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The effects of IT capabilities and delivery model on cloud computing success and firm performance for cloud supported processes and operations

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ABSTRACT

Our study examines the effect of relational, managerial and technical IT-based capabilities on cloud computing success; and analyzes how this success impacts firm performance with respect to the processes and operations supported by cloud computing. Additionally, we investigated the complex relationships that exist between IT capabilities and the public, private and hybrid cloud delivery models. Data from a sample of 302 organizations were collected to empirically test our model. The results indicate that a relational IT capability is the most influential factor to facilitate cloud success compared to technical and managerial IT capabilities. Furthermore, an evaluation of the interrelationships indicates that the public and hybrid cloud delivery models may be more dependent on relational IT capabilities for cloud success while the flexibility and agility of the firm's internal IT (technical IT capability) facilitates the public cloud. We discuss how IT-based capabilities may be used to leverage cloud delivery models to positively influence the successful implementation of cloud computing, and ultimately, firm performance for the processes and operations supported by the cloud.

1. Introduction

Cloud computing is quickly changing the nature of business and represents a projected $3.3 trillion transformation in the computing environment (Ballmer, 2010). A large number of organizations and government agencies are expected to rely on the cloud for more than half of their IT services by 2020 (Gartner, 2011). About 90% of business and technology leaders expect to implement some type of cloud computing by 2015 (Berman, Kesterson-Townes, Marshall, & Srivathsa, 2012) leaving many organizations scrambling to develop coherent plans for successful cloud deployment (Windstream, 2014). Cloud computing represents a transformational shift in IT that is rapidly changing the way in which organizations manage and deliver IT services over the internet (Shawish & Salama, 2014). As cloud computing becomes mainstream with a broad set of enterprise applications, the role of IT in organizations is strategically shifting toward reliance on external suppliers of infrastructure, software and services (Fauscette, 2013).

Many organizations are transitioning to cloud computing because it offers dynamic and scalable resources using internet-based services like Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Service (Paas) (Sharma, 2014). As organizations move more of their business functions into the cloud, some are reporting benefits like geographic expansion, better collaboration among business units, improved customer service and increased agility, as well as time to market and process efficiency (Windstream, 2014). However, despite the cloud's promise to enable organizational flexibility and agility, many organizations face challenges developing a strategy for the execution and deployment of cloud resources (e.g., internal assessments, vendor selection) (Windstream, 2014). For example, the pace at which organizations are migrating to cloud technologies suggests a shorter IT planning horizon which may have implications for the success of cloud computing (c.f., Newkirk, Lederer, & Johnson, 2008). This presents a dilemma because firms in certain industries that are slower to adopt cloud-based services will likely find themselves at a competitive disadvantage (Windstream, 2014).

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Recent research has examined the direct relationship between IT capabilities and cloud deployment success (Garrison, Kim, & Wakefield, 2012). However, it is likely that greater complexity underlies the relationships among the factors involved in determining the relative value of IT capabilities (Bharadwaj, 2000) and the role each plays in positively affecting firm performance. Within the context of cloud computing our study examines how the three main cloud delivery structures (i.e., public, private and hybrid) interact with a firm's internal IT capabilities to influence cloud success and firm performance with respect to the processes and operations supported by cloud computing. Because a firm's IT capabilities represent the ability to combine physical and human capital in ways that drive performance (Teece, Pisano, & Shuen, 1997), unraveling the relationships between the various cloud delivery structures and IT capabilities will lead to a greater understanding of how IT capabilities are effectively utilized in changing technological environments. When organizational technology experiences dynamic shifts, such as the move to cloud computing, we expect that the various IT-based capabilities will play prominent and distinct roles in the organizational response.

One objective of our study is to examine the relationship between firm-specific IT capabilities, cloud success and firm performance because the value of IT continues to be of importance to both practitioners and researchers (e.g., Kohli & Grover, 2008; Melville, Kraemer, & Gurbaxani, 2004; Santhanam & Hartono, 2003). Research also argues that the role of IT capabilities is more complex than is suggested by the direct effect models in the literature (Fink, 2011). Therefore, the present study examines the more complex interweaving of the three IT-based capabilities with the three cloud delivery models to clarify their differential influence on the success of cloud computing. We examine relational, technical and managerial IT capabilities in a cloud success model and assess how those relationships may be affected by the public, private or hybrid cloud delivery choice. Our study goes beyond the basic model of Garrison et al. (2012) and contributes to the understanding of how organizations respond to technological shifts with the internal IT capabilities at their disposal. A recent review of cloud studies (Venters & Whitley, 2012) recommends ongoing research that examines the capabilities that are necessary for firms to effectively implement and use cloud computing.

Innovative technology adoptions such as cloud computing present challenges to the organization's bottom line (Zhuang, 2005). To this point, Lim and Oh (2012), claim that cloud delivery models may impact differently the effects of IT capabilities on cloud success. Therefore, research that focuses on *how* a firm uses its capabilities to successfully meet those challenges will inform others about the specific IT capabilities that will more likely lead to cloud success. The research questions addressed in our study include: (1) What is the distinct influence of relational, technical and managerial IT capabilities on cloud implementation success? (2) How do the relationships in the model differ according to the cloud delivery structure that is chosen? The research model is tested using data collected from a global sample of 302 organizations that have adopted one of three general types of cloud delivery structures: public cloud, private cloud, or hybrid cloud. The empirical results indicate that, in general, relational IT capabilities are the most influential in cloud success. However, the results also show the specific ways in which firms combine their IT capabilities to best facilitate public, private or hybrid cloud delivery structures. While relational IT capability offers advantages for private and hybrid cloud delivery, technical IT capabilities are an important facilitator of the public cloud, and managerial IT capability is fundamental in any cloud delivery approach.

2. Literature review

2.1. IT-based capabilities and resource-based theory

In general, capabilities represent the ability of the organization to combine resources (i.e., physical and human capital) in ways that result in greater performance (Teece et al., 1997). Capabilities also describe the ability to combine unique competencies with firm resources to diversify the firm from competitors (Teece et al., 1997). A variety of IT-based capabilities have been identified and include managerial IT skills, technical IT skills and IT infrastructure (Byrd & Turner, 2001; Dehning & Stratopoulos, 2003; Mata, Fuerst, & Barney, 1995), IT-enabled processes (Bharadwaj, 2000), and relationship infrastructure and IT business experience (Bhatt & Grover, 2005; Fink, 2011; Zhang, Sarker, & Sarker, 2008). IT capabilities encompass both IT-based assets and routines (Ravichandran & Lertwongsatien, 2005; Sambamurthy & Zmud, 2000). A common finding among the research examining IT capabilities is the significant positive relationship between different IT capabilities and performance or competitive advantage (e.g., Bharadwaj, 2000; Caldeira & Ward, 2003; Dehning & Stratopoulos, 2003; Santhanam & Hartono, 2003; Zhang et al., 2008).

Since capabilities are considered organizationally embedded, non-transferable and firm-specific (Dehning & Stratopoulos, 2003; Makadok, 2001), they have the attributes that, when leveraged, may lead to firm level competitive advantage. IT-based capabilities are commonly studied using resource-based theory (RBV) which views the firm in terms of its available resources and how those resources may be combined in effective growth strategies and firm diversification (Wernerfelt, 1984). Management researchers state that firm performance originates from firm-specific capabilities and assets that, along with isolating mechanisms, helped to establish and sustain competitive advantage (e.g., Feeny & Ives, 1990; Nelson & Winter, 1982; Prahalad & Hamel, 1990; Teece, 1988; Wernerfelt, 1984). The resource-based approach in explaining the sources of competitive advantage in the firm often highlights firm-level efficiency advantages (Teece et al., 1997), which may be achieved when IT capabilities are sufficiently leveraged.

It has been noted that direct effects models in prior research clearly show that IT capabilities contribute to firm advantage; however, due to their simplicity they fall short in explaining the complexities that underlie the relationship (Fink, 2011). Recent research on resource-based (i.e., business and managerial) and process-based (technical and behavioral) IT capabilities concluded that different structural mechanisms are responsible for determining the value of different IT capabilities. For example, while technical and behavioral capabilities did not directly influence IT-based competitive advantage, they had a significant indirect influence via their effect on physical and managerial capabilities (Fink, 2011). This supports the notion that the value of different IT capabilities may result from more complex interrelationships and causally ambiguous processes (Bharadwaj, 2000). While RBV is fundamental to establishing the link between IT capabilities and performance or advantage, research that examines IT capabilities in more complex relationships will clarify the strategic value of IT.

2.2. Cloud computing

Cloud computing is defined as a shared pool of on-demand computing resources that are accessible over the internet and dynamically configured to optimize resource utilization (Garrison et al., 2012; Shawish & Salama, 2014). Cloud computing offers users ubiquitous and convenient access to a shared pool of computing resources consisting of networked servers, storage and software applications that are configured based on user requirements, rapidly provisioned to correspond with demand, and made available on a pay-per-use basis (Garrison et al., 2012; Mell & Grance, 2011). Essentially, cloud computing represents the mode by which IT services are delivered over the internet on a scalable, virtual infrastructure using the latest communication technologies; allowing businesses and users access to shared resources in a service format tailored to their needs without having to buy, install, maintain, and manage those computing resources.

Three main delivery models exist for cloud services including the public cloud, the private cloud and the hybrid cloud (Cearley & Reeves, 2011). To summarize Mell and Grance (2011), in general, the public cloud provider operates a shared-service environment that is accessible over the internet to any buyer where data centers are owned and maintained by the service provider. In comparison, the private cloud is built and operated solely for the contracting firm, may be located on the firm's premises, and offers the firm a high level of control over data, security, applications and systems performance. A hybrid cloud environment combines both the public and private cloud service delivery models in situations where a firm might require the extra capacity of a public cloud for temporary workload spikes while primarily using the private cloud for mission critical services. In sum, the cloud delivery options offer the firm choices to balance IT savings and scalability with security. Since the three cloud delivery models are relatively standardized, this context presents an opportunity to examine the functional roles of IT capabilities and how they may be strategically used to influence the successful implementation of cloud-based services. The choice of cloud delivery model is a strategic business decision and should be closely examined (Fauscette, 2013).

Mell and Grance (2011), divided cloud services into three models: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). With SaaS, the buyer pays for the serviced based on the use of the application(s) as either a service on demand or through a subscription. The cloud vendor is solely responsible for any update or change in the application (Wang, Rashid, & Chuang, 2011) allowing the user to focus on core business activities. PaaS is a cloud-based service where vendors provide buyers with the computing platform that allows the buyer to create software applications without the complexity of having to purchase and maintain the requisite IT infrastructure. Buyers of PaaS access the computing platform and related development tools through a web browser which allows users to customize, deploy and test their newly developed applications without the administrative overhead of purchasing and managing the servers (Wang et al., 2011). With IaaS, vendors supply buyers with the requisite infrastructure to support their business operations, including the hardware, operating systems, storage, servers, and networking equipment in an on-demand service. Rather than purchasing and maintaining these services independently, buyers instead purchase those computing resources as a fully outsourced, on-demand service (Wang et al., 2011).

As yet, the number of empirical studies focusing on cloud computing is limited in the IS literature. A review of cloud computing (Venters & Whitley, 2012) has synthesized the research to date into two dimensions—technological and service. This framework is meant to distinguish users into those that desire the equivalence, variety and scalability (technical) benefits of cloud and those wanting the efficiency and simplicity (service) of cloud. Empirical studies have identified cloud computing risks that emerge from legal and technical complexity (Dutta, Peng, & Choudhary, 2013), and have examined security and privacy (Alzain, Soh, & Pardede, 2012; Talib, Rodziah, Abdullah, & Murad, 2012), cost efficiency (Mazhelis & Tyrvainen, 2012) and cloud adoption (Obeidat & Turgay, 2013). One study develops a basic direct effect model for IT capabilities and cloud deployment to show that capabilities are indeed essential precursors of an effective cloud implementation (Garrison et al., 2012).

More recently, cloud computing adoption studies have been conducted from both an individual and an organizational perspective. From an individual perspective, Park and Kim (2014) proposed and tested an integrated adoption model of mobile cloud services based on the extended Technology Acceptance Model. This study proposed user perceptions of mobility, usefulness, connectedness, security and service and system quality as key determinants that influenced a positive attitude in mobile cloud users. Results showed each user perception studied had a significant and positive impact on attitude.

With respect to cloud computing adoption studies conducted at an organizational level, Hsu, Ray, and Li-Hsieh (2014) developed a research model based on the technology-organization-environment (TOE) framework of innovation diffusion theory. They found perceived benefits, business concerns and IT capability as important factors of cloud computing adoption. Similarly, Oliveira, Thomas, and Espadanal (2014) examined cloud computing adoption in the manufacturing and service sectors. Cloud adoption was evaluated based on a technology, an organizational and an environmental context. Results revealed that organizations from different sectors (e.g., manufacturing and service) expressed different motives for adopting cloud computing. Further, manufacturers adopted cloud computing based on the technology's relative advantage, the firm's technology readiness and size. In contrast, service firms adopted cloud computing based on the technology's complexity and compatibility, the firm's technology readiness, top management support, and size. Since cloud computing is regarded as transformational to the firm (Venters & Whitley, 2012), our model continues the stream of research examining organizational capabilities in relation to cloud effectiveness.

2.3. Control variables

This study includes three control variables that may influence firm performance. These variables include firm size (e.g., number of employees and annual sales) and the industry in which the firm operates. By controlling for firm size and industry, we can minimize the variance in firm performance that may be influenced by these variables (Chae, Koh, & Prybutok, 2014). To this point, firms greater in size tend to have greater financial and labor resources that can lead to differences in firm performance (Chen & Tsou, 2012). Industry is included as a control variable to take into consideration the differences in performance that may be related to industry-specific characteristics (e.g., industry environment, market competition intensity) (Luo, Wieseke, & Homburg, 2012)

3. Research model and hypotheses

3.1. Research model

The research model in Fig. 1 shows the direct effects model as well as the expected relationships between IT capabilities, cloud success and firm performance. At the firm level, relational, technical and managerial IT capabilities are direct antecedents of cloud success and cloud success is an antecedent of firm performance. However, the strength and significance of these relationships are influenced by the three main cloud delivery models: public, private and hybrid cloud.

3.2. Hypotheses development

3.2.1. Managerial IT capability

Human IT resources represent intangible assets that are important antecedents of a firm's IT capabilities (Ravichandran & Lertwongsatien, 2005). Generally, human IT resources represent the training, experience, and employee insight (Barney, 1991)

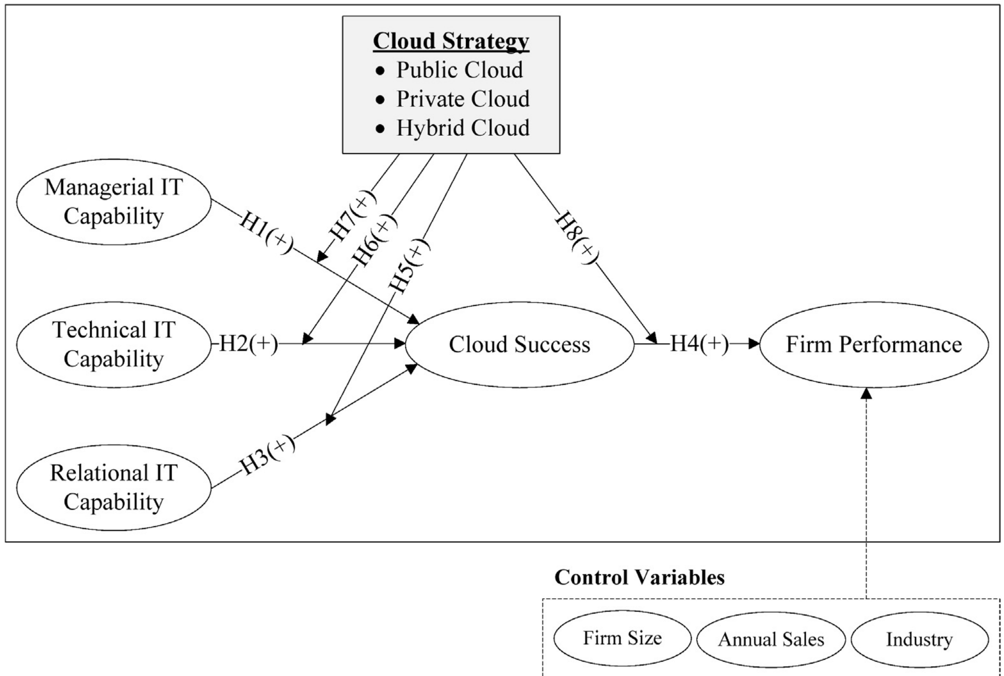

Fig. 1. Research model.

that develop one's technical and managerial skills or capabilities. Technical skills may include a systems-thinking approach to integrating emerging technologies into an existing IT infrastructure and managerial capabilities may include project coordination and leadership skills that expedite technology integration (Bharadwaj, 2000).

In the present study, managerial IT capability is defined as the extent to which IT managers have the necessary business acumen and technical skills to foresee emerging technologies and leverage them effectively in the alignment of business processes with organizational goals. A key determinant of a firm's successful implementation of a new system is the IT manager's ability to coordinate multi-faceted activities associated with the implementation effort (Sambamurthy & Zmud, 1992). It is the combination of foresight, business acumen and IT knowledge that enables the IT manager to optimize IT efforts that benefit the firm (e.g., increased IT capacity, decreased IT expenses). Capable IT managers are efficient and effective at integrating new technologies into existing business processes and do it in a more reliable and cost effective manner (Bharadwaj, 2000).

Prior studies have shown that IT managerial capabilities have a positive influence on competitive advantage and/or firm performance (e.g., Bhatt & Grover, 2005; Dehning & Stratopoulos, 2003; Fink, 2011; Ravichandran & Lertwongsatien, 2005). Additionally, resource-based theory (RBV) posits that firm capabilities represent resources that may be utilized to increase performance and competitive advantage (Wernerfelt, 1984). In our study, the overall effect of managerial IT capability on performance is mediated by cloud success. We define cloud success as the benefits ascribed to a firm in terms of the strategic, economic and technological gains resulting from a successful implementation. The benefits of cloud success are discussed in greater detail to come, but in summary they include greater attention to core competencies, access to key technologies and skilled personnel that may not be available internally, and a reduced risk of IT obsolescence. We propose that these efficiency gains must be attained prior to the realization of performance gains or competitive advantage. Thus, the extent to which cloud success is achieved depends upon the IT managerial capabilities in the organization and how they are leveraged, leading to the first hypothesis.

H1 *(:)*. Managerial IT capability is positively related to cloud success.

3.2.2. *Technical IT capability*

In the literature, IT technical capability refers to various features or aspects of a firm's IT abilities. For example, technical capability may represent the physical assets (e.g., computers, network equipment, and databases) that provide a firm with functionality in terms of its accessibility and range of shared information (Bharadwaj, 2000; Keen, 1991). A firm's technical capability may also represent the collective resources the firm possesses that provide it with a flexible and scalable foundation for requisite business applications (Niederman, Brancheau, & Wetherbe, 1991). Additionally, IT technical capabilities may include intangibles such as technical knowledge, firm-specific know-how, problem-solving processes, and/or business unit collaboration strategies that allow the firm to effectively and efficiently integrate new technologies (Ravichandran & Lertwongsatien, 2005).

In the present study, IT technical capability is defined as the ability to deliver technical solutions in a quick and effective manner that will enable the firm to efficiently integrate new IT into an existing infrastructure. The more capable the firm in integrating cloud services across business units, the quicker the firm will reduce IT expenses, increase IT capacity and free resources for strategic purposes–results indicative of cloud success. Often it is the unique characteristics of a firm's technical capability that enable it to implement new technology differently and exploit opportunities synergistically across business units (Reed & DeFillippi, 1990). A strong technical capability also reduces the complexities of integration and allows the IT department to deliver new technologies rapidly and efficiently (Ravichandran & Rai, 2000). A firm's distinct ability to integrate and deploy valuable resources sets it apart from other firms on performance measures despite having similar internal and external resources (Bharadwaj, 2000; Han, Lee, &

Seo, 2008). In sum, IT technical capability often has an important indirect influence on competitive advantage and performance.

Researchers posit that a firm's technical capability can be a source of competitive advantage when it enables business objectives such as improved cycle time (Keen, 1991) and streamlined business processes (Ravichandran & Lertwongsatien, 2005). This suggests that factors indicative of implementation success (e.g., reduced cycle time, steamlined processes) mediate the relationship between technical capability and competitive advantage. Relying on the attributes of IT technical capability discussed above and research indicating that IT capabilities influence performance via mediating factors, we posit that IT technical capability directly influences cloud success.

H2 *(:).* Technical IT capability is positively related to cloud success.

3.2.3. Relational IT capability

Four sources of advantage within inter-organizational relationships have been proposed including relation-specific assets, knowledge sharing routines, complementary resources and effective governance (Dyer & Singh, 1998). Inter-firm relation-specific assets are 'specialized assets' or strategic assets that are capabilities that have been developed by management for the purpose of creating and protecting competitive advantage (Amit & Schoemaker, 1993). Productivity gains have been realized when firms make relation-specific investments that create human asset specificity or co-specialization in which transacting partners develop specialized information, language and know-how that leads to effective communication and problem solving (Asanuma, 1989; Dyer, 1996).

If an inter-firm relationship develops into a strategic asset that provides the focal firm with market advantages, then governance or protection of that asset is key to sustaining the beneficial relationship. Informal social controls, such as trust, have been identified as an effective governance mechanism over specialized investments (Godfrey & Hill, 1995; Uzzi, 1997). At the inter-organizational level, trust is defined as the extent to which there is a reciprocal trust orientation among members (Zaheer, McEvily, & Perrone, 1998) and a confidence that the firm's vulnerabilities will not be exploited (Ring & Van de ven, 1992). In general, trust refers to one party having confidence in another party based on an alignment of value systems (Blois, 1999; Costigan, Ilter, & Berman, 1998). Trust signifies that a distinct association has been established among two parties and the development and maintenance of trust is a managerial ability or skill (Wade & Hulland, 2004) that represents an intangible the firm uses in the effort to bring goods or services to a market (Sanchez, Heene, & Thomas, 1996).

Researchers have demonstrated that trust is an important aspect of a strong organizational network and firms looking to build and maintain strong relationships tend to be efficient and effective in their cooperative efforts with strategic partners, which increases the likelihood for successful interactions (Johnston, McCutcheon, Stuart, & Kenwood, 2004). Inter-organizational studies often focus on the relational characteristics between firms in terms of strength and degree of trust and how it affects contract renewal, dissolution, and other performance outcomes (Gulati & Nickerson, 2008). Our study regards inter-firm trust as an indicator of the health and functioning of the firm-provider relationship, a measure of relational IT capability, since trust is a governance tool to protect an established relationship (Godfrey & Hill, 1995; Uzzi, 1997). When there is full reliance (trust) that the cloud vendor has provided services in full cooperation, collaboration and problem solving with the firm, then cloud success would be noted by increased IT economies of scale and productivity. The mere investment in IT (e.g., cloud technology) does not equate to an increase in firm performance, since IT investments can be wasted or implemented in a non-optimizing manner (Davern & Kauffman, 2004; Mooney, Gurbaxani, & Kraemer, 1996).

As a relation-specific asset, trust is an indicator of relational capability because it signifies that a viable relationship has formed between two parties and it is a mechanism that governs the inter-firm relationship. Inter-firm trust has also been shown to be an important factor in the success of outsourcing projects (Sabherwal, 1999) and it adds to the members' willingness to work collaboratively (Costigan et al., 1998). Thus, as an indicator of relational IT capability, we expect that trust is directly related to cloud success. Trust indicates that a relationship has formed and in the cloud context is the product of reliance, collaboration, and problem solving among two firms working for mutual benefit. Trust also augments the transfer of resources between partners, since the perceptions of opportunistic behaviors among firms are limited (Nelson & Cooprider, 1996). Additionally, transaction costs are lowered when organizations exhibit higher levels of inter-organizational trust resulting in the realization of higher relational benefits (Zaheer et al., 1998). Thus, we expect that a relational IT capability characterized by trust creates the environment for cloud success.

H3 *(:).* Relational IT capability is positively related to cloud success.

3.2.4. Cloud success and firm performance

Information system success has been widely investigated by IS researchers. Most notably, DeLone and McLean (1992) presented a model that provided a comprehensive review of various success measures including: System Quality, Information Quality, IS Use, User Satisfaction, Individual Impact, and Organizational Impact. The authors proposed that the six dimensions were interrelated rather than independent measures of success suggesting that IS success is a multidimensional and interdependent construct that requires the study of the interrelationships among the factors (DeLone & McLean, 1992, 2003).

Since the original DeLone and McLean Model of IS Success, several attempts have been made to empirically test the multi-dimensional relationships among the six success measures (e.g., Seddon & Kiew, 1994; Seddon, 1997). Based on empirical findings and suggestions by IS researchers, the model was revised to include a category labeled 'net benefits' (DeLone & McLean, 2003). Net benefits is a simplification of the success 'impacts' that include: group impacts (Ishman, 1998; Myers, Kappelman, & Prybutok, 1997), inter-organizational and industry impacts (Clemmons & Row, 1993; Clemmons, Reddi, & Row, 1993) and societal impacts (Seddon, 1997).

Additionally, a technology's success may also be examined in terms of the benefits attained by the adopting firm. For example, researchers have described success using three categories of attained benefits: strategic benefits, economic benefits, and technological benefits (Grover, Chen, & Teng, 1996; Lee, 2001). Strategic benefits refer to a firm's ability to focus on its core business and economic benefits represent a firm's ability to utilize the vendor's expertise and technological resources (Loh & Venkatraman, 1992a, 1992b). Technological benefits occur when a firm is able to access state-of-the-art technology while avoiding the risk of technological obsolescence (Grover et al., 1996; Loh & Venkatraman, 1992b). In line with the development of technology 'success' in the literature, we define cloud success as the benefits and advantages gained by a firm implementing cloud computing; a multidimensional construct that encompasses strategic, economic and technological benefits. We posit that the firm realizes cloud success when it can focus to a greater extent on its core business (strategic benefits), it has access to key technologies and skilled IT personnel (economic benefits), and it has reduced the risks of IT obsolescence (technological benefits).

Performance is the key outcome variable of any competitive strategy and in cloud environments the focus is on the success of the technology, because of its potential to greatly impact performance for the processes and operation affected by cloud computing. For example, firms without the internal IT resources for a competitive IT infrastructure would have greater access, and those drowning under IT maintenance and technology obsolescence costs would find relief. As newly available IT resources enable the firm to focus on core business competencies, greater operational performance, productivity and financial performance are likely. Firm performance increases when IT is used to support and enhance the business' core competencies (Ravichandran & Lertwongsatien, 2005). Similarly, firms with an effective IT capability experience greater financial performance over firms with lesser IT capability (Bharadwaj, 2000) as well as sustainable performance (Santhanam & Hartono, 2003).

We define and model cloud success as an outcome based on managerial, technical and relational IT-related capabilities that leverage cloud resources. As cloud technology is successfully implemented and employed, firm performance, for the processes and operations impacted by cloud computing, would be positively influenced since the effective use of firm resources positively influence firm performance (Clemmons & Row, 1991; Powell & Dent-Micallef, 1997), leading to the following:

H4 *(:).* Cloud success is positively related to firm performance.

3.2.5. The moderating effect of the cloud delivery model

The cloud delivery models (i.e., public, private and hybrid) represent different configurations of organizational and cloud provider resources. The cloud delivery model can influence the relationship between a firm's IT capabilities and its cloud success (Lim & Oh, 2012). For example, in a public cloud the vendor operates a shared-service environment where the infrastructure and applications are off-premises and owned by the vendor. While in-house IT expenses are often minimized in the public cloud, public clouds pose the highest security and control risks (Julisch & Hall, 2010). Firms have learned from the WikiLeak's case (Sternstein, 2011) that the public cloud model may expose them to greater risks, which may limit the firm's cloud success if their IT capabilities are not effectively deployed.

Thus, it is likely that firms using the public cloud will have greater interactions with the service provider since the public cloud offers the lowest level of control and data centers are located at the provider's site. Yoon and Oh (2013) claimed that both the manager's cloud computing knowledge and his/her ability to maintain a trusting relationship with the cloud vendor are key drivers of successful public cloud implementation. Additionally, firms that outsource an IT function (such as ERP) will interact with the vendor on a more frequent basis and therefore the role of the vender becomes more critical (Peng & Gala, 2014).

In contrast, a private cloud solution is fully owned by the firm which has full control over the data, services and infrastructures (Geczy, Izumi, & Hasida, 2013) and is likely to have the least number of issues related to integration, customization and availability (Geczy, Izumi, & Hasida, 2012), and thus would require fewer relational resources allocated to the vendor. Because a hybrid cloud represents a mixture of public and private solutions in which non-critical services are outsourced to a public cloud provider (Sotomayor, Montero, Llorente, & Foster, 2009), the firm's relationship with the vendor is not likely to be as extensive and essential as that of a public cloud adoption, and yet not as limited as in a private cloud. Therefore, we investigate if the model's paths would differ according to the type of cloud implemented (public, private or hybrid). It is expected that the relationship between Relational IT Capability and Cloud Success will differ among the public, private and hybrid cloud structures.

H5 *(:).* There is a significant difference in the relationship between relational IT

3.2.6. Capability and cloud success according to the cloud delivery model

A firm's technical capability represents the resources the firm possesses for a flexible and scalable foundation for business applications (Niederman et al., 1991) and may include intangibles that allow the firm to effectively and efficiently integrate new technologies (Ravichandran & Lertwongsatien, 2005). Flexibility and agility characterize technical IT capability which involves the firm's ability to quickly integrate new IT in order to realize greater IT economies of scale. We expect that the relationship between technical IT capability and cloud success will differ among the cloud delivery models since a lack of an on-site physical IT infrastructure may motivate some firms to employ the public cloud, for example. Other firms with scalable and flexible infrastructures may employ specific cloud services for reasons of greater performance and cost savings.

Kim and Kim (2013) claimed that a firm's technical capability might be the strongest IT capability leading to successful implementation for a number of information technologies, including cloud computing. However, the strength of the relationship between the different IT capabilities and cloud success may be dependent upon the cloud delivery model. For example, when implementing services from a public cloud a firm may need greater managerial and relational resource allocations to the vendor, compared to technical capability because in a public cloud the firm's IT needs (i.e., infrastructure, services, resources) are outsourced (Hoffman & Woods, 2010) and the firm is less dependent on in-house IT functions. In contrast, private cloud implementations require in-house maintenance, management and up-dating expertise (Geczy et al., 2013); technical capabilities that may not be necessary in public cloud models that outsource these functions, or only to a limited extent as in the hybrid cloud. Research suggests that a more technical capability is required compared to managerial when the cloud service is delivered from the private cloud (Kim & Kim, 2011), or hybrid cloud because valuable core data and services should be in-house with separation at both physical and logical levels (Loganayagi & Sujatha, 2011) from external entities. Additionally, technology alignment, integration and customization issues are associated with cloud adoption (Geczy et al., 2012) and may create technological hindrances for firms that opt for greater security and control in private and hybrid cloud implementations. Therefore, we hypothesize the following:

H6 *(:).* There is a significant difference in the relationship between technical IT capability and cloud success according to the cloud delivery model.

Capable IT managers efficiently and effectively integrate new technologies into existing business processes (Bharadwaj, 2000) and effectively coordinate multi-faceted activities in the implementation (Sambamurthy & Zmud, 1992). Research indicates that a coordinated planning and deployment of information technologies is necessary to obtain operating efficiencies (Georgantzas & Katsamakas, 2010) and the adoption of cloud solutions should be managed in a balanced manner (McKinney, 2010). Moreover, because the adoption of cloud computing is similar to outsourcing, managers with outsourcing expertise would have greater competence implementing a cloud solution (Geczy et al., 2013). Thus, it is likely that the managerial IT capability would be related to cloud success; however, the intensity of that relationship may not be similar across the cloud delivery models.

For example, a firm using a public cloud service may focus its management efforts cultivating a relationship with its cloud service provider (Yoon & Oh, 2013), and may not effectively manage the risks associated with the public cloud such as the loss of control over firm data and infrastructure (Anthes, 2010; Hoffman & Woods, 2010). A firm's data are susceptible to significant security risks when hosted by external vendors and accessed over the internet or mobile networks (Geczy et al., 2013), as occurs with the public and hybrid cloud. Hence, public and hybrid cloud adoptions would likely require a higher degree of managerial oversight compared to private clouds that inherently minimize security risks (Hamlen, Kantarcioglu, Khan, & Thuraisingham, 2010). For example, greater managerial oversight of data encryption, updates, deletes and backups would be crucial when IT functions are wholly or partially outsourced (Geczy et al., 2012). Cloud vendors are general-purpose oriented and not likely to provide solutions closely tailored to the needs of firms (Geczy et al., 2012). Hence, managerial capabilities may be more critical to achieve cloud success with public and hybrid adoptions, compared to a private cloud delivery model in which technical capabilities are likely to be more critical (Lim & Oh, 2012). Thus, the following hypothesis is proposed:

H7 *(:)*. There is a significant difference in the relationship between managerial IT capability and cloud success according to the cloud delivery model.

Finally, we expect that a successful cloud implementation would lead to firm performance advantages that differ according the cloud delivery model selected. The various types of cloud services in demand imply differences in cloud strategy among firms. Some firms may fully integrate a cloud infrastructure whereas others may use cloud for a small segment of business processes. The various delivery models are likely to result in different success outcomes post implementation (Yoon & Oh, 2013), which could impact firm performance. For example, the public cloud may increase problems and contribute to a firm's economic losses (Bright, 2011) such as through the loss of customer data (Clark, 2011) or service outages that may negate the benefits of the public cloud implementation.

Additionally, the successful performance of a cloud solution is associated with the available IT resources of the firm (Geczy et al., 2013) that can be allocated to the cloud implementation process. A firm with fewer IT resources may opt for the public model that has lower initial costs, but may not be cost efficient over the long-term (Geczy et al., 2013) or may suffer from service availability and security issues that negatively impact firm performance. Moreover, the economic benefits of the public cloud may be limited to less than two-years (Morton & Alford, 2009). In contrast, the private cloud requires a greater investment of the firm's IT resources but is regarded as more cost efficient in the long-term (Geczy et al., 2013) and likely to positively impact firm performance. However, a successful hybrid cloud implementation may be more flexible in balancing the short and long-term costs (Geczy et al., 2013). Thus, the relationship between cloud success and its impact on firm performance is likely to differ among the cloud delivery models, leading to the following hypothesis:

H8 *(:)*. There is a significant difference in the relationship between cloud success and firm performance according to the cloud delivery model.

4. Methodology

4.1. Sample

Data were collected using on-site interviews, online participation, and telephone interviews to administer 3000 surveys to a random sample of companies from three sources: the Korea Composite Stock Price Index (KOSPI), the Korean Securities Dealers' Automated Quotation (KOSDAQ) and the Korea Foreign Company Association (FORCA) which lists more than 12,160 foreign companies. A total of 330 questionnaires were collected and 28 were subsequently discarded for incomplete responses or because the firm was not a cloud adopter.

4.2. The unit of analysis in this study is the firm.

We instructed the participating firms to indicate their primary cloud delivery structure. The breakdown of the 302 respondents by title, industry and cloud structure are shown in Table 1. A majority of the respondents consisted of high level employees represented by CEOs (12.9%), CFOs (19.9%), CIOs (20.5%) and CTOs (28.5%). A

Table 1
Respondent demographics.

Demographic categories	Frequency	Percentage
Primary industry		
IT	74	24.5
Manufacturing	60	19.9
Education	27	8.9
Logistic/Transportation	46	15.2
Service	41	13.6
Finance/Banking	52	17.2
Others	2	0.7
Location of corporate headquarters		
North America (U.S. and Canada)	75	24.8
Europe (German, France, U.K., Holland, etc.)	74	24.5
Asia (Japan, Korea, China, Singapore, etc.)	90	29.8
Australia	34	11.3
Africa	17	5.6
Others	12	4.0
Current position		
CEO	39	12.9
CFO	60	19.9
CIO	62	20.5
CTO	86	28.5
Senior IT Manager	49	16.2
Others	6	2.0
Number of full-time employees		
Less than 500	49	16.2
500–1000	70	23.2
1000–1500	78	25.8
1500–2000	48	15.9
2000–2500	37	12.3
Over 2500	20	6.6
Annual sales ($) for most recent year		
Less than 100 million	49	16.2
100–500 million	112	37.1
500–1 billion	97	32.1
Over 1 billion	44	14.6
Type of cloud computing service in use		
SaaS (Software as a Service)	129	42.7
IaaS (Infrastructure as a Service)	112	37.1
PaaS (Platform as a Service)	61	20.2
Main reasons of using cloud computing (multiple responses)		
Saving costs	124	41.1
Information sharing	101	33.4
Superior performance over in-house systems	84	27.8
Performance degradation of existing in-house systems	70	23.2
Others (e.g., vendor required)	8	2.6
Cloud delivery model		
Public cloud	139	46.0
Private cloud	91	30.1
Hybrid cloud	72	23.8
Length of time using cloud computing		
1–2 years	86	28.5
2–3 years	157	52.0
More than 3 years	59	19.5

Table 2
Construct correlations, consistency and reliability.

Construct	CR	Alpha	AVE	1	2	3	4	5	6	7p5pc	8
Relational IT capability	.91	.87	.55	**.74**							
Technical IT capability	.83	.71	.63	.30	**.79**						
Managerial IT capability	.84	.81	.52	.41	.38	**.72**					
Cloud success	.91	.90	.63	.47	.51	.57	**.79**				
Firm performance	.88	.78	.59	.32	.24	.43	.54	**.77**			
Firm size	1.00	1.00	1.00	−.12	−.06	−.08	−.010	−.05	**1.00**		
Annual sales	1.00	1.00	1.00	.26	.19	.24	.14	.21	.16	**1.00**	
Industry	1.00	1.00	1.00	.10	.10	.05	.07	.18	.20	.17	**1.00**

*Bold numbers on the diagonal are the square root of the AVE.

significant proportion of the respondents (66%) were senior level IS executives or IS managers while the remainder (i.e., CEO, CFO) were from the highest levels in the organizational hierarchy. It is likely that a move from in-house computing to a cloud solution would be an organizational strategy approved and authorized at the highest levels in the firm, and thus a focus of interest by high-level executives concerned with realizing the benefits of a cloud adoption. Hence, CEOs and CFOs would likely have informed perceptions about the success of an approved cloud strategy. Similarly, IT managers that implement a cloud solution would be responsible for performance outcomes of a cloud adoption, and thus would acquire perceptions related to how the cloud solution has impacted the firm's economic performance.

The industry with the greatest percentage of participants was IT (24.5%) followed by manufacturing (19.9%), and the location of participating firms was diverse with respondents from Asia (29.8%), North America (24.8%), and Europe (24.5%). The main reasons given for using cloud computing included (respondents chose all that applied): cost savings (41.1%), information sharing (33.4%), performance upgrades (27.8%), and to offset the deficiencies of in-house systems (23.2%). The public cloud was the most utilized structure (46%) among the respondents followed by the private cloud (30%) and hybrid cloud (24%).

4.3. Measures

The survey instrument was developed using items adopted and/or adapted from previous studies and is included in Appendix A. Some items were modified to reflect cloud computing as the point of reference. Relational IT Capability was measured using items adapted from Zaheer et al. (1998) and Han et al. (2008). Items measuring Technical IT Capability and Managerial IT Capability were derived from Han et al. (2008) and Ravichandran and Lertwongsatien (2005).

Firm Performance measures were adopted from Nagpal and Lyytinen (2010) and Ravichandran and Lertwongsatien (2005). For the purpose of this study, Firm Performance is evaluated in the context of the processes and operations impacted by cloud computing. Cloud Success items were developed using adapted measures from Grover et al. (1996), Han et al. (2008), and Lee (2001). Participants responded with their level of agreement on a 5-point Likert-type scale, ranging from "1" (strongly disagree) to "5" (strongly agree). In selecting a cloud delivery structure (public, private or hybrid), the respondents were instructed to indicate their primary mode for business activities.

Three control variables were measured based on the method used in the literature. For example, similar to Mithas, Ramasubbu, & Sambamurthy (2011), we assessed Firm Size using an ordinal scale based on the number of employees in a firm (1 = less than 500 employees, 2 = 500–999, 3 = 1000–1499, 4 = 1500–1999, 5 = 2000–2499 and 6 = 2500+) and Annual Sales (1 = less than 100 million, 2 = 100–499 million, 3 = 500–1 billion, and 4 = over 1 billion). Then, we used an indicator variable (1 = service and 0 = manufacturing) in order to code the industry.

4.4. Data analysis

4.4.1. The measurement model

The research model was analyzed using SmartPLS 2.0 (Ringle, Wende, & Will, 2005) to assess the psychometric properties of the measurement items while simultaneously estimating the paths of the structural model. The bootstrapping procedure using 500 re-samples of the original 302 case dataset was applied to achieve a stable set of standard error estimates. First, the reliability and validity of the scales and measurement items were evaluated and the composite reliability (CR) values and Cronbach's alpha in Table 2 show all values were above the acceptable 0.7 threshold (Nunnally, 1978). The CR values ranged from 0.83 to 0.91 and Cronbach's ranged from 0.71 to 0.90. The Average Variance Extracted (AVE) is a common measure of convergent validity and all AVE values in Table 2 were above the recommended minimum of 0.50 (Fornell & Larcker, 1981) indicating that at least 50% of measurement variance was captured by the latent construct (Chin, 1998).

Discriminant validity is supported in Table 2 where the square root of the AVE of each latent construct, bolded on the diagonal, is greater than the inter-construct correlations in the related columns and rows. The inter-item correlations are all below the .90 threshold (Bagozzi, Yi, & Phillips, 1991) indicating the distinctness of each construct. The table of loadings and cross-loadings (Table 3) shows each item loading highest on its assigned latent construct. However, several items were below the 0.7 loading recommendation (Nunnally, 1978) on their construct and were eliminated from further analysis, including one item in Relational IT Capability (RC8), Managerial IT Capability (MC1) and Performance (Perf5). Each item that was retained demonstrated sufficient convergent validity as indicated by the high t-values associated with the item's loading on its related factor in the outer model (see Appendix A). The variance inflation factor (VIF) test for excessive multicollinearity among the five latent constructs showed all VIF measures below the 5.0 minimum (Kline, 1998), ranging from 1.87 to 2.58.

4.4.2. The structural model

The results of the direct effect model are shown in Table 4 and Fig. 2. Managerial and Technical IT Capability are significantly related to Cloud Success (H1: $\beta = 0.373$, $p < 0.001$; H2: $\beta = 0.462$, $p < 0.001$, respectively). Relational IT Capability also shows a significant ($\beta = 0.527$, $p < 0.001$) positive effect on Cloud Success supporting H3. Furthermore, Cloud Success is significantly related to Performance (H4: $\beta = 0.531$, $p < 0.001$). IT-based capabilities explain a large portion (62.8%) of the variance in Cloud Success and the model accounts for 29.7% of the variance in Performance. Overall, the results show that managerial, technical, and relational IT capabilities facilitate cloud success and cloud success has a positive effect on performance.

Table 3
Loadings and cross-loadings.

	Relational capability	Technical capability	Managerial capability	Cloud success	Firm performance	Firm size	Annual sales	Industry
RC1	**0.798**	0.128	0.186	0.089	0.087	0.044	0.090	0.264
RC2	**0.816**	0.148	0.155	0.140	0.157	−0.007	0.082	0.344
RC3	**0.741**	0.254	0.141	0.027	0.041	−0.020	0.056	0.136
RC4	**0.723**	0.227	0.042	0.093	0.044	−0.027	0.056	0.066
RC5	**0.732**	0.238	-0.003	0.088	0.215	−0.060	0.039	0.123
RC6	**0.766**	0.047	0.175	−0.099	0.120	0.060	0.420	0.013
RC7	**0.745**	0.117	0.175	0.022	0.237	−0.046	0.000	0.036
RC8	**0.598**	0.279	0.506	−0.158	−0.064	0.005	−0.062	0.217
TC1	0.150	**0.752**	−0.032	−0.001	0.102	0.053	0.258	0.031
TC2	0.026	**0.836**	0.088	0.186	0.181	0.001	−0.130	0.109
TC3	0.293	**0.781**	0.162	0.279	0.270	0.074	0.110	-0.011
MC1	0.087	0.044	**0.544**	0.091	0.321	0.064	−0.197	0.455
MC2	0.199	0.074	**0.756**	0.155	0.014	0.042	−0.096	−0.037
MC3	0.286	0.072	**0.781**	0.211	0.107	0.049	0.015	0.244
MC4	0.292	0.243	**0.743**	0.380	0.006	0.211	0.110	0.077
MC5	0.319	0.204	**0.763**	0.288	0.240	0.008	0.273	0.063
CS1	0.294	0.221	0.104	**0.837**	0.353	−0.010	0.199	0.182
CS2	0.336	0.113	0.037	**0.830**	0.207	0.004	−0.187	0.013
CS3	0.288	0.096	0.043	**0.792**	0.337	0.175	0.120	0.110
CS4	0.288	0.160	0.091	**0.772**	0.313	−0.019	0.275	0.239
CS5	0.322	0.230	0.086	**0.767**	0.227	0.248	0.070	0.085
CS6	0.320	0.140	0.091	**0.760**	0.177	0.137	−0.009	0.240
Perf1	0.207	0.087	0.025	0.042	**0.791**	0.037	0.115	0.087
Perf2	0.253	0.168	0.040	0.092	**0.854**	−0.070	0.024	0.316
Perf3	0.257	0.161	0.154	0.074	**0.873**	0.037	−0.146	−0.031
Perf4	0.215	0.146	0.139	0.061	**0.799**	0.049	−0.082	0.006
Perf5	0.219	0.190	0.154	0.085	**0.455**	0.218	0.055	−0.129
Fs	0.061	0.284	0.071	−0.057	−0.011	**1.000**	−0.070	0.129
As	0.232	−0.223	−0.157	−0.164	0.427	−0.006	**1.000**	0.202
Ind	0.121	−0.071	−0.103	0.230	0.110	0.042	0.003	**1.000**

Table 4
Direct effect results.

Hypothesis	Path	Coefficient	S.E.	*t*-value	Results
H1	Managerial IT capability → cloud success	.373**	.081	6.29	Supported
H2	Technical IT capability → cloud success	.462**	.077	5.83	Supported
H3	Relational IT capability → cloud success	.527**	.1131	9.25	Supported
H4	Cloud success → firm performance	.531**	.056	8.32	Supported
Control variables	Firm size → firm performance	0.037	0.075	0.335	
	Annual sales → firm performance	0.117	0.101	1.084	
	Industry → firm performance	0.126	0.083	1.228	

** $p < .001$.

4.4.3. *Multi-group moderation effect*

After grouping the data by the cloud delivery model (i.e., public, private and hybrid) the direct effects model was tested for each of the three groups and the results are shown in Figs. 3–5. All of the main paths were significant for each group with variation in the strength of the paths according to cloud group. The path between Relational IT Capability and Cloud Success is greatest for the public cloud ($\beta = 0.498$), compared to the private cloud ($\beta = 0.258$) and

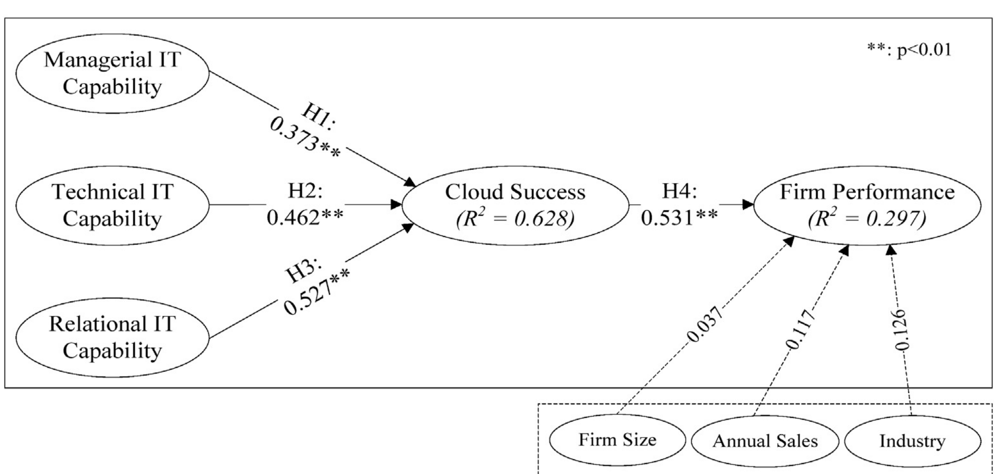

Fig. 2. Structural model with full dataset.

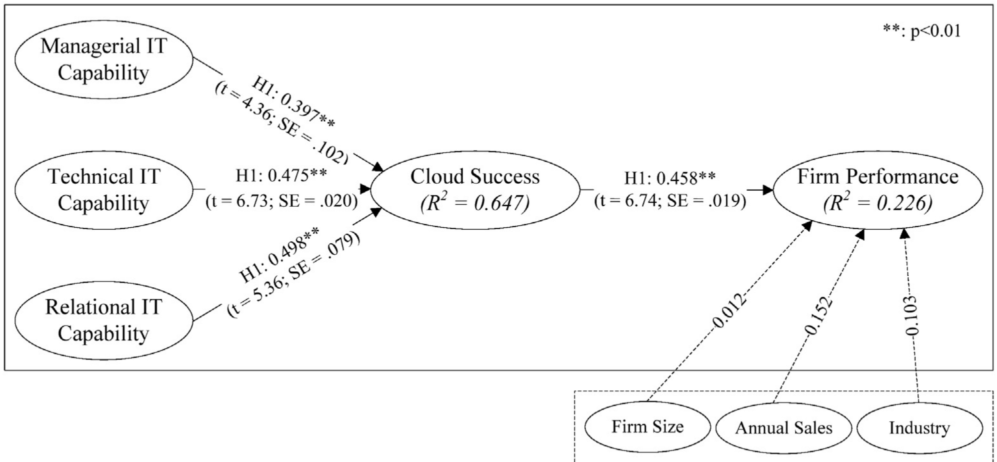

Fig. 3. Structural model for Public Cloud ($n = 139$).

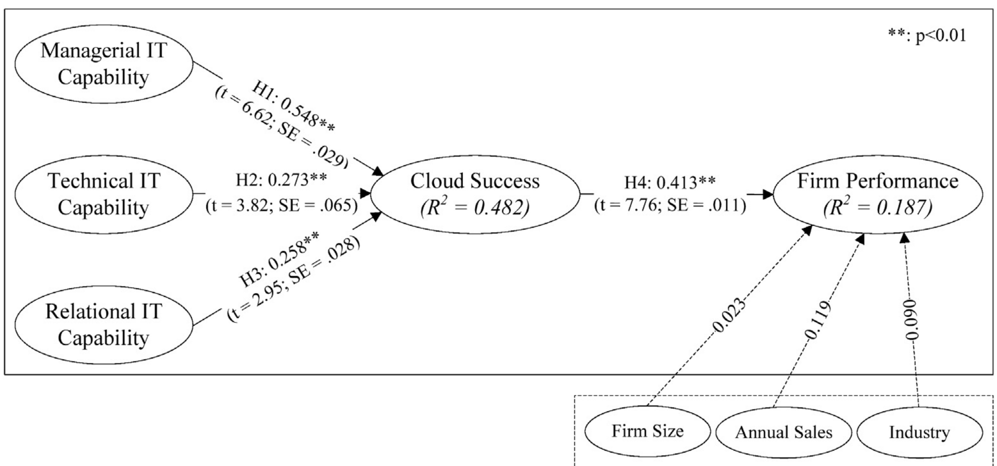

Fig. 4. Structural model for Private Cloud ($n = 91$).

hybrid cloud ($\beta = 0.455$). This result would be expected given that the public cloud structure entails greater dependency on vendor resources compared to the private and hybrid structures.

Similarly, Technical IT Capability is largest for the public cloud ($\beta = 0.475$) compared to the private ($\beta = 0.273$) and hybrid ($\beta = 0.415$) structures, which may be explained by the flexibility of a firm's internal IT such that outsourcing to the cloud is readily accomplished for firms choosing the public cloud. The results provide an initial indication that IT capabilities are uniquely employed according to the cloud delivery model implemented by the firm.

After evaluating the direct effects, a multi-group moderation analysis was conducted to determine if cloud delivery structure

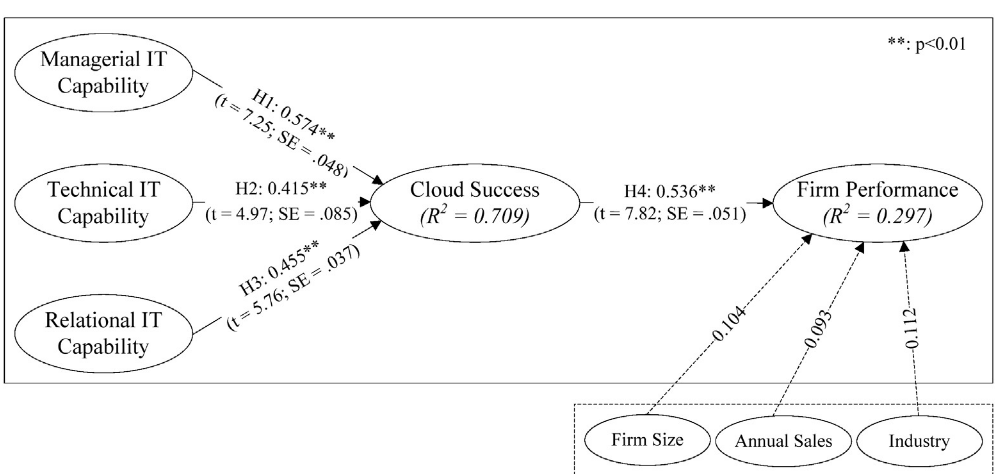

Fig. 5. Structural model for Hybrid Cloud ($n = 91$).

Table 5
Multi-group differences.

Cloud delivery model	Path	Coefficient	S.E	*t*-value	Group difference *t*-value (*p*-value)	Result
Public	Relational capability → cloud success	0.498**	0.079	5.367	2.401	Different
Private		0.258**	0.028	2.951	(0.008)	
Public	Technical capability → cloud success	0.475**	0.020	6.730	3.500	Different
Private		0.273**	0.065	3.827	(0.000)	
Public	Managerial capability → cloud success	0.397**	0.102	4.362	−0.927	Not different
Private		0.548**	0.129	6.627	(0.178)	
Public	Cloud success → firm performance	0.458**	0.019	6.747	1.798	Different
Private		0.413**	0.011	7.760	(0.037)	
Cloud delivery model	Path	Coefficient	S.E	*t*-value	Group difference *t*-value (*p*-value)	Result
Public	Relational capability → cloud success	0.498**	0.079	5.365	0.382	Not different
Hybrid		0.455**	0.037	5.762	(0.352)	
Public	Technical capability → cloud success	0.475**	0.020	6.730	1.945	Different
Hybrid		0.415**	0.019	4.794	(0.027)	
Public	Managerial capability → cloud success	0.397**	0.102	4.363	−1.217	Not different
Hybrid		0.574**	0.048	7.251	(0.113)	
Public	Cloud success → firm performance	0.458**	0.012	6.742	1.950	Different
Hybrid		0.536**	0.051	7.829	(0.026)	
Cloud delivery model	Path	Coefficient	S.E	*t*-value	Group difference *t*-value (*p*-value)	Result
Private	Relational capability → cloud success	0.258**	0.028	2.951	4.353	Different
Hybrid		0.455**	0.037	5.762	(0.000)	
Private	Technical capability → cloud success	0.273**	0.065	3.827	1.903	Different
Hybrid		0.415**	0.019	4.794	(0.029)	
Private	Managerial capability → cloud success	0.548**	0.129	6.627	0.173	Not different
Hybrid		0.574**	0.048	7.251	(0.432)	
Private	Cloud success → firm performance	0.413**	0.011	7.760	2.636	Different
Hybrid		0.536**	0.051	7.829	(0.005)	

** $p < .01$; Based on Keil et al. (2000), the *t*-values to test group differences are calculated: $t = \frac{\mathrm{Path}_{\mathrm{sample\_1}} - \mathrm{Path}_{\mathrm{sample\_2}}}{\left[\sqrt{\frac{(m-1)^2}{(m+n-2)} S.E.^2_{\mathrm{sample1}} + \frac{(n-1)^2}{(m+n-2)} S.E.^2_{\mathrm{sample2}}}\right]\left[\sqrt{\frac{1}{m} + \frac{1}{n}}\right]}$

(public, private and hybrid) had an effect on the path relationships in the primary research model. Using the model of Keil et al. (2000), *t*-value differences were calculated for each pair of cloud delivery models on the main paths, and the group differences are shown in Table 5. The moderation effect of Cloud Delivery on the path between Relational IT Capability and Cloud Success in H7 was partially supported. The multi-group analysis shows that there is a difference between the public and the private (*t*-value 2.401, $p = 0.008$), and the private and the hybrid (*t*-value 4.353, $p < 0.001$) for this path, while there is no difference for this path between the public and the hybrid (*t*-value 0.382, $p = 0.352$).

H6 is fully supported in that significant differences were found according to Cloud Delivery for the path between Technical Capabilities and Cloud Success. This result implies that although Technical IT Capability is considered a crucial factor for cloud success, its dynamic is dependent on the type of cloud delivery structure used by the firm. H7 that proposed differences in the Managerial Capability to Cloud Success path was not supported with the *t*-value differences between public and private −0.927 ($p = 0.178$), public and hybrid −1.217 ($p = 0.113$), and private and hybrid 0.173 ($p = 0.432$), respectively. This result implies that Managerial IT Capability is crucial for cloud success, regardless of the cloud delivery model employed.

Finally, H8 is fully supported as the result of the multi-group difference test in the relationship between Cloud Success and Firm Performance. This result indicates that firms would expect differing performance outcomes depending on their cloud delivery approach. Overall, the results indicate that a public, private or hybrid cloud delivery structure necessitates different combinations of IT capabilities for positive performance outcomes. While each cloud delivery mode has its own advantages, a firm's choice of cloud may be based on its overall IT strategy. Table 6 summarizes the results for testing hypotheses H5–H8.

5. Discussion

The empirical results of this study support the underlying concept that relational, managerial and technical IT capabilities are directly related to cloud success and indirectly related to performance. In the cloud delivery context, IT capabilities are mediated by the success of the cloud in their relationship with performance. Cloud success facilitates the process by which IT capabilities contribute to performance and supports the current view of mediated causality as underlying IT strategic value (Fink & Neumann, 2009; Ravichandran & Lertwongsatien, 2005). Since cloud success is a measure of how well the cloud structure and the firm IT capabilities work together (i.e., IT economies of scale, focus on core business processes, access to key technologies and personnel), it may serve as an indicator of IT value and a source of competitive advantage.

In the research model, relational IT capability is shown as the path of greatest magnitude in relationship with cloud success, compared to technical and managerial IT capabilities. The creation of a strong inter-organizational relationship is noteworthy because relatively little empirical work in the IT literature has examined the link between relational IT capabilities and indicators of IT value or competitive advantage, even though it has been acknowledged that relationships may be a key inter-organizational resource that explains differences in advantage among trading partners (Melville et al., 2004). Additionally, it has been noted that trust is a crucial requirement among firms and their cloud vendors (Venters & Whitley, 2012). One practical implication is that a firm with a strong relational IT capability has greater potential to realize value with a cloud implementation compared to a competitor lacking in this capability. A strong relational IT capability is characterized by a process in which procedures, negotiations and contractual processes have proceeded in the firm's best interests. Since the cloud provider is essentially out of the contracting firm's control,

Table 6
Summary of moderation effects.

Path	Cloud delivery model	Group difference	Results
H5: Relational IT capability → cloud success	Public Private	Different	Partially supported
	Public Hybrid	Not different	
	Private Hybrid	Different	
H6: Technical IT capability → cloud success	Public Private	Different	Fully supported
	Public Hybrid	Different	
	Private Hybrid	Different	
H7: Managerial IT capability → cloud success	Public Private	Not different	Not supported
	Public Hybrid	Not different	
	Private Hybrid	Not different	
H8: Cloud success → cloud success → firm performance	Public Private	Different	Fully supported
	Public Hybrid	Different	
	Private Hybrid	Different	

the inter-firm relationship is a critical dynamic since uncertainties, risks and opportunity costs would accompany outsourcing an IT function. It has been noted that cloud providers are not equivalent and the level of maturity varies widely in the market (Ambrose & Huntley, 2009). Since inter-organizational trust functions to smooth negotiations and reduce the transactions costs of inter-firm exchanges (Zaheer et al., 1998), we speculate that relational IT capability would create relative advantage for the contracting firm since mutual collaboration and cooperative negotiation processes comprise this capability.

The strong relationship between cloud success and firm performance is not surprising given the main reasons that firms migrate to the cloud are cost savings and performance gains (Garrison et al., 2012). A successful cloud implementation would reduce the risk of IT obsolescence and provide the firm with access to skilled IT personnel as well as other operational benefits, thus enabling firms to make better use of key resources and focus on core business activities. Firms may also increase IT competence by leveraging the vendor's IT capabilities and incorporating best practices into the organization.

5.1. Group differences

Our study also indicates that the relationships between relational, managerial, technical capabilities, success and performance may differ based on the cloud delivery model the firm employs. Configuration theory from organizational research stresses congruence among parts of the whole (Meyer, Tsui, & Hinings, 1993) and has been applied in IT research to show that interdependencies among IT capabilities result in congruence, which is one way to clarify the value of IT capabilities (Fink, 2011). That is, when IT capabilities are grouped into 'profiles' of capabilities then the strategic value of these distinct profiles may be ascertained by examining their causal roles.

In our study, the interrelationships of IT capabilities with cloud delivery models may typify specific profiles that an organization may use to achieve value or cloud success. Or, it may be that when a cloud delivery mode is chosen a 'profile' of interdependent IT capabilities emerges that works to align the cloud with organizational objectives. We further discuss our findings below, however future research would contribute to this stream by identifying and investigating profiles of IT capabilities and their relationships to IT value and firm performance.

5.2. Relational capabilities

Only partial support was found for the hypothesis of differences in the paths between Relational Capability and Cloud Success (H5) among the three cloud delivery modes. Both the public and private cloud and the private and hybrid cloud groups exhibited significantly different path coefficients, while there was no significant difference in the path among the public and hybrid cloud groups. This finding would be reasonable given that the public and hybrid cloud structure would entail greater dependency on vendor resources compared to a private structure in which the contracting firm retains control over systems and data.

For example, in a public cloud the vendor operates a shared-service environment where the infrastructure and applications are off-premises and owned by the vendor. The hybrid cloud is a composite of the public structure and would also have applications or processes within total control of the vendor. Thus, it is likely that firms using the public and hybrid cloud would have greater interactions with the service provider since these structures offer a lower level of control and often have data centers off-site. Although a firm opting for a public or hybrid structure may carefully evaluate cloud providers, concerns such as platform lock-in, reliability, security, privacy, and performance are likely to factor into the successful implementation of the cloud and resolving these issues would be dependent upon inter-organizational relational capabilities.

For firms choosing external IT (i.e., public and hybrid cloud), a strong relational capability would help alleviate such concerns thus implying that favorable conditions exist for constructive exchanges and shared governance that would enhance IT economies of scale. Research indicates that, in general, IT outsourcing success is positively influenced by a firm's internal IT capabilities which depend, in part, on the extent of interactions and relationship intensity with the provider (Han et al., 2008). Hence, relational IT capability is likely a source of strategic IT value and relative advantage for firms employing the public or hybrid cloud.

5.3. Technical capabilities

A firm's technical capability represents the resources the firm possesses for a flexible and scalable foundation for business applications (Niederman et al., 1991) and may include intangibles that allow the firm to effectively and efficiently integrate new technologies (Ravichandran & Lertwongsatien, 2005). Flexibility and agility characterize technical IT capability which involves the firm's ability to quickly integrate new IT in order to realize greater IT economies of scale. Thus, it is reasonable that public, hybrid and private cloud structures would involve differing scopes and magnitudes of technical capability since each involves varying infrastructures and/or provision of IT processes and services.

It would be expected that the choice of cloud delivery mode interacts with the technical capabilities of the contracting firm in order to bring success. Whereas a firm employing the public cloud may be totally dependent on the cloud vendor in the provision of infrastructure and process to support business activities, firms using a hybrid and/or private delivery mode infer partial dependence on a vendor's IT resources. One implication is that for firms utilizing the public cloud, the flexibility and agility of the firm's internal IT is a key to realizing success.

5.4. Managerial capabilities

Capable IT managers efficiently and effectively integrate new technologies into existing business processes (Bharadwaj, 2000) and effectively coordinate multi-faceted activities in the implementation (Sambamurthy & Zmud, 1992). It is reasonable, then, that managerial IT capability would be related to cloud success and our results indicate that the intensity of this relationship is similar across cloud delivery modes. Managerial capability also involves the ability to identify technologies that would provide business performance improvements which would be applicable to all cloud delivery modes since improvements are a key reason for moving to cloud technology.

5.5. Cloud success and performance

Results indicate that differences in performance may be attributed to the cloud structure implemented. The strongest path to performance is exhibited in the hybrid cloud structure which is a mixture of both public and private cloud applications. Hybrid clouds may offer the best economic model as well as maximum agility for firms that must retain data centers in-house in a private structure but still utilize the advantages of the public cloud. Achieving symmetry with both external and internal systems and maximizing benefits may involve using the public cloud for select low-risk workloads while reserving the private cloud for data and applications more sensitive to outages or data loss (Burns, 2012).

Thus, firms using the hybrid delivery mode to balance economic benefits with uncertainty and risk (e.g., security, availability) may realize the greatest benefits. If this result is replicable in other studies, it would suggest that a profile of IT capabilities based on the hybrid structure would be an important framework for organizations that seek to achieve an IT competitive advantage. The extent to which the hybrid cloud contributes to firm performance is interesting and worthy of future study as it indicates an advantage that a strictly private or public structure may not deliver.

5.6. IT-based capabilities and competitive advantage

Outsourcing IT to the cloud provides businesses with on-demand access to computing power, applications, and other IT resources as cost-effective alternatives to in-house IT. One of the many benefits is that it frees resources with which firms can apply to core competencies. Clearly, organizations anticipate value in migrating to the cloud yet the imitability of cloud services may prohibit organizations from believing that it can be a source of competitive advantage. Yet, research argues that relative advantage may be created and sustained when the technology leverages some other critical resource (Bhatt & Grover, 2005). These 'other' resources have been identified as complementary resources (e.g., organizational size, structure, culture) (Kettinger, Grover, Guha, & Segars, 1994) and IT-related capabilities (Bhatt & Grover, 2005).

Our study suggests that IT-related capabilities play a role in cloud success and performance, important components of a competitive strategy. The path differences discussed above imply distinctness in how the IT-based capabilities may be combined to leverage the different cloud structures. For example, a preponderance of relational IT capability compared to managerial or technical may create greater advantage for firms moving to the public cloud. Similarly, technical IT capability may be less strategic in the profile of IT capabilities of firms using the private cloud.

Rumelt (1984) argues that resource heterogeneity and supranormal performance may result when firms come to possess difficult to imitate resources (e.g., IT capabilities) and capability-building is a strategic mechanism for leveraging a firm's resources because capabilities are embedded and thus are unique and inimitable (Bhatt & Grover, 2005). Since technical, managerial and relational capabilities may act as isolating factors to distinguish firms, advantage would originate with IT capabilities that are developed, combined and applied in IT-related decisions (e.g., cloud). Future research that explores IT-based capabilities and their interdependencies and synergies would clarify how they contribute to IT value and advantage.

Research also suggests that IT combined with specific organizational and managerial capabilities produces value that may result in a sustained advantage (Hitt & Brynjolfsson, 1996; Bhatt & Grover, 2005). However, the idea of a sustained competitive advantage has come under scrutiny in discussions of complex adaptive business systems (CABS) which are comprised of numerous diverse parts and stakeholders (e.g., Tanriverdi, Rai, & Venkatraman, 2010). Cloud technologies might typify the complexity inherent in CABS solutions given the variety of products, services, business processes, and interdependencies that characterize the cloud.

Since complexity increases both internal and external uncertainties that threaten a firm's performance and sustained competitive advantage generally ranges for only five to seven years (Wiggins & Ruefli, 2005), organizational cloud systems may be hard pressed to achieve long-term advantage. While short-term competitive advantage may be realized when IT capabilities leverage a technology to success, sustainability of that advantage is unknown.

5.7. Limitations and future research

The research questionnaire was designed to reduce common model bias with reverse coded items; however, bias cannot be entirely avoided since the data was collected from single respondents that evaluated the independent and dependent variables concurrently. We performed Harman's single-factor analysis to determine whether the majority of the variance in the research model can be accounted for by one general factor (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The unrotated factor analysis using principal component analysis yielded five factors with the first factor accounting for 31% of the total variance. Since one factor did not account for the majority of the variance and multiple factors emerged, there is some assurance that common model bias did not unduly affect the results. However, additional remedies should be included in future studies to deter common model bias.

Additionally, the survey participants represented cloud adopters and did not include cloud providers. Future studies that include the provider's perceptions of the firm's IT-based capabilities might give insight into the interdependencies among the capabilities that lead to fit or congruence with a cloud delivery mode. A particular strength of our study is the collection of data representing a global perspective about cloud services and IT-related economies of scale (i.e., cloud success). A global sample that can be grouped into one of three distinct cloud delivery structures enhances the generalizability of the model and the implications that are drawn from the results.

Our study highlights IT-based capabilities and how they leverage technology assets for cloud deployment success. Future research should assess the actual impact cloud deployments success has on firm performance (e.g., sales, profit and process efficiency). Future researchers should consider examining additional inter-firm relationship variables as well as other firm-specific capabilities and how they influence technology success. A study of IT capability profiles and their relationship with technology assets would provide a holistic approach to understanding the complexities that underlie performance, advantage and strategic IT value. Furthermore, our study did not assess the contractual aspects of the cloud provider relationship (e.g., terms, longevity, security) which are likely to affect the research model's paths and add to the complexities surrounding IT strategic value. Finally, actual benchmarks for cloud implementation success and firm performance should be evaluated to provide a more objective measure of success and performance, which could strengthen our findings.

6. Conclusion

Overall, our study results indicate that organizations employ specific IT-based capabilities for a specific cloud delivery model in order to meet performance objectives. Relational, managerial and technical IT capabilities are uniquely employed in the cloud implementation to facilitate positive outcomes such as IT economies of scale, cost reductions and access to professional skills. The combination of firm-specific IT capabilities and the three specific cloud delivery structures implies that cloud success may be dependent on matching the IT capabilities. In a practical sense, our findings clarify the prominent role of relational IT capabilities in the public and hybrid cloud structures as well as the importance of technical IT capabilities for the public cloud.

Additionally, organizations that effectively employ the hybrid cloud may be poised to realize the greatest advantages. Management researchers have acknowledged that firm performance originates from firm-specific capabilities and assets that, along with isolating mechanisms, help to establish and sustain firm-level advantages (c.f., Nelson & Winter, 1982; Prahalad & Hamel, 1990; Teece, 1988; Wernerfelt, 1984). We surmise that the strategic value of IT-based capabilities may lie with how they are combined and how distinct combinations of relational, managerial and technical capabilities interact with internal and external IT assets to create competitive advantage.

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Appendix A. Appendix A. Constructs, Items and Descriptive Statistics

Construct	Source/Items	Mean	SD	Outer model *t*-value/loading	
Relational capability	Han, Lee, & Seo, 2008; Zaheer et al., 1998				
RC1	Our Cloud vendor makes decisions beneficial to my organization.	3.19	0.60	10.05	0.795
RC2	*We have had difficulty in obtaining assistance from our Cloud vendor. (R)	2.24	0.44	6.12	0.813
RC3	Our Cloud vendor has always been evenhanded in its negotiations with us.	3.19	0.81	7.08	0.738
RC4	Our Cloud vendor has shown willingness to profit at our expense. (R)	2.52	0.92	9.05	0.720
RC5	*Based on past experience we cannot, with complete confidence, rely on our Cloud vendor to keep its promises made to my organization. (R)	2.24	0.54	17.6	0.729
RC6	Our Cloud vendor is trustworthy.	3.95	0.53	14.07	0.763
RC7	We are reluctant to think that our Cloud vendor will secure our data. (R)	1.91	0.83	16.64	0.742
RC8	I trust that our Cloud vendor will provide us with reliable services. **(Item dropped)**	4.05	0.59	1.93	0.595
Technical capability	Han et al., 2008; Ravichandran & Lertwongsatien, 2005				
TC1	We have a process for IT standardization.	3.38	0.87	16.74	0.749
TC2	We have the ability to quickly integrate new IT into our existing infrastructure.	3.38	0.74	14.80	0.833
TC3	The complexity of our current systems does not restrict our ability to implement new technology.	4.09	0.44	12.87	0.778
Managerial capability	Han et al., 2008; Ravichandran & Lertwongsatien, 2005				
MC1	Our managers have the ability to exploit new technologies before our competitors. **(Item dropped)**	3.43	0.81	2.21	0.541
MC2	Our managers have the ability identify emerging technologies before our competitors.	3.52	0.93	4.79	0.753
MC3	Our managers lack the ability to leverage IT as a strategic core competence. (R)	2.00	0.63	5.69	0.778
MC4	Our managers have a strong understanding of how technology can be used to increase business performance.	3.95	0.74	8.13	0.740
MC5	*Our managers are slow to integrate emerging technologies into our business although the technologies can improve performance. (R)	2.05	0.67	9.01	0.760
Cloud success	Grover et al., 1996; Han et al., 2008; Lee, 2001				
	Since adopting Cloud computing:				
CS1	We have been able to focus strictly on our core business.	2.95	0.59	9.22	0.834
CS2	We have increased our access to skilled IT personnel.	2.67	0.66	10.99	0.827
CS3	We have enhanced our economies of scale with regards to our technological resources.	3.24	0.89	8.49	0.789
CS4	*Our IT expenses have increased significantly. (R)	2.19	0.68	8.58	0.769
CS5	We have reduced the risk of our IT infrastructure of becoming obsolete.	3.52	0.68	6.29	0.764
CS6	We have increased our access to key information technologies.	3.48	0.87	7.07	0.757

Construct	Source/Items	Mean	SD	Outer model *t*-value/loading	
Performance	Nagpal & Lyytinen, 2010; Ravichandran & Lertwongsatien, 2005				
Perf1	Our Cloud solution provides us with more accurate data.	4.05	0.59	11.56	0.788
Perf2	Our Cloud solution has increased the profitability of my business	3.24	0.54	10.90	0.851
Perf3	Our Cloud solution has increased our financial performance.	3.43	0.51	11.38	0.870
Perf4	Our Cloud solution has not increased our productivity. (R)	1.86	0.36	13.94	0.796
Perf5	Our use of the Cloud has decreased my firm's operational performance. (R) **(Item dropped)**	1.95	0.67	1.56	0.452

References

Alzain, M. A., Soh, B., & Pardede, E. (2012). A new model to ensure security in cloud computing services. *Journal of Service Science Research*, *4*(1), 49–70.

Ambrose, C., & Huntley, H. (2009). Vendor management for cloud-enabled outsourcing: Understand the fundamentals. *Gartner Inc.*, *25*, 2009 (September).

Amit, R., & Schoemaker, P. J. H. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, *14*(1), 33–46.

Anthes, B. (2010). Security in the cloud: Cloud computing offers many advantages, but also involves security risks. *Communications of the ACM*, *53*(11), 16–18.

Asanuma, B. (1989). Manufacturer–supplier relationships in Japan and the concept of relation-specific skill. *Journal of the Japanese and International Economies*, *3*(1), 1–30.

Bagozzi, R., Yi, Y., & Phillips, L. W. (1991). Assessing construct validity in organizational research. *Administrative Science Quarterly*, *36*, 421–458.

Ballmer, S. Seizing the opportunity of the cloud: The next wave of business growth. (2010). London School of Economics. ⟨http://www.microsoft.com/presspass/exec/steve/2010/10-05londonschoolofeconomics.mspx.⟩.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120.

Berman, S., Kesterson-Townes, L., Marshall, A., & Srivathsa, R. (2012). *The power of cloud: Driving business model innovation*. Somers, NY: IBM Institute for Business Value. ⟨http://www-935.ibm.com/services/us/gbs/thoughtleadership/ibv-power-of-cloud.html.⟩.

Bharadwaj, A. (2000). A resource-based perspective on information technology capability and firm performance: An empirical investigation. *MIS Quarterly*, *24*(1), 169–197.

Bhatt, G., & Grover, V. (2005). Types of information technology capabilities and their role in competitive advantage: An empirical study. *Journal of Management Information Systems*, *22*(2), 253–277.

Blois, K. J. (1999). A framework for assessing relationships. In *Proceedings of the 28th Annual Conference of the European Marketing Academy*. Berlin: Hummboldt Universitat.

Bright, P. (2011). Amazon's lengthy cloud outage shows the danger of complexity. *ArsTechnica*,. ⟨http://arstechnica.com/business/news/2011/04/⟩.

Burns, C. (2012). 2013: Year of the hybrid cloud. *Network World* (December).

Byrd, T., & Turner, D. (2001). An exploratory analysis of the value of the skills and IT personnel: Their relationship to IS infrastructure and competitive advantage. *Decision Sciences*, *32*(1), 21–54.

Caldeira, M., & Ward, J. (2003). Using resource-based theory to interpret the successful adoption and use of information systems and technology in manufacturing small and medium-sized enterprises. *European Journal of Information Systems*, *12*(2), 127–141.

Cearley, D., & Reeves, D. (2011). Cloud computing innovation key initiative overview. *Gartner Inc.*, *22*, 2011 (July).

Chae, H., Koh, C. E., & Prybutok, V. R. (2014). Information technology capability and firm performance: Contradictory findings and their possible causes. *MIS Quarterly*, *38*(1), 305–326.

Chen, J., & Tsou, H. (2012). Performance effects of IT capability, service process innovation, and the mediating role of customer service. *Journal of Engineering and Technology Management*, *29*, 71–94.

Chin, W. (1998). The partial least squares approach for structural equation modeling. In G. A. Marcoulides (Ed.), *Modern models for business research* (pp. 295–336). Hillsdale, NJ: Lawrence Erlbaum.

Clark, J. (2011). AWS cloud accidentally deletes customer data. *ZDNet*,. ⟨http://www.zdnet.co.uk/news/cloud/2011/08/10/⟩.

Clemmons, E. K., Reddi, S. P., & Row, M. C. (1993). The impact of information technology on the organization of economic activity: The "move to the middle" hypothesis. *Journal of Management Information Systems*, *10*(2), 9–35.

Clemmons, E. K., & Row, M. (1993). Limits to inter-firm coordination through information technology: Results of a field study in consumer goods packaging distribution. *Journal of Management Information Systems*, *10*(1), 73–95.

Clemmons, E. K., & Row, M. (1991). Sustaining IT advantage: The role of structural differences. *MIS Quarterly*, *15*(3), 275–292.

Costigan, R. D., Ilter, S. S., & Berman, J. J. (1998). A multi-dimensional study of trust in organizations. *Journal of Managerial Issues*, *10*(3), 303–317.

Davern, M. J., & Kauffman, R. L. (2004). Discovering potential and realizing value from information technology investments. *Journal of Management Information Systems*, *16*(4), 41–68.

Dehning, B., & Stratopoulos, T. (2003). Determinants of a sustainable competitive advantage due to an IT-enabled strategy. *Journal of Strategic Information Systems*, *12*(1), 7–28.

DeLone, W. H., & McLean, E. R. (1992). Information system success: The quest for the dependent variable. *Information Systems Research*, *3*(1), 60–95.

DeLone, W. H., & McLean, E. P. (2003). Information systems success: A ten-year update. *Journal of Management Information Systems*, *19*(4), 9–30.

Dutta, A., Peng, G., & Choudhary, A. (2013). Risks in enterprise cloud computing: The perspective of IT experts. *The Journal of Computer Information Systems*, *53*(4), 39–48.

Dyer, J. (1996). Specialized supplier networks as a source of competitive advantage: Evidence from the auto industry. *Strategic Management Journal*, *17*(4), 271–291.

Dyer, J., & Singh, H. (1998). The relational view: Cooperative strategy and sources of inter-organizational competitive advantage. *The Academy of Management Review*, *23*(4), 660–679.

Fauscette, M. (2013). ERP in the cloud and the modern business. *IDC*, http://resources.idgenterprise.com/original/AST-0111292_ERP_US_EN_WP_IDCERPInTheCloud.pdf

Feeny, D. F., & Ives, B. (1990). In search of sustainability: Reaping long-term advantage from investments in information technology. *Journal of Management Information Systems*, *7*(1), 27–46.

Fink, L. (2011). How do IT capabilities create strategic value? Toward greater integration of insights from reductionistic and holistic approaches. *European Journal of Information Systems*, *20*, 16–33.

Neumann, Fink L. (2009). Exploring the perceived business value of the flexibility enabled by information technology infrastructure. *Information & Management*, *46*(2), 90–99.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *48*, 39–50.

Garrison, G., Kim, S., & Wakefield, R. (2012). Factors leading to the successful deployment of cloud computing. *Communications of the ACM*, *55*(9), 62–68.

Gartner. (2011). *Re-imaging IT: The 2011 CIO agenda* (January).

Geczy, P., Izumi, N., & Hasida, K. (2012). Cloudsourcing: Managing cloud adoption. *Global Journal of Business Research*, *6*(2), 57–70.

Geczy, P., Izumi, N., & Hasida, K. (2013). Hybrid cloud management: Foundations and strategies. *Review of Business and Finance Studies*, *4*(1), 37–50.

Georgantzas, N., & Katsamakas, E. (2010). Performance effects of information systems integration: A system dynamics study in a media firm. *Business Process Management Journal*, *16*(5), 822–846.

Godfrey, P., & Hill, C. (1995). The problem of unobservables in strategic management research. *Strategic Management Journal*, *16*, 519–534.

Grover, V., Chen, M. J., & Teng, J. T. C. (1996). The effect of service quality and partnership on the outsourcing of information systems functions. *Journal of Management Information Systems*, *12*(4), 89–116.

Gulati, R., & Nickerson, J. A. (2008). Inter-organizational trust, governance choice, and exchange performance. *Organization Science*, *19*(5), 688–708.

Hamlen, K., Kantarcioglu, M., Khan, L., & Thuraisingham, B. (2010). Security issues for cloud computing. *International Journal of Information Security and Privacy*, *4*(2), 36–48.

Han, H. S., Lee, J. N., & Seo, Y. W. (2008). Analyzing the impact of a firm's capability on outsourcing success: A process perspective. *Information & Management*, *45*, 31–42.

Hitt, L., & Brynjolfsson. (1996). Productivity, business profitability, and consumer surplus: Three different measures of information technology value. *MIS Quarterly*, *20*(2), 121–142.

Hoffman, P., & Woods, D. (2010). Cloud computing: The limits of public clouds for business applications. *EEE Internet Computing*, *14*(6), 90–95.

Hsu, P.-F., Ray, S., & Li-Hsieh, Y.-Y. (2014). Examining cloud computing adoption intention, pricing mechanism, and deployment model. *International Journal of Information Management*, *34*, 474–488.

Ishman, M. (1998). Measuring information system success at the individual level in cross-cultural environments. In E. J. Garrity, & G. L. Sanders (Eds.), *Information systems success measurement* (1998) (pp. 60–78). Hershey PA: Idea Group.

Johnston, D. A., McCutcheon, D. M., Stuart, F. I., & Kenwood, H. (2004). Effects of supplier trust on performance of cooperative supplier relationships. *Journal of Operations Management*, *22*(1), 23–38.

Julisch, K., & Hall, M. (2010). Security and control in the cloud. *Information Security Journal*, *19*(6), 299–309.

Keen, P. G. (1991). *Shaping the future: Business design through information technology*. Cambridge, MA: Harvard Business Press.

Keil, M., Tan, B. C. Y., Wei, K.-K., Saarinen, T., Tuunainen, V., & Wassenaar, A. (2000). A cross-cultural study on escalation of commitment behavior in software projects. *MIS Quarterly*, *24*(2), 299–325.

Kettinger, W., Grover, V., Guha, S., & Segars, A. (1994). Strategic information systems revisited: A study in the sustainability and performance. *MIS Quarterly*, *18*(1), 31–58.

Kim, S. H., & Kim, G. N. (2011). An empirical study on the influence of environmental determinants on the mobile cloud computing technology usage and the moderating effect of job relevance. *Journal of Information Technology Applications and Management*, *18*(4), 1–20.

Kim, S. H., & Kim, G. N. (2013). An empirical study on factors influencing the assimilation and expected benefits of cloud computing and the moderating effect of organizational readiness. *Journal of Korean OR and MS Society*, *30*(2), 63–77.

Kline, R. (1998). *Principles and practice of structural equation modeling*. New York, NY: The Guilford Press.

Kohli, R., & Grover, V. (2008). Business value of IT: An essay on expanding research directions to keep up with the times. *Journal of the AIS*, *9*(1), 23–39.

Lee, J. N. (2001). The impact of knowledge sharing, organizational capability and partner quality on IS outsourcing success. *Information & Management*, *38*(5), 323–335.

Lim, J. S., & Oh, J. I. (2012). A study on the effect of the introduction characteristics of cloud computing services on the performance expectancy and the intention to use: From the perspective of the innovation diffusion theory. *Asia Pacific Journal of Information Systems*, *22*(3), 99–124.

Loganayagi, B., & Sujatha, S. (2011). Improving cloud security through virtualization. *Communications in Computer and Information Science*, *204*, 442–452.

Loh, L., & Venkatraman, N. (1992a). Diffusion of information technology outsourcing: Influence sources and the Kodak effect. *Information Systems Research*, *3*(4), 334–358.

Loh, L., & Venkatraman, N. (1992b). Determinants of information technology outsourcing. *Journal of Management Information Systems*, *9*(1), 7–24.

Luo, X., Wieseke, J., & Homburg, C. (2012). Incentivizing CEOs to build customer- and employee-firm relations for higher customer satisfaction and firm value. *Journal of the Academy of Marketing Science*, *40*, 745–758.

Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal*, *22*(5), 387–401.

Mata, F., Fuerst, W., & Barney, J. (1995). Information technology and sustained competitive advantage: A resource-based analysis. *MIS Quarterly*, *19*(5), 487–505.

Mazhelis, O., & Tyrvainen, P. (2012). Economic aspects of hybrid cloud infrastructure: User organization perspective. *Information Systems Frontiers*, *14*(4), 845–869.

McKinney, P. (2010). Is cloud computing for you? *Forbes*, *186*(10), 56–57.

Mell, P., & Grance, T. (2011). *The NIST definition of cloud computing*. National Institute of Standards and Technology. U.S. Department of Commerce (NIST Special publication 800-145).

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Review: Information technology and organizational performance: An integrative model of IT business value. *MIS Quarterly*, *28*(2), 283–322.

Meyer, A., Tsui, A., & Hinings, C. (1993). Configurational approaches to organizational analysis. *Academy of Management Journal*, *36*(6), 1175–1195.

Mithas, S., Ramasubbu, N., & Sambamurthy, V. (2011). How information management capability influences firm performance. *MIS Quarterly*, *35*(1), 237–256.

Mooney, J. G., Gurbaxani, V., & Kraemer, K. L. (1996). A process oriented framework for assessing the business value of information technology. *DATA BASE for Advances in Information System*, *27*(2), 68–81.

Morton,G., & Alford, T. The economics of cloud computing analyzed. (2009). ⟨http://govcloud.ulitzer.com/node/1147473.⟩ Accessed 29.10.09.

Myers, B., Kappelman, L., & Prybutok, V. (1997). A comprehensive model for assessing the quality and productivity of the information systems function: Toward a theory for information systems assessment. *Information Resources Management Journal*, *10*(1), 6–25.

Nagpal, P., & Lyytinen, K. (2010). Modularity, information technology outsourcing success, and business peformance. In *Proceedings of ICIS 2010 Proceedings*. ⟨http://aisel.aisnet.org/icis2010_submissions/64⟩.

Niederman, F., Brancheau, J., & Wetherbe, J. (1991). Information systems management issues for the 1990's. *MIS Quarterly*, *15*(4), 475–495.

Nelson, K. M., & Cooprider, J. G. (1996). The contribution of shared knowledge to IS group performance. *MIS Quarterly*, *20*(4), 409–432.

Nelson, R., & Winter, S. (1982). *An evolution theory of economic change*. Cambridge, MA: Belknap.

Newkirk, H., Lederer, A., & Johnson, A. (2008). Rapid business and IT change: Drivers for strategic information systems planning? *European Journal of Information Systems*, *17*, 198–218.

Nunnally, J. (1978). *Psychometric theory* ((2nd ed.)). New York, NY: McGraw-Hill.

Obeidat, M., & Turgay, T. (2013). Empirical analysis for the factors affecting the adoption of cloud computing initiatives by information technology executives. *Journal of Management Research*, *5*(1), 152–178.

Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management*, *51*, 497–510.

Park, E., & Kim, K. J. (2014). An integrated adoption model of mobile cloud services: Exploration of key determinants and extension of technology acceptance model. *Telematics and Informatics*, *31*, 378–385.

Peng, G., & Gala, C. (2014). Cloud ERP: A new dilemma to modern organisations? *Journal of Computer Information Systems*, 22–30 (Summer).

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common model biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903.

Powell, T. C., & Dent-Micallef, A. (1997). Information technology as a competitive advantage: The role of human, business, and technology resources. *Strategic Management Journal*, *18*(5), 375–405.

Prahalad, C., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review*, *68*(3), 79–92.

Ravichandran, T., & Lertwongsatien, C. (2005). Effect of information systems resources and capabilities on firm performance: A resource-based perspective. *Journal of Management Information Systems*, *21*(4), 237–276.

Ravichandran, T., & Rai, A. (2000). Quality management in systems development: An organizational system perspective. *MIS Quarterly*, *24*(3), 381–416.

Reed, R., & DeFillippi, R. J. (1990). Causal ambiguity, barriers to imitation, and sustainable competitive advantage. *Academy of Management Review*, *15*(1), 88–102.

Ring, P., & Van de ven, R. (1992). Structuring cooperative relationships between organizations. *Strategic Management Journal*, *13*(7), 483–498.

Ringle, C. M., Wende, S., & Will, A. (2005). *SmartPLS 2.0 (beta)*. Germany: Hamburg. ⟨www.smartpls.de.⟩.

Rumelt, R. (1984). Towards a strategic theory of the firm. In B. Lamb Richard (Ed.), *Competitive strategic management* (pp. 566–570). Engelwood Cliffs, NJ: Prentice-Hall.

Sabherwal, R. (1999). The relationship between information systems planning sophistication and information systems success: An empirical assessment. *Decision Sciences*, *30*(1), 137–167.

Sambamurthy, V., & Zmud, R. W. (1992). *Managing IT for success: The empowering business partnership, working paper*. Washington, DC: Financial Executives Research Foundation.

Sambamurthy, V., & Zmud, R. (2000). The organizing logic for an enterprise's IT activities in the digital era—A prognosis of practice and a call for research. *Information Systems Research*, *11*(2), 105–114.

Sanchez, R., Heene, A., & Thomas, H. (1996). *Introduction: Towards the theory and practice of competence-based competition*. Oxford: Pergamon Press.

Santhanam, R., & Hartono, E. (2003). Issues in linking information technology capability to firm performance. *MIS Quarterly*, *27*(1), 125–153.

Seddon, P. B. (1997). A re-specification and extension of the DeLone and McLean model of IS success. *Information Systems Research*, *8*(3), 240–253.

Seddon, P. B., & Kiew, M. Y. (1994). A partial test and development of the DeLone and McLean model of IS success. In J. I. DeGross, S. L. Huff, & M. C. Munro (Eds.), *Proceedings of the International Conference on Information Systems* (1994) (pp. 99–110). Atlanta, GA: Association for Information Systems.

Sharma, R. M. (2014). The impact of virtualization in cloud computing. *International Journal of Recent Development in Engineering and Technology*, *3*(1), 197–202.

Shawish, A., & Salama, M. (2014). Cloud computing: Paradigms and technologies. In F. Xhafa, & N Bessis (Eds.), *Inter-cooperative collective intelligence: Techniques and applications, studies in computational intelligence 495* (2014) (pp. 39–67). Springer-Verlag Berlin Heidelberg, 10.1007/978-3-642-35016-0_2.

Sotomayor, B., Montero, R., Llorente, I., & Foster, I. (2009). Virtual infrastructure management in private and hybrid clouds. *IEEE Internet Computing*, *13*(5), 14–23.

Sternstein, A. (2011). Service interrupted: WikiLeaks fiasco reinforces push to set security standards for cloud services. *Government Executive*, *43*(2), 13–14.

Talib, A., Rodziah, A., Abdullah, R., & Murad, M. (2012). Towards a comprehensive security framework of cloud data storage based on multi agent system architecture. *Journal of Information Security*, *3*(4), 295–306.

Tanriverdi, H., Rai, A., & Venkatraman, N. (2010). Reframing the dominant quests of information systems strategy research for complex adaptive business systems. *Information Systems Research*, *21*(4), 822–834.

Teece, D. (1988). Capturing value form technological innovation: Integration, strategic partnering, and licensing decisions. *Interfaces*, *18*(3), 46–61.

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533.

Uzzi, B. (1997). Social structure and competition in inter-firm networks: The paradox of embeddedness. *Administrative Science Quarterly*, *42*(1), 35–67.

Venters, W., & Whitley, E. (2012). A critical review of cloud computing: Researching desires and realities. *Journal of Information Technology*, *27*, 179–197.

Wade, M., & Hulland, J. (2004). Review: The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS Quarterly*, *28*(1), 107–142.

Wang, W., Rashid, A., & Chuang, H. M. (2011). Toward the trend of cloud computing. *Journal of Electronic Commerce Research*, *12*(4), 238–242.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, *5*(2), 171–180.

Wiggins, R., & Ruefli, T. (2005). Schumpeter's ghost: Is hypercompetition making the best of times shorter? *Strategic Management Journal*, *26*(10), 887–911.

Windstream. (2014). ⟨http://www.windstreambusiness.com/media/268018/The-Path-to-Value-in-the-Cloud-by-Oxford-Economics.pdf.⟩.

Yoon, S. Y., & Oh, J. I. (2013). A study on the intention to use cloud services based on their characteristics. In *Proceeding of Pacific Asia Conference on Information Systems (PACIS)* Jeju Island, Korea.

Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of inter-organizational and interpersonal trust on performance. *Organization Science*, *9*(2), 141–159.

Zhang, M., Sarker, S., & Sarker, S. (2008). Unpacking the effect of IT capability on the performance of export-focused SMEs: A report from China. *Information Systems Journal*, *18*(4), 357–380.

Zhuang, Y. (2005). Does electronic business create value for firms? An organizational innovation perspective. *Journal of Electronic Commerce Research*, *6*(2), 146–159.

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