment. They can also investigate which IT functions are more critical in the cloud computing context.

Practical Implication

The results of this research provide a decision-making guideline that allows firms to fully exploit cloud computing investments' unique transformative and value-creating capacity to achieve IT value to compete in the marketplace. The guidance and examples presented by ITGI - a non-profit independent research entity that provides guidance for the global business community on issues related to the governance of IT assets - is a general guideline to address all aspects that should be contained in governing IT investment. However, by considering the characteristics of cloud computing investment, this study provides a guideline to govern cloud computing investment.

The findings empirically show that the relational mechanism has the most critical role in creating value from cloud computing investment. In particular, relational practices that help bridge the gap between business and IT have the highest weights among formative indicators used to measure relational mechanism. Table C.2 (see Appendix C) shows the minimum baseline practices developed by De Haes and Van Grembergen (2009a) and De Haes and Van Grembergen (2009b) and the nine practices (bold practices in Table C.2) with significant weight in the model tested in the current study. These findings indicate the importance of these nine practices in a cloud computing context. The findings show that the baseline practices previously suggested by scholars are insufficient in the cloud computing context and that firms that invest in cloud computing should implement the practices that are identified in the current study.

The practices identified in the present study are practices that have critical roles in creating value from cloud computing investment. The roles of these practices are critical because they address the four major issues in creating value from cloud computing. First, because the business unit may not be aware of the risks related to cloud-based services, it may invest in cloud-based services that might cause security issues, including confidentiality, integrity, and availability issues, resulting in extra costs to fix such security problems. However, if the firms have a training program to educate business people about the risks of cloud computing and enterprise communication systems to address issues related to cloud-based services, the systems could help increase the awareness of business people and reduce such issues. The significantly higher weights of practices such as (1) having training programs to ensure business people are knowledgeable about IT; (2) addressing IT issues through internal corporate communication; (3) launching enterprise communication systems (e.g., electronic bulletin boards, intranet, and blogs) to share and distribute information about IT-related decision-making structures and processes; (4) organizing an awareness campaign to explain to business and IT people the need for IT governance; and (5) establishing a close relationship such as "partners" between senior business and IT manager, support the importance of such practices and specifically in cloud computing context.

Second, firms investing in cloud computing experience gradual transformation in roles and responsibilities (Hoberg et al., 2012). The significantly higher weights of practices related to defining a new position to align business and IT units indicate the requirement for gradual transformative change in the roles and responsibilities. Practices such as (1) defining positions such as account managers who act as in-betweens and (2) assigning a job task to the CIO or a person in a similar role to ensure that business managers clearly understand the IT vision throughout the firm are among practices that firms should implement after investing in cloud computing to increase IT value.

Third, despite the cost reduction benefit of cloud computing investment, firms usually struggle to control cloud computing expenses because of the failure to establish an adequate financial budget for cloud computing investment (Dutta et al., 2013). The unique cost structure of cloud computing investment requires appropriate governance. Suppose firms fail to establish an appropriate IT governance framework, cloud computing investment might cause hidden costs. For instance, assume the amount of money to invest in IT without IT department approval has been determined based on the characteristics of on-premises applications. Thus, a business unit could invest in cloud-based services without IT department approval. However, suppose the firm does not have an organization-wide policy related to cloud computing investment. In that case, the cloud-based service purchased by the business unit may not meet the acceptable criteria related to the firm's confidentiality, availability, and integrity policies. Thus, this cloud computing investment could cause security issues, resulting in additional costs to fix such issues. Examples of practices to control hidden cost of cloud computing include (1) establishing a steering committee composed of business and IT people to determine IT development prioritization, to focus on prioritizing and managing IT projects, and to provide IT architecture guidelines; (2) establishing formal processes for prioritizing IT investments and projects in which business and IT are involved; (3) establishing formal processes to control and report on budgets for IT investments and projects; (4) having IT performance measurement (e.g., IT balanced scorecard) in domains of corporate contribution, user orientation, operational excellence, and future orientation; and (5) defining IT governance and control framework in use (e.g., COBIT); (6) defining responsibility for promoting, driving, and managing IT integration and standardization for business and IT people; (7) established formal processes to govern and manage IT projects; (8) establishing regular self-assessments or independent assurance processes on the governance and control over IT; (9).establishing formal processes to monitor the planned business benefits during and after implementation of the IT investments and projects; (10) establishing formal processes to charge back IT costs to business units to enable an understanding of the total cost of ownership.

Fourth, in a cloud computing context, a cloud provider would be responsible for managing security instead of an internal IT department when the sourcing is in-house or a firm's external IT provider in the case of outsourcing.

However, when investing in cloud computing, while the firm may have access to security services with better quality and lower cost and to more choices for disaster recovery and backup than if the firm were responsible for securing the system, this does not mean that the firm does not require security management. There are still major security and privacy risks that the firm must manage. Having mature practices related to governing security and privacy issues of cloud computing investments and governing the relationship between the cloud computing provider and firm, in general, are among the most cited practices in the findings of the present study. These practices include (1) having a defined responsibility for security, compliance, and/or risk, which possibly affects IT; (2) establishing regular self-assessments or independent assurance processes on the governance and control over IT; (3) having a defined framework for internal controls and risk management (e.g., COSO/ERM, ISO 27002 [formerly ISO/IEC 177999]); and (4) having a strategy committee at the board of directors level to ensure IT is on the regular agenda of the board meetings.

While previous studies showed that firms invest in IT primarily for reasons such as increasing cost efficiency, agility, security and privacy, and competency, this particular study found that in the context of cloud computing, the value generated from IT investments is more strongly associated with competency and cost efficiency. Therefore, an investment in cloud computing is a favorable option for firms looking to bolster their IT competency and control costs. Investing in cloud computing enhances IT competency in firms by increasing access to skilled personnel and enabling refocus on core business.

This study's alignment with one of the top five topics in published articles within PAJAIS (Jiang et al., 2019) underscores its significance and relevance to both scholars and practitioners in the Asia Pacific Region. Specifically, by focusing on the context of cloud computing, this work advances the work published in this journal. It offers valuable insights into IT governance mechanisms and cloud computing value, offering a roadmap to harness the potential of cloud computing. These insights are pivotal for crafting customized strategies tailored to navigate the ever-evolving technological landscape in the Asia-Pacific. Furthermore, by delving into governing cloud computing, the study not only creates new pathways for future research but also addresses a critical issue listed among the top ten in IT management over the past four years (2019-2022) (Johnson et al., 2023), promising valuable guidelines for practical implementation.

Limitations and Future Research

There are limitations to this study to guide future research. This study uses quantitative data to test the model. Future studies should advance this work by using mixed-method approaches. This study relied on one key informant in the business or IT unit of each firm. The use of a single informant from each firm is a common approach used in IS research due to accessibility issues (Gerow et al., 2014). Moreover, in order to reduce the bias, we gathered data from both business and IT executives. The current study demonstrates robust empirical and theoretical support for its findings. However, future research could use matched pairs analysis to further enrich our understanding of the interplay among ITGM, IT value, and organizational performance.

This study used cross-sectional data. Due to the lagged influence of ITGM on IT value and the subsequent organizational performance over time (Kohli & Grover, 2008), it would be useful to conduct longitudinal research. Although, in this study, firms that have invested in cloud computing for more than one year were selected to address the lag, conducting longitudinal research could provide deeper insight into the role of ITGM in the different stages of cloud computing investment.

The ITGM construct conceptualized and empirically validated in this study by capturing practices in all IT functions in each of the three ITGM provides a more complete and well-developed conceptualization of the ITGM construct. However, future research should use and test this construct in various IT investment contexts to continue developing a coherent theoretical IT governance knowledge base. With regard to the five control variables included in the model, only decision rights and business strategy are significantly related to IT value. The exact role of decision rights and business strategy in generating value and enhancing organizational performance within the context of ITGM remain interesting questions for future research.

The current study uses IT governance theory to examine the relationship between ITGM and organizational performance. However, future studies can incorporate other theoretical lenses, such as DeLone and McLean's information systems success model, to understand more deeply the information technology landscape within organizations. DeLone and McLean's model (DeLone, 1988; DeLone & McLean, 1992)focuses on assessing the success of IS within an organization and identifies six success dimensions, including (1) system quality: the technical attributes of the IS, (2) information quality: the accuracy, relevance, and timeliness of information produced by the system, (3) information use: the extent to which users employ the system's capabilities, (4) user satisfaction: users perceive the system's quality and usefulness, (5) individual impact: the positive effects of using the system on individuals' job performance, and (6) organizational impact: the positive effects of using the system on the organization's performance. ITGM might influence the success factors identified in the IS success model. For example, effective ITGM can impact the quality of systems and information by guiding investments, decision-making, and alignment with business needs, can influence how systems are deployed, used, and adopted within the organization, affecting user satisfaction and system use, and can shape how IT initiatives are prioritized, managed, and evaluated. This, in turn, can impact the individual and organizational outcomes derived from IT systems. Therefore, future studies could examine the role of ITGM in IS success and enhance our understanding of the interplay between IS success and IT governance.

The identified practices in this study are also very relevant for the Asia–Pacific organizations that are investing in cloud computing and desire to achieve maximum value from cloud computing investment. However, future research can replicate the current study by collecting data from Asia–Pacific organizations to customize the findings of the current study based on the characteristics of the Asia–Pacific organizations.

Conclusion

While organizations continue to invest in IT because they anticipate performance growth, increasing organizational performance from IT investment is challenging. Furthermore, although ITGM have been acknowledged as a crucial antecedent of organizational performance, few empirical studies have examined how ITGM impact it. This work investigated, posited, and empirically examined the association between ITGM and organizational performance and provided more guidance on how organizations can enhance IT value and, thus, organizational performance by leveraging ITGM.

Data collected from 250 United States companies were used to empirically validate the theoretical relationships proposed in the research model. The findings of this study indicate the positive impact of the ITGM on IT value and organizational performance. The findings reveal that structural, procedural, and relational mechanisms are effective in enhancing IT value. The research theoretically proposes and empirically validates a model that indicates the type of value derived by a certain type of IT investment and explains how ITGM influence organizational performance. The findings also have significant implications for practitioners, as ITGM need to be focused and leveraged to apply more mature practices to generate greater value from IT investment, which in turn can increase the performance of an organization.

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Appendix A – Survey Instrument

IT Governance Mechanism

The following maturity anchor is used to capture the ITGM construct: 0 (Processes are not applied at all), 1 (Processes are ad hoc and disorganized), 2 (Processes follow a regular pattern), 3 (Processes are documented and communicated), 4 (Processes are monitored and measured), 5 (Best practices are followed and automated)

Structural Mechanism

Indicate the extent to which your organization is applying the following **structural practices** for making the IT-related decisions.

In our organization, …

1. We have a strategy committee at the board of directors' level to **ensure IT is on the regular agenda of the board meetings.**
2. We have a steering committee at an executive or senior management level responsible for **determining IT development prioritization.**
3. We have a steering committee at an executive or senior management level responsible for **determining business priorities in IT investments**.
4. We have a steering committee composed of business and IT people to **focus on prioritizing and managing IT projects.**
5. We have a steering committee composed of business and IT people to **focus on IT-related risks and security issues**.
6. We have a steering committee composed of business and IT people to **overview IT assurance activities and address IT risks.**
7. We have a steering committee composed of business and IT people to **provide IT architecture guidelines**.
8. We have a **defined responsibility** for promoting, driving, and managing IT integration and standardization for business and IT people.
9. We have **documented roles and responsibilities** for promoting, driving, and managing IT integration and standardization for business and IT people.
10. We have **a defined responsibility** for security, compliance, and/or risk, which possibly affects IT.
11. Members of the board of directors have **expertise and experience regarding the value and risk of IT**.
12. The chief information officer (CIO) has a **direct reporting line** to the chief executive officer (CEO) and/or chief operational officer (COO).
13. CIO is a **full member of the executive committee**.

Procedural Mechanism

Indicate the extent to which your organization is applying the following procedural practices for making the IT-related decisions.

In our organization, we have …

1. Established formal processes to **define and update IT strategies**.
2. Established formal processes to **prioritize IT investments and projects** in which business and IT are involved.
3. Established formal processes to **charge back IT costs to business units** to enable an understanding of the total cost of ownership.
4. Established formal processes to **govern and manage IT projects**.
5. Established formal processes to **control and report on budgets** for IT investments and projects.
6. Established formal processes to **monitor the planned business benefits** during and after implementation of the IT investments and projects.
7. Established **regular self-assessments or independent assurance processes** on the governance and control over IT.
8. IT performance measurement (e.g., IT balanced scorecard) in domains of corporate contribution, user orientation, operational excellence, and future orientation.

9. Formal Service Level Agreements (SLAs) between IT services providers and our organization about **IT development projects**.
10. Formal Service Level Agreements (SLAs) between IT services provider and our organization about **IT operations**.
11. A defined framework for **internal controls and risk management** (e.g., COSO/ERM, ISO 27002 [formerly ISO/IEC 177999]).

Relational Mechanism

Indicate the extent to which your organization is applying the following relational practices for making collaborative relationships between business and IT people in the process of making the IT-related decisions.

In our organization, …

1. We have **training programs** to ensure business people are knowledgeable about **IT**.
2. We have **training programs** to ensure IT people are knowledgeable about the **business**.
3. We have **enterprise communication systems** (e.g., electronic bulletin boards, intranet, and blogs) to share and distribute information about IT-related decision-making structures and processes.
4. Senior business and IT manager act as "**partners**".
5. Senior business and IT manager **meet informally** (e.g., during informal lunches) with no agenda to discuss general activities and directions of the organization and IT's role in it.
6. There is **job rotation** for creating a shared understanding of the business role of IT (e.g., IT staff working in the business units and business people working in IT).
7. Business and IT people are **physically located close** to each other.
8. Bridging the gap between business and IT is achieved by means of the managers (e.g., **account managers)** who act as in-betweens.
9. The CIO or a person in a similar role ensures that the **IT vision** is clearly understood by managers throughout the organization.
10. **Internal corporate communication** addresses IT issues.
11. We organize an **awareness campaign** to explain to business and IT people the need for IT governance.

Cloud Computing Value

Indicate the extent to which you agree or disagree that Cloud Computing investment assists your organization to achieve the following business values.

Our cloud computing investment allows our organization to …

1. Enhance economies of scale in human resources.
2. Enhance economies of scale in technological resources.
3. Increase control of IT expenses.
4. Reduce the risk of technological obsolescence.
5. Be responsive to a wide range of contingencies.
6. Be responsive to changing needs and priorities.
7. Improvise quickly.
8. Respond quickly to changes in market needs.
9. Respond to competitive changes quickly.
10. Increase access to key information technologies.
11. Reduce the level of the risk related to IT.
12. Access more choices for disaster recovery and backup.
13. Reduce the number of security and privacy breaches.
14. Reduce concerns related to security and privacy.
15. Enhanced IT competence.
16. Refocus on core business.
17. Increase access to skilled personnel.

Organizational Performance

On a scale of 1 (much less than average), 2 (Slightly less than average), 3 (Same as competitors-average), 4 (Better than average, 5 (Much better than average or 6 (Don't know), please indicate compared to other organizations in your industry how you would assess the performance of your organization in each of the following categories:

1. Return on investment (ROI)
2. Return on equity (ROE)
3. Return on asset (ROA)
4. Percent change in revenue per year
5. Increasing sales of existing products
6. Finding new revenue streams (e.g., new products, new markets)
7. Customers perception of products and services quality
8. Customer satisfaction
9. Firm image
10. Strong and continuous bond with customers
11. Precise knowledge of customer buying patterns
12. Productivity improvements
13. Timeline of customer service
14. Production cycle time

Appendix B – Summary of Control Variables

Data Collection

Qualtrics, a 3rd party data-collection service provider, was employed as a survey platform and a panel to design and distribute the survey. While data gathered from data-collection service providers such as Qualtrics, which is currently popular and increasingly being used in behavioral research, is valid and trustworthy, the data could also be significantly more diverse than the other data gathering methods such as traditional message boards and email or in-person data collection (Casler et al., 2013).

Studies in IT business value argue that there is significant latency in the process of IT business value creation (Kohli & Grover, 2008). Thus, the unit of analysis was considered a firm that has invested in CC for more than one year. The research instrument targeted small-sized (with less than 100 employees), mid-sized (with more than 100 employees and less than 1000 employees), and large-sized (with more than 1000 employees) firms in the United States. To assure the instrument was evenly distributed among firms with different sizes, quotas were established to collect data evenly from firms with less and greater than 100 employees. The research model was also examined while it controlled for firm size. The descriptive statistics of control variables are illustrated in Table B.1.

Scholars (e.g., Gerow et al., 2014) state matched-pair, e.g., CIO/CEO pairs, respondents are superior to single respondents, e.g., only the CIO. Matched pairs are superior to single respondents because both sides of the dyad could be captured (Gerow et al., 2014). Dyadic data that are collected from distinct and independent sources helps control common method bias and provides higher measurement reliability (Podsakoff et al., 2003).

However, collecting data from multiple respondents in the same firms could also be problematic because the anonymity of the questionnaire can be compromised and the study still has the possibility of subjectivity and measurement error (Gerow et al., 2015). For instance, when conducting a meta-analysis study in IT/business strategic alignment, Gerow et al. (2014) indicates that matched pairs may result in an alignment paradox in research findings. This paradox may be due to the incongruent perception of IT between IT and business people. Thus, although using a matched pair assists in capturing both sides of the dyad and reduces common method bias, an alignment paradox could occur in the findings.

Collecting data from two sources at the management or executive level in the same firm also is often difficult. Due to the difficulty of collecting data from both sides of the dyad, several studies investigating IT governance mechanism surveyed only the CIO (e.g., Ali & Green, 2012; Bradley et al., 2012; Prasad et al., 2010).

To provide insights from both IT and business sides, the current study recruited both IT and business executives. Although they may not be from the same firm, gathering data from both IT and business executives helps (1) avoid the possible bias in single-sided self-reported data (e.g., CEOs may overestimate organizational performance), (2) control common method bias between the variables preceding organizational performance in the model (i.e., IT governance mechanism and CC business value) and the dependent variable (i.e., organizational performance), (3) provide a more comprehensive view of the constructs within the firm, and (4) cover responsibilities of both the IT and business sides (Wu et al., 2015). High-level business and IT executives such as CEOs, CFOs, CIOs, and CTOs along with IT and business senior and middle managers who have been working on their current position in their organization for more than one year were recruited to complete the survey. The respondents held positions that are well suited with the subject matter of this study investigation and were likely to be informed about IT governance mechanism, CC business value, and organizational performance within their firms. To assure the instrument was evenly distributed between business and IT executives, quotas were established to collect data evenly from business and IT units.

To ensure that the samples have the aforementioned characteristics and to increase the quality of the data, eight screening questions (see Table B.2) were used. Besides, in order to increase the quality of the data, several quality checks such as straight lining check and speeding check were employed.

To refine and purify the scale, the data were gathered in two steps. First, before the final operationalization of each construct, the samples were gathered for a pilot. Data gathered from the pilot were used for evaluating the goodness of fit of the measurement model, assessing the validity of the set of indicators at the construct level, assessing the reliability of the set of indicators at the construct level, evaluating individual indicator validity and reliability, and eliminating problematic indicators (MacKenzie et al., 2011). After refining the scale based on the results of the pilot, new samples were gathered, and the scale properties were reexamined and validated (MacKenzie et al., 2011).

Table B.1 – Control Variables Descriptive Statistics		
	Frequency (F)	**Percent (P)**
Internal factors		
Organization Size		
Small-to- Medium-Sized Firm (number of employees less than 250)	149	59.6
Large-Sized Firm (number of employees greater than 251)	101	40.4
Total	250	100.0
External factors		
Industry (IT vs non-IT)		
IT	75	30.0
Non-IT	175	70.0
Total	250	100.00
Organization Revenue		
Under $50 million	86	34.4
$50 million - $250 million	72	28.8
Over $250 million	92	36.8
Total	250	100.0
Business Strategy		
Increase productivity and efficiency as the focus	219	87.6
Innovate	212	84.8
Increase profit	209	83.6
Enable business processes	206	82.4
Reduce costs	198	79.2
Satisfy customers	189	75.6
Create a competitive advantage	189	75.6
Drive business strategy	172	68.8
Business Strategy		
Following 2 to 6 strategies	118	47.2
Following 7 or 8 strategies	132	52.8
Total	250	100.0

Table B.1 – Control Variables Descriptive Statistics

IT Archetype

	Domain1		Domain2		Domain3		Domain4		Domain5		Domain6		Domain7	
	F	P	F	P	F	P	F	P	F	P	F	P	F	P
Business	43	17	28	11	23	9	32	13	28	11	38	15	24	10
Business with IT involvement	52	21	54	22	38	15	61	25	40	16	42	17	45	18
Business and IT equally	56	23	76	30	89	36	68	27	72	29	80	32	65	26
IT with business involvement	58	23	63	25	68	27	63	25	61	24	61	24	68	27
IT	41	16	29	12	32	13	26	10	49	20	29	12	48	19
Total	250	100	250	100	250	100	250	100	250	100	250	100	250	100

Domain1: The strategic role of IT (Principle)
Domain2: Integrated sets of technical choices to satisfy business needs (Architecture)
Domain3: The centrally coordinated, shared, and enabling IT services that provide the foundation for our organization's IT capability (Infrastructure)
Domain4: Business needs and requirements for purchased or internally developed IT applications (Business needs)
Domain5: IT services that are externally sourced (Outsourcing)
Domain6: IT initiatives to fund and how much to spend (Financial investment)
Domain7: Mitigate IT-related risks (Security and privacy)

	Domain1		Domain2		Domain3		Domain4		Domain5		Domain6		Domain7	
	F	P	F	P	F	P	F	P	F	P	F	P	F	P
Decentralized	95	38	82	33	61	24	93	38	68	27	80	32	69	28
Federal	56	23	76	30	89	36	68	27	72	29	80	32	65	26
Centralized	99	39	92	37	100	40	89	35	110	44	90	36	116	46
Total	250	100	250	100	250	100	250	100	250	100	250	100	250	100

Business Centric (Decentralized) = Business + Business with IT involvement
Federal = Business and IT equally
IT Centric (Centralized) = IT with business involvement + IT

Table B.2 – Screening Questions

Question	Possible answers[1]	
For classification purposes, what is your age?	• ***Under 18*** • 18–29 • 30–39 • 40–49	• 50–59 • 60–69 • 70 or older
In what department do you work?[2]	• Customer Service • Finance • Human Resources • IT (Information Technology)	• Marketing • Sales • Operation • Other
At what organizational level is your position in your current organization?	• Executive • ***Individual contributor (nontechnical)*** • ***Individual contributor (technical)***	• Management • Middle management • *Other*
For how long have you been at this position at your current organization?	• ***Less than 1 year*** • One year or more but less than 3 years	• Three years or more but less than 5 years • Five years or more
The number of employees in your organization is which of the following?[3]	• Less than 100 • 101–250 • 251–1,000	• 1,001–5,000 • Over 5,000
Identify the disruptive technologies your organization has been using and for how long.[4]	• ***3D printing (less than 1 year/more than 1 year)*** • ***Advanced materials (less than 1 year/more than 1 year)*** • ***Advanced oil and gas exploration and recovery (less than 1 year/more than 1 year)*** • ***Advanced robotics (less than 1 year/more than 1 year)*** • ***Autonomous and near-autonomous vehicles (less than 1 year/more than 1 year)*** • ***Automation of knowledge work (less than 1 year/more than 1 year)*** • Cloud Computing (***less than 1 year***/more than 1 year) • ***Internet of Things (less than 1 year/more than 1 year)*** • ***Energy storage (less than 1 year/more than 1 year)*** • ***Mobile Internet (less than 1 year/more than 1 year)*** • ***Next-generation genomics (less than 1 year/more than 1 year)*** • ***Renewable energy (less than 1 year/more than 1 year)***	
What type of IT sourcing does your organization use today?[5]	• ***In-house*** • ***Outsourcing*** • Cloud Computing (Cloud Sourcing)	
When did your organization first start using the Cloud Computing Solution?[6]	• Year ________	• Month _________________

[1]: If bold and italic choices are selected, participations will be screened out.
[2]: A quota was set up for this question, in order to assure that the survey was being evenly distributed between IT and business units.
[3]: A quota was set up for this question, in order to assure that the survey was being evenly distributed between small-sized (less than 100 employees), and medium to large-sized (greater than 100 employees) organizations.
[4]: This question was asked to select a firm which has invested in CC for one year or more. However, after this question, two follow-up questions also were asked to assure the firm is using CC for one year or more. These two follow-up questions could use both for the attention-check and collecting exact data related to the duration of CC investment, and the other IT resources are using in the firm.
[5]: A combination of “In-house” and “Outsourcing” with “Cloud Computing” is acceptable.
[6]: In this question, the certain date of CC investment was asked. The data collected from this question was used to double-check that the CC investment has been made for one year or more.

Appendix C – Measurement Model Validation

Measurement Model Validation

Evaluating the PLS-SEM Measurement Model

SmartPLS v3.2.8 (Ringle et al., 2015) is used to evaluate the PLS-SEM measurement model. The assessment procedure at the full launch includes two stages: (1) assess the formative measurement model for the collinearity issue, and (2) assess the significance and relevance of the formative indicators (Hair Jr et al., 2016).

To check the model for the collinearity of indicators we looked at the VIF values of the formative indicators and to check the significance and relevance of the formative indicators we used bootstrapping (Hair Jr et al., 2016). In order to estimate the significance of the indicator weights and loadings, a bootstrapping technique with 5000 subsamples, No Sign Change option, Bias-Corrected and Accelerated (BCa) Bootstrap, Two-Tailed testing, and a significant level of 0.05 was used. The VIF, outer weights, and our loadings of all the formative items are illustrated in Table C.1.

As illustrated in Table C.1, no indicators have VIF higher than the threshold value of 3.3 that is the conservative cutoff for VIF (Hair Jr et al. (2016) consider 5 as the threshold value). GMP12 has the highest VIF value (2.9). Hence, VIF values are uniformly below the threshold value of 3. Therefore, the collinearity does not reach critical levels in any of the formative constructs and is not an issue for the estimation of the PLS path model in the research model.

The weights of 20 indicators (8 out of 13 items related to the structural mechanism construct, 4 out of 12 items related to the procedural mechanism construct, 6 out of 11 items related to the relational mechanism construct, 1 out of 6 items related to the financial return construct, and 1 out of 5 items related to the customer perception construct) are not significant at the level of 0.05; however, all items with nonsignificant weights were retained because their corresponding loadings are substantial and significant ($\rho < 0.001$) (Hair Jr et al., 2016).

Table C.1 – VIF, Weights, and Loadings					
Construct	**Item code**	**Item**	**VIF**	**Outer weight (outer loading)**	**ρ-Value**
Structural Mechanism	GMS1	We have a strategy committee at the level of the board of directors to ensure IT is on our regular agenda.	2.012	.205 (.781)	.000
	GMS2	We have a steering committee at an executive or senior management level responsible for determining IT development prioritization.	1.976	.152 (.747)	.002
	GMS3	We have a steering committee at an executive or senior management level responsible for determining business priorities in IT investments.	2.125	.032 (.703)	**.549**
	GMS4	We have a steering committee composed of business and IT people to focus on prioritizing and managing IT projects.	2.237	.148 (.785)	.007
	GMS5	We have a steering committee composed of business and IT people to focus on IT-related risks and security issues.	2.271	.056 (.753)	**.354**
	GMS6	We have a steering committee composed of business and IT people to overview IT assurance activities and address IT risks.	2.214	.061 (.743)	**.307**
	GMS7	We have a steering committee composed of business and IT people to provide IT architecture guidelines.	2.301	.096 (.782)	**.100**
	GMS8	We have a defined responsibility for promoting, driving, and managing IT integration and standardization for business and IT people.	2.341	.143 (.773)	.041
	GMS9	We have documented roles and responsibilities for promoting, driving, and managing IT integration and standardization for business and IT people.	2.114	**-.005** (.685)	**.933**
	GMS10	We have a defined responsibility for security, compliance, and/or risk, which possibly affects IT.	2.143	.170 (.765)	.019
	GMS11	Members of the board of directors have expertise and experience regarding the value and risk of IT.	2.008	.100 (.708)	**.124**
	GMS12	The chief information officer (CIO) has a direct reporting line to the chief executive officer (CEO) and/or chief operational officer (COO).	2.129	.096 (.707)	**.156**
	GMS13	CIO is a full member of the executive committee.	2.204	.071 (.712)	**.371**
Procedural Mechanism	GMP1	Established formal processes to define and update IT strategies.	2.627	.073 (.798)	**.233**
	GMP2	Established formal processes to prioritize IT investments and projects in which business and IT are involved.	2.59	.129 (.808)	.027
	GMP3	Established formal processes to charge back IT costs to business units to enable an understanding of the total cost of ownership.	2.04	.087 (.742)	.044

Table C.1 – VIF, Weights, and Loadings

Construct	Item code	Item	VIF	Outer weight (outer loading)	ρ-Value
	GMP4	Established formal processes to govern and manage IT projects.	2.507	.097 (.804)	**.082**
	GMP5	Established formal processes to control and report on budgets for IT investments and projects.	1.996	.108 (.741)	.032
	GMP6	Established formal processes to monitor the planned business benefits during and after implementation of the IT investments and projects.	2.305	.112 (.782)	.040
	GMP7	Established regular self-assessments or independent assurance processes on the governance and control over IT.	2.538	.119 (.811)	.034
	GMP8	IT performance measurement (e.g., IT balanced scorecard) in domains of corporate contribution, user orientation, operational excellence, and future orientation.	2.65	.157 (.835)	.004
	GMP9	Formal Service Level Agreements (SLAs) between IT services providers and our organization about IT development projects.	2.341	.057 (.769)	**.354**
	GMP10	Formal Service Level Agreements (SLAs) between IT services provider and our organization about IT operations.	2.205	.057 (.752)	**.265**
	GMP11	A defined framework for internal controls and risk management (e.g., COSO/ERM, ISO 27002 [formerly ISO/IEC 177999]).	2.726	.122 (.82)	.040
	GMP12	A defined IT governance and control framework in use (e.g., COBIT (Control Objectives for Information and Related Technologies)).	2.9	.133 (.843)	.028
Relational Mechanism	GMR1	We have training programs to ensure business people are knowledgeable about IT.	2.117	.085 (.738)	**.072**
	GMR2	We have training programs to ensure IT people are knowledgeable about the business.	2.187	.053 (.723)	**.305**
	GMR3	We have enterprise communication systems (e.g., electronic bulletin boards, intranet, and blogs) to share and distribute information about IT-related decision-making structures and processes.	2.373	.159 (.805)	.003
	GMR4	Senior business and IT manager act as “partners”.	2.093	.128 (.764)	.014
	GMR5	Senior business and IT manager meet informally (e.g., during informal lunches) with no agenda to discuss general activities and directions of the organization and IT’s role in it.	2.349	.051 (.750)	**.310**
	GMR6	There is job rotation for creating a shared understanding of the business role of IT (e.g., IT staff working in the business units and business people working in IT).	2.226	.038 (.739)	**.475**

Table C.1 – VIF, Weights, and Loadings

Construct	Item code	Item	VIF	Outer weight (outer loading)	ρ-Value
	GMR7	Business and IT people are physically located close to each other.	1.698	.045 (.625)	**.398**
	GMR8	Bridging the gap between business and IT is achieved by means of the managers (e.g., account managers) who act as in-betweens.	2.339	.242 (.836)	.000
	GMR9	The CIO or a person in a similar role ensures that the IT vision is clearly understood by managers throughout the organization.	2.376	.194 (.828)	.003
	GMR10	Internal corporate communication addresses IT issues.	2.36	.167 (.803)	.001
	GMR11	We organize awareness campaign to explain to business and IT people the need for IT governance.	2.581	.103 (.796)	**.079**
Cost Efficiency	BVCE1	Enhance economies of scale in human resources.	1.326	.406 (.759)	.000
	BVCE2	Enhance economies of scale in technological resources.	1.675	.327 (.807)	.000
	BVCE3	Increase control of IT expenses.	1.329	.356 (.725)	.000
	BVCE4	Reduce the risk of technological obsolescence.	1.323	.257 (.659)	.000
Agility	BVA1	Be responsive to a wide range of contingencies.	1.26	.165 (.567)	.005
	BVA2	Be responsive to changing needs and priorities.	1.506	.196 (.691)	.000
	BVA3	Improvise quickly.	1.58	.236 (.737)	.001
	BVA4	Respond quickly to changes in market needs.	1.765	.372 (.841)	.000
	BVA5	Respond to competitive changes quickly.	1.676	.188 (.740)	.002
	BVA6	Increase access to key information technologies.	1.434	.213 (.680)	.001
Security and Privacy	BVSP1	Reduce the level of the risk related to IT.	1.392	.358 (.757)	.000
	BVSP2	Access more choices for disaster recovery and backup.	1.217	.374 (.702)	.000
	BVSP3	Reduce the number of the security and privacy breaches.	1.966	.349 (.824)	.000
	BVSP4	Reduce concerns related to security and privacy.	1.774	.243 (.737)	.006
Competency	BVC1	Enhanced IT competence.	1.323	.354 (.733)	.000
	BVC2	Refocus on core business.	1.402	.386 (.780)	.000
	BVC3	Increase access to skilled personnel.	1.347	.522 (.840)	.000
Financial Returns	OPFR1	Return on investment (ROI)	1.853	.292 (.804)	.000
	OPFR2	Return on equity (ROE)	1.904	.243 (.785)	.002
	OPFR3	Return on asset (ROA)	1.818	.094 (.699)	**.195**

Table C.1 – VIF, Weights, and Loadings					
Construct	**Item code**	**Item**	**VIF**	**Outer weight (outer loading)**	**ρ-Value**
	OPFR4	Percent change in revenue per year	1.667	.180 (.708)	.014
	OPFR5	Increasing sales of existing products	1.858	.238 (.765)	.004
	OPFR6	Finding new revenue streams (e.g., new products, new markets)	1.882	.237 (.788)	.003
Customer Perspective	OPCP1	Customers perception of products and services quality	1.531	.276 (.717)	.000
	OPCP2	Customer satisfaction	1.463	.258 (.660)	.001
	OPCP3	Firm image	1.357	.349 (.719)	.000
	OPCP4	Strong and continuous bond with customers	1.591	.079 (.628)	**.430**
	OPCP5	Precise knowledge of customer buying patterns	1.244	.433 (.740)	.000
Operational Excellence	OPOE1	Productivity improvements	1.661	.388 (.809)	.000
	OPOE2	Timeline of customer service	1.521	.286 (.726)	.000
	OPOE3	Production cycle time	1.379	.548 (.856)	.000

Table C.2 – Minimum Baseline Practices[1]

	Item code	Item (Practice)	Outer weight (outer loading)
Structural Mechanism	GMS1	We have a strategy committee at the level of the board of directors to ensure IT is on our regular agenda.	.205(.781)***
	GMS2	We have a steering committee at an executive or senior management level responsible for determining IT development prioritization.	.152(.747)**
	GMS3	We have a steering committee at an executive or senior management level responsible for determining business priorities in IT investments.	.032(.703)^{ns}
	GMS4	We have a steering committee composed of business and IT people to focus on prioritizing and managing IT projects.	.148(.785)**
	GMS7	**We have a steering committee composed of business and IT people to provide IT architecture guidelines.**	**.096(.782)***
	GMS8	We have a defined responsibility for promoting, driving, and managing IT integration and standardization for business and IT people.	.143(.773)**
	GMS10	We have a defined responsibility for security, compliance, and/or risk, which possibly affects IT.	.170(.765)**
	GMS12	The chief information officer (CIO) has a direct reporting line to the chief executive officer (CEO) and/or chief operational officer (COO).	.096(.707)^{ns}
	GMS13	CIO is a full member of the executive committee.	.071(.712)^{ns}
Procedural Mechanism	GMP1	Established formal processes to define and update IT strategies.	.073(.798) ^{ns}
	GMP2	Established formal processes to prioritize IT investments and projects in which business and IT are involved.	.129(.808)**
	GMP3	Established formal processes to charge back IT costs to business units to enable an understanding of the total cost of ownership.	.087(.742)**
	GMP4	Established formal processes to govern and manage IT projects.	.097(.804)*
	GMP5	Established formal processes to control and report on budgets for IT investments and projects.	.108(.741)**
	GMP6	**Established formal processes to monitor the planned business benefits during and after implementation of the IT investments and projects.**	**.112(.782)****
	GMP7	**Established regular self-assessments or independent assurance processes on the governance and control over IT.**	**.119(.811)****
	GMP8	IT performance measurement (e.g., IT balanced scorecard) in domains of corporate contribution, user orientation, operational excellence, and future orientation.	.157(.835)**
	GMP9	Formal Service Level Agreements (SLAs) between IT services providers and our organization about IT development projects.	.057(.769)^{ns}
	GMP10	Formal Service Level Agreements (SLAs) between IT services provider and our organization about IT operations.	.057(.752)^{ns}

Table C.2 – Minimum Baseline Practices[1]

	Item code	Item (Practice)	Outer weight (outer loading)
	GMP11	**A defined framework for internal controls and risk management (e.g., COSO/ERM, ISO 27002 [formerly ISO/IEC 177999]).**	**.122(.82)****
	GMP12	**A defined IT governance and control framework in use (e.g., COBIT (Control Objectives for Information and Related Technologies)).**	**.133(.843)****
Relational Mechanism	**GMR1**	**We have training programs to ensure business people are knowledgeable about IT.**	**.085(.738)***
	GMR3	We have enterprise communication systems (e.g., electronic bulletin boards, intranet, and blogs) to share and distribute information about IT-related decision-making structures and processes.	.159(.805)**
	GMR4	Senior business and IT manager act as "partners".	.128(.764)**
	GMR8	**Bridging the gap between business and IT is achieved by means of the managers (e.g., account managers) who act as in-betweens.**	**.242(.836)*****
	GMR9	The CIO or a person in a similar role ensures that the IT vision is clearly understood by managers throughout the organization.	.194(.828)**
	GMR10	**Internal corporate communication addresses IT issues.**	**.167(.803)****
	GMR11	**We organize awareness campaign to explain to business and IT people the need for IT governance.**	**.103(.796)***

*: significant at the level of .1 **: significant at the level of .05 ***: significant at the level of .001
[1]Minimum baseline practices previously developed by scholars along with the practices (in bold font) with significant weight identified in the current study.

Appendix D – Common Method Bias

Common Method Bias Assessment

There is a potential for common method biases in all self-reported data from multiple sources such as consistency motif and social desirability (Podsakoff et al., 2003). In order to reduce the effect of common method variance on the data analysis, in the process of the instrument development, several techniques such as removing the ambiguous questions and negative words were used. In addition, different scale anchors were used for each construct, and in the process of data gatherings, several techniques such as anonymity and item randomization were employed. However, it is recommended to assess a potential common method bias for all self-reported data (Podsakoff et al., 2003). Although there is an assumption that formative indicators are free of errors and are thus incompatible with data that can contain common method variance (Rönkkö & Ylitalo, 2011), three methods were employed to assess the potential common method bias: (1) Harman's single-factor test (Podsakoff et al., 2003), (2) latent method factor approach (Liang et al., 2007), and (3) marker variable (Simmering et al., 2015).

First, a Harmon one-factor test was conducted on the ten conceptually first-order variables in the research model including GMS, GMP, GMR, BVCE, BVA, BVSP, BVC, OPFR, OPCP, and OPOE. In Harman's single-factor test, all items in the research model are subjected to an exploratory factor analysis to identify the number of factors that account for the variance in the variables (Podsakoff et al., 2003; Schwarz et al., 2017). IBM SPSS statistics version 24 is applied to conduct an exploratory factor analysis to examine the unrotated factor solution. The result indicated the presence of eleven distinct factors, rather than a single factor, with the eigenvalue greater than 1.0. The most covariance explained by one factor is 35.084 percent, while the whole variance explained by all factors is 64.741 percent. The result shows that common method biases are not a likely contaminant of the results.

Second, a common method factor that comprises all the model indicators is included in the research model (Liang et al., 2007). Using SmartPLS v3.2.8 (Ringle et al., 2015), the common method bias was assessed by comparing the variance of model indicators explained by the principal constructs with the variance of model indicators explained by the method factor (Liang et al., 2007). The average variance explained by the principal constructs is 0.592, while the average variance explained by the method factor is 0.007) (ratio about 1:85) (see Table D.1). Besides, all substantive loadings (67 paths) are significant ($p < 0.001$), while only a few of the path coefficients (8 paths) from the method factor are significant ($p < 0.05$).

Third, the benefit administration as a marker variable was used. In order to be consistent with the substantive variables, i.e., IT governance mechanism, CC business value, and organizational performance, which are at the firm level, the original ten items for capturing the benefit administration (Williams, 1995) were modified to become firm-level items. The benefit administration theoretically is unrelated to the substantive variables under investigation in the research model. Thus, the use of benefits administration as a marker variable is consistent with the assumption for a marker variable approach (Lindell & Whitney, 2001).

The marker techniques (Williams et al., 2010) for controlling the method variance are applicable to reflective constructs. Thus, to analyze the effects of the marker variable, all substantive variables were treated as reflective constructs, and five models, i.e., the CFA[2] Model, Baseline Model, Method-C Model, Method-U Model, and Method-R Model, were analyzed via Mplus version 8.0. In the CFA Model or the initial version of the model, the 67 method factor loadings were set to 0. In the Baseline Model, ten correlations between the marker and substantive latent variables were fixed to 0, and the measurement parameters of the marker variable including ten loadings and ten measurement error variances were fixed at nonzero values obtained from the initial CFA Model, and the 67 method factor loadings were fixed to 0. In the Method-C model, the 67 method factor loadings were added to the model, under the assumption that these loadings are constrained to have equal values. The Method-U Model is an alternative version of the Method-C model so the 67 method factor loadings were unconstrained. The Method-R Model is identical to the Method-C and Method-U Model, but only the 45 substantive factor correlations were constrained to their values from the Baseline Model. The model fits the results of the analyses for each model, and comparisons of the results of the models are shown in Table D.2 and Table D.3.

The comparison of the Method-C Model and the Baseline Model indicates a significant difference between these two models. The chi-square difference test comparing these two models indicates support for rejecting the null hypothesis, which is the absence of equal method effects associated with the marker latent variable. The values

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of the standardized method factor loadings range from 0.230 to 0.356, and the median value is 0.266. The square of these values indicates the percentage of variance in the indicator associated with the marker variable, indicating that the median amount of marker variance in each indicator is 7.0%.

The comparison of the Method-U Model and the Method-C Model indicates the nonsignificant difference between these two models. The chi-square difference test comparing these two models indicates support for accepting the null hypothesis, which is that the impact of the method marker variable is equal for all of the 67 items loading on the substantive indicators.

The comparison of the Method-R Model and the Method-U Model indicates the nonsignificant difference between these two models. The chi-square difference test comparing these two models indicates support for accepting the null hypothesis, which is that the substantive factor correlations are not biased by marker variable method effects.

In sum, the results indicate that the method effect is present via the comparison of the Baseline Model with the Method-C Model. However, the assumption of the equivalent method effects (Lindell & Whitney, 2001) is met, in that there is not a significant difference between the Method-C Model and the Method-U Model. Thus, the common method biases are not a critical issue of the results.

Given the results of three methods conducted to the common method bias, the common method bias is unlikely to be a serious concern in the current study.

Table D.1 – Common Method Bias Analysis – Method Factor Approach

Construct	Indicator	Substantive factor loading (R1)	$R1^2$	Method factor loading (R^2)	R^2
Structural Mechanism	GMS1	.606**	.367	.156	.024
	GMS2	.635**	.403	.102	.010
	GMS3	.872**	.760	-.142	.020
	GMS4	.737**	.543	.043	.002
	GMS5	.851**	.724	-.081	.007
	GMS6	.774**	.599	-.019	.000
	GMS7	.732**	.536	.057	.003
	GMS8	.737**	.543	.032	.001
	GMS9	.851**	.724	-.135	.018
	GMS10	.658**	.433	.094	.009
	GMS11	.780**	.608	-.06	.004
	GMS12	.755**	.570	-.037	.001
	GMS13	.813**	.661	-.085	.007
Procedural Mechanism	GMP1	.893**	.797	-.087	.008
	GMP2	.773**	.598	.032	.001
	GMP3	.713**	.508	.039	.002
	GMP4	.773**	.598	.038	.001
	GMP5	.747**	.558	-.013	.000
	GMP6	.748**	.560	.037	.001
	GMP7	.780**	.608	.027	.001
	GMP8	.805**	.648	.019	.000
	GMP9	.849**	.721	-.065	.004
	GMP10	.884**	.781	-.119	.014
	GMP11	.746**	.557	.07	.005
	GMP12	.827**	.684	.006	.000
Relational Mechanism	GMR1	.835**	.697	-.084	.007
	GMR2	.959**	.920	-.215*	.046
	GMR3	.710**	.504	.095	.009
	GMR4	.746**	.557	.021	.000
	GMR5	.949**	.901	-.175*	.031
	GMR6	.865**	.748	-.109	.012
	GMR7	.773**	.598	-.127	.016
	GMR8	.560**	.314	.256*	.066
	GMR9	.688**	.473	.124	.015
	GMR10	.683**	.466	.118	.014
	GMR11	.854**	.729	-.042	.002
Cost Efficiency	BVCE1	.728**	.530	-.007	.000
	BVCE2	.789**	.623	.059	.003
	BVCE3	.684**	.468	.054	.003
	BVCE4	.774**	.599	-.129*	.017

Table D.1 – Common Method Bias Analysis – Method Factor Approach

Construct	Indicator	Substantive factor loading (R1)	$R1^2$	Method factor loading (R^2)	R^2
Agility	BVA1	.527**	.278	.073	.005
	BVA2	.726**	.527	-.021	.000
	BVA3	.784**	.615	-.056	.003
	BVA4	.742**	.551	.088*	.008
	BVA5	.801**	.642	-.058	.003
	BVA6	.696**	.484	-.021	.000
Security and Privacy	BVSP1	.731**	.534	.019	.000
	BVSP2	.572**	.327	.089	.008
	BVSP3	.852**	.726	0	.000
	BVSP4	.858**	.736	-.09*	.008
Competency	BVC1	.755**	.570	.012	.000
	BVC2	.806**	.650	-.008	.000
	BVC3	.803**	.645	-.003	.000
Financial Returns	OPFR1	.778**	.605	0	.000
	OPFR2	.810**	.656	-.065	.004
	OPFR3	.754**	.569	.025	.001
	OPFR4	.725**	.526	.032	.001
	OPFR5	.788**	.621	-.003	.000
	OPFR6	.775**	.601	.018	.000
Customer Perspective	OPCP1	.778**	.605	-.043	.002
	OPCP2	.748**	.560	-.089*	.008
	OPCP3	.687**	.472	.027	.001
	OPCP4	.776**	.602	-.049	.002
	OPCP5	.597**	.356	.154*	.024
Operational Excellence	OPOE1	.854**	.729	.006	.000
	OPOE2	.799**	.638	.012	.000
	OPOE3	.787**	.619	-.017	.000
Average		**.765**	**.592**	**-.003**	**.007**

**$\rho < .001$; *$\rho < .05$

Table D.2 – Psychometric Properties of The Models for Assessing Common Method Bias – Marker Approach

Model	Number of parameters	Chi-square	Degrees of freedom	ρ-value	CFI	TLI	RMSEA	SRMR
CFA	286	3964.316	2794	.0000	.886	.881	.041 (.038 .044)	.059
Baseline	256	4051.687	2824	.0000	.881	.876	.042 (.039 .045)	.117
Method-C	257	398.834	2823	.0000	.888	.883	.041 (.038 .043)	.079
Method-U	323	3897.516	2757	.0000	.889	.882	.041 (.038 .044)	.057
Method-R	278	3898.698	2802	.0000	.893	.889	.040 (.037 .042)	.076

Table D.3 – Chi-Square Difference Test of The Models for Assessing Common Method Bias – Marker Approach

Models compared	Chi-square	Degrees of freedom	ρ-value
Baseline vs. Method-C	70.853	1	.0000
Method-C vs. Method-U	83.318	66	.073
Method-U vs. Method-R	1.182	45	1.0000

Appendix E – Mediating Effect Test

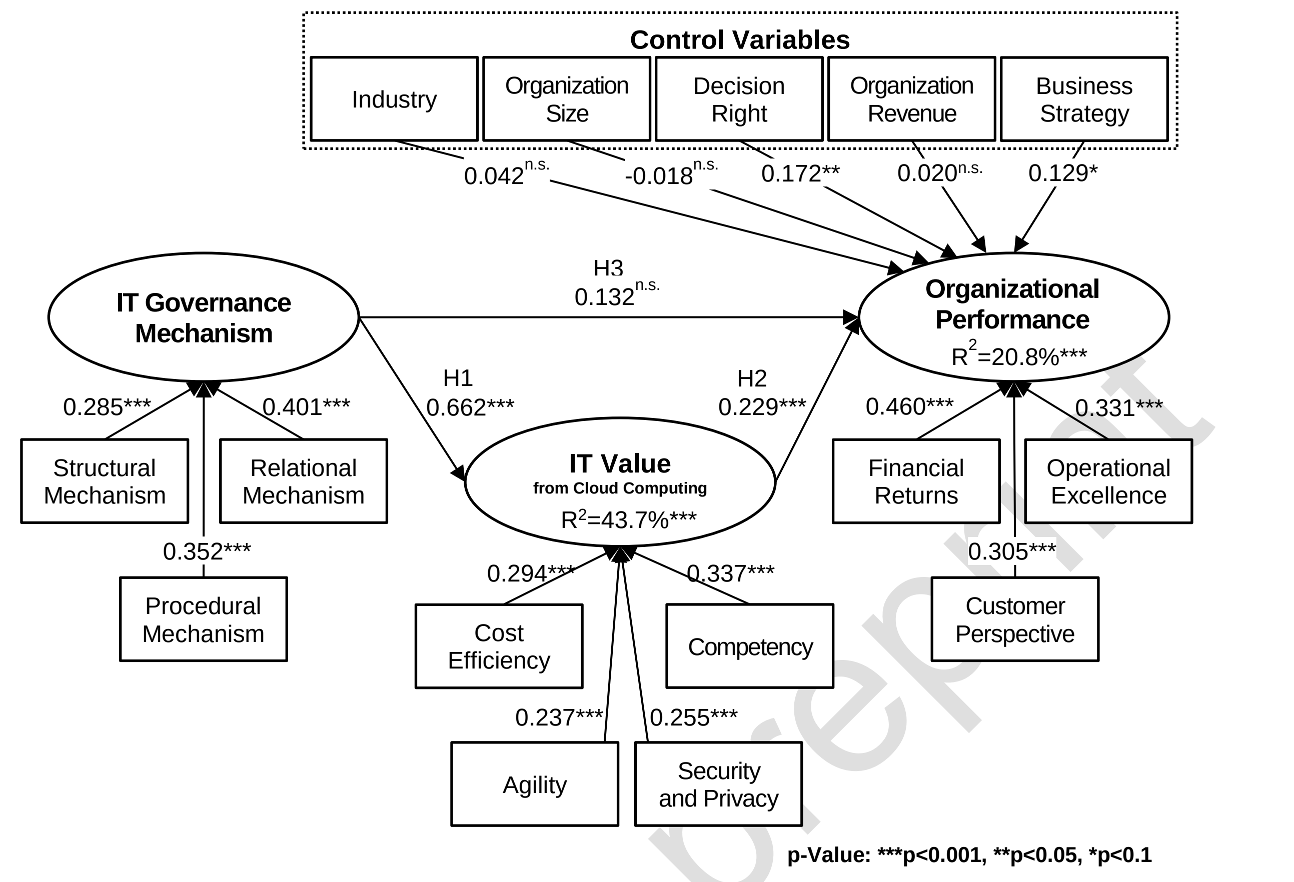

Figure E.1 – Result of Path Analysis with Direct Effect

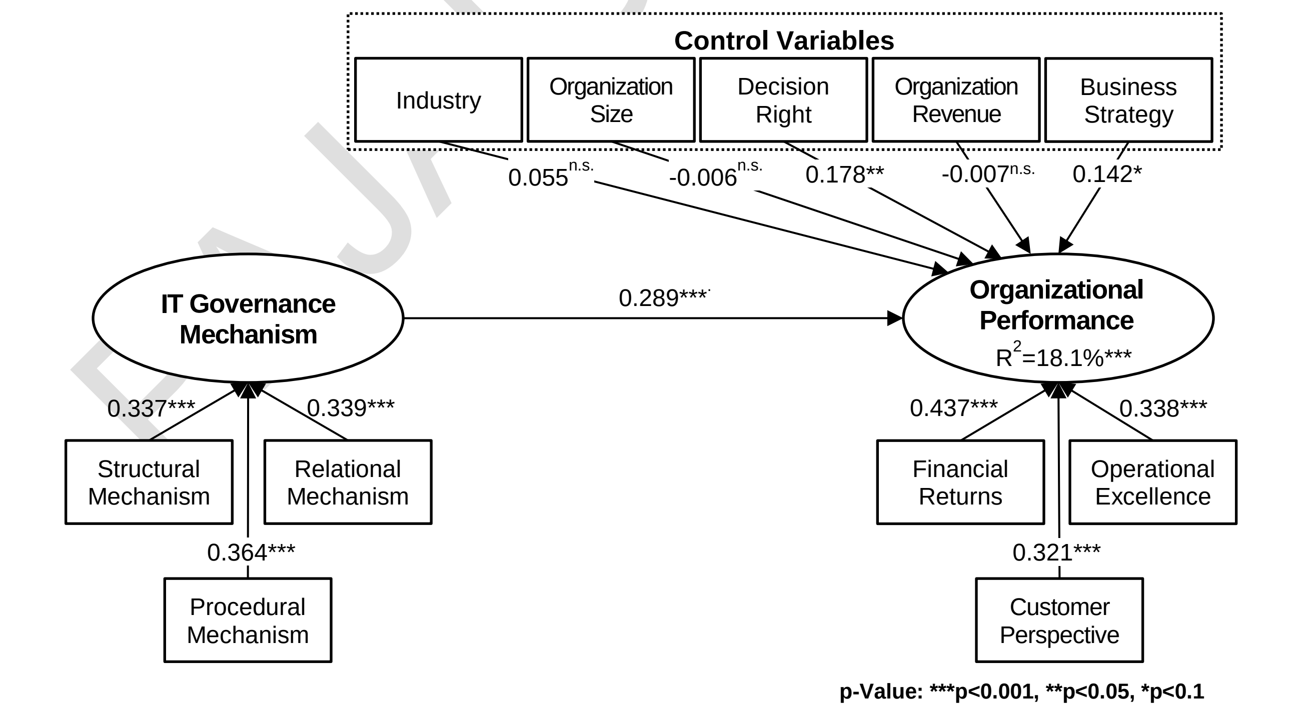

Figure E.2 – Result of Path Analysis without Mediator

Appendix F – Post Hoc Analysis

Table F.1 – Alternative Model of IT Value with Single Representative

Model	Path	Standardized Path Coefficient (ρ-Value)
Original Model	*ITGM* -> IT Value	0.661 (0.000)
	IT Value -> OP	0.305 (0.000)
Cost Efficiency as IT Value	*ITGM* -> IT Value	0.592 (0.000)
	IT Value -> OP	0.274 (0.003)
Agility as IT Value	*ITGM* -> IT Value	0.543 (0.000)
	IT Value -> OP	0.202 (0.036)
Security and Privacy as IT Value	*ITGM* -> IT Value	0.538 (0.000)
	IT Value -> OP	0.213 (0.017)
Competency as IT Value	*ITGM* -> IT Value	0.631 (0.000)
	IT Value -> OP	0.301 (0.000)

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