CLOUD COMPUTING ADOPTION AND ITS IMPLICATIONS FOR CIO STRATEGIC FOCUS – AN EMPIRICAL ANALYSIS

Completed Research Paper

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Abstract

The evolving role of Chief Information Officers (CIO) has been widely recognized in IS literature. Yet the enablers of CIOs to focus on strategic activities towards CIO effectiveness have been understudied from constructs, structures, processes and mechanisms perspective and the evidence is largely anecdotal. Cloud computing technologies are gaining adoption and anecdotal evidence suggests that these technologies may allow CIOs to focus more on strategic activities. Drawing on IS literature and on the Attention Based View of the firm from Organizations literature, we posit that cloud computing can enable CIOs to focus on strategic activities and organizational complementarities augment the impact. Our large dataset of US firms provides conclusions beyond single instances and largely supports our propositions. We find that cloud computing can in fact enable CIO strategic focus and complementarities in process and systems capabilities and organizational learning maximize the value.

Keywords: Cloud Computing, Chief Information Officer (CIO), IT-enabled Innovation, Strategic Focus, Attention Based View, Complementarities
Introduction

The disruptive forces of digitization and their impact on organizational structures have increased the significance of IT as an enabler of innovation and new product development (Tarafdar and Gordon 2007; Saldanha and Krishnan 2011; Sambamurthy et al. 2003). As business dependence on IT in both operational and strategic perspectives is growing, CIOs are gaining acceptance as a member of the executive team and are evolving to become business strategists (Carter et al. 2011; Ross and Feeny 1999). Conventionally, CIOs were focused on operational demands while the focus on strategic activities was what was called for (Chun and Mooney 2009). Subscribing to this theme, information systems (IS) research has attempted to improve our understanding on the factors affecting CIO effectiveness (Rockhart et al. 1996; Smaltz et al., 2006). While there is increasing interest in researching enablers of CIO effectiveness and CIO contribution, on the ground, majority of the CIOs are still spending substantial time on operational issues (Weill and Woerner 2009). It is an interesting contrast to our collective understanding in academic research and thus is the motivation for our study on how the CIOs can be enabled to spend their time effectively towards strategic activities and add value to business. This echoes with the recognition in IS research that there is a need for improving our collective understanding on the processes, structures and mechanisms that allow the CIOs to balance operational and strategic priorities and impact CIO effectiveness (Karahanna and Watson 2006).

Cloud computing phenomenon is gaining acceptance as a delivery model for applications, infrastructure and platforms as a service. According to the official NIST definition, “cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (NIST 2011). One underpinning advantage in cloud computing technologies is that it creates IT efficiency whereby highly scalable hardware and software resources enable efficient ways in which computing power is generated and consumed (Marston et al. 2011; McAfee 2011). Customers are availing cloud based offerings for different benefits including cost and process efficiencies, new opportunities and competitive advantage. For example, customers are using Salesforce Corporation’s Customer Relationship Management applications under the Software-as-a-Service (SaaS) business model. Eli Lilly is hosting pre-regulated data on the cloud and the scientists are pooling the computing power on demand to conduct high performance statistical analysis (Foley 2010). While there is anecdotal evidence, there is limited empirical work on how cloud computing can enable business value from adoption (World Economic Forum 2010).

Our literature review on CIO highlights that despite the emphasis on understanding how CIOs can be more effective, there is limited understanding on the enabling conditions for CIO effectiveness and the evidence is largely anecdotal. We surveyed the extant management literature and realized that ‘attention’ is an important construct widely studied in management literature but received limited investigation in IS research. We conjectured that attention can be an important construct to study about enablers of CIOs’ focus on more strategic priorities. We explored further on the measures that can handle operational efficiency so that the CIO can be relieved of such duties. Our supposition was that cloud computing adoption can mitigate the efficiency demands on CIO so that the limited attention of the CIOs can be spent on strategic activities. Consistent with this discussion, we pose two research questions: Can Cloud Computing adoption enable CIO’s strategic focus? If so, do these technologies by themselves enable this benefit or do organizational complementarities have a role in augmenting the impact?

We draw on past literature to define strategic focus as ‘an orientation towards innovation and new product development capabilities’. This definition is consistent with the innovation-oriented organizational culture advocated in Drazin and Schoonhoven (1996). In addition, while the emerging IS literature has treated cloud computing as a form of ITO outsourcing (ITO) (e.g. Clemons and Chen 2011; Xin and Levina 2008), we utilize past research to suggest that cloud computing to be different from ITO. We propose that there are differences at least at three levels – resource, architecture/delivery and service/contract – that distinguish cloud computing from ITO. At the resource level, ITO has been associated with the “make or buy” or “in-source vs. outsource” decisions (Clemons et al. 1993). Cloud computing is a hosting decision underpinned by technology delivery and is essentially about IT services delivered from a virtual private or public source (Marston et al. 2011). Services can be delivered from a public or private cloud. Within each cloud delivery type, the services can be insourced or outsourced. For example, private cloud service procurement can be in-sourced or outsourced. So also a public cloud based
service can be insourced or outsourced. We argue that the ability to deliver services from an insourced private or outsourced public cloud fundamentally separates cloud computing from IT outsourcing business models at the level of resource procurement.

At the architecture/delivery level, cloud based deployments differ from ITO in the degree of customization of the vendor offerings. While ITO allowed customizations per the unique requirements of each customer, cloud computing based models leverage multi-tenant architecture to deploy a single instance and thereby leave less scope for customization compared to ITO (Xin and Levina 2008). For example, for software applications delivered under the cloud based model, a single instance of common code and set of data definitions are hosted by the vendor with limited scope for customization by the adopter (Chong and Carraro 2006). In addition, the model gives more control over future development to the vendor as clients have to adopt future software upgrades without an option (Xin and Levina 2008).

At the service/contract level, we foresee at least two differences between ITO and cloud computing. First, services can be availed with relative ease and within a shorter time frame, without the need for lengthy negotiations and long-term contracts (Marston, et al. 2011). This is unlike in ITO where contracts tended to be defined by a particular project or period of time. Second, cloud computing offers elasticity with computing capacity available on-demand to scale quickly and thus offers capacity at different speeds and different times based on need (Willcocks 2011). This flexibility creates more scope for consumerization of IT due to usage-bound pricing structures and lack of up-front commitment of resources (Willcocks 2011). ITO is more about service delivery than about elasticity and scalability advantages inherent in the cloud model.

To investigate the research questions, we draw from the theory of the Attention Based View of the firm (ABV) from Organizations literature and the IT business value literature to relate cloud computing adoption with CIO strategic focus. Our work studies the firm-level characteristics i.e. systems, process and learning capabilities and puts them in the context of both research questions, thus providing a deeper examination into the CIO effectiveness enablers and value creation mechanisms in firm’s sourcing decisions (Karahanna and Watson 2006; Whitaker et al. 2010; Williamson 1999). We propose that cloud computing adoption can relieve the CIOs from day-to-day operational demands and enable them to focus on strategic activities. We posit that a firm’s existing strengths in organizational learning, coordination IT capability and process management have a role in enhancing the impact. Our results largely support the hypotheses.

There are three primary contributions of our study among others. First, we extend, to our knowledge, the attention based view to IS research to understand the impact of cloud computing on CIO strategic focus. We use this to understand the potential of cloud computing technologies and the role of firm-level characteristics in enabling CIO strategic focus. Second, this study adds to the CIO effectiveness literature and is particularly a step in understanding the enablers of value creation, as called for in past research (Karahanna and Watson 2006). Third, our study is also one of the first to empirically examine the business value of cloud computing by using a proposed measure of business value, CIO strategic focus.

The rest of this paper is organized as follows. In the following section, we briefly discuss the literature related to Cloud Computing, CIO role and the Attention based view of the firm. We then develop the theoretical foundations underpinning our research and discuss our hypotheses, research methodology and results. Finally, we discuss the implications of our research, describe the limitations and suggest future research opportunities before concluding in the final section.

**Literature Review**

**Literature on Cloud Computing**

With cloud computing being an emerging phenomenon, there is limited academic research in this area, to our knowledge. The existing literature has attempted to improve our understanding on the concepts and opportunities around cloud computing adoption. Marston et al. (2011) provided theoretical arguments...
about the IT efficiencies and business agility benefits from cloud computing. Their core argument was that cloud computing is a convergence of two trends – IT efficiency and business agility, wherein IT efficiency is enhanced when the power of computers is utilized more efficiently through highly scalable hardware and software resources, while the rapid deployment, parallel processing and real-time response of IT resources can drive agility. With no up-front capital investment, immediate access to IT resources can be procured and it would make easier for enterprises to scale resources on demand. Another advantage cited was that cloud computing would reduce the barriers to innovation and would lower the cost of entry for smaller firms to access new functionality which was hitherto available only for large enterprises. On the other hand, they argued that lack of standards leading to vendor lock-in and the regulations to deploy storage within geographical boundaries may hinder adoption (Marston et al. 2010: 182). McAfee (2011) suggested through his conceptual work that cloud computing adoption can free-up the time of IT departments as the firms can get access to latest technologies from cloud based deployments and the internal IT departments need not spend time on reposing older technology for modern use (McAfee 2011: 4). He explained that this will be useful to improve the productivity of already stretched IT departments. In addition, he found that the ability of the IT users to access applications without routing every request for sign-up through the stretched IT departments is not only freeing-up the IT departments but also improving the productivity of the IT users in the firms (McAfee 2011: 5).

Regarding the strategic benefits of cloud computing, Aral et al. (2010) found from qualitative evidence that cloud computing can create strategic benefits towards competitive advantage in addition to the economic benefits but the value is contingent on coordinating complementary capabilities including standardized infrastructure, data management and business processes. They further found that firms with strong IT-Business partnership and firms that excel at managing external vendors drive value maximization. Brynjolfsson et al. (2010) cautioned against replacing resources with cloud computing and suggested that complementary investments in process and organizational changes should accompany the adoption. Choudhary (2007) analytically modeled the impact of cloud based SaaS licensing models on the publisher’s incentive to invest in software quality. By comparing SaaS licensing model with perpetual licensing, it was found that firms will invest more in product development in SaaS business model and this increased investment leads to innovation, higher software quality and higher profits. Demirkan et al. (2010) analytically modeled the coordination strategies in a SaaS supply chain comprising of Application Service Providers (ASP) and application infrastructure providers (AIP) and concluded that a coordination strategy wherein a well-recognized ASP and a relatively unknown AIP tie-up is preferable over a strategy with tie-up between an unknown ASP and a well-recognized AIP. Koehler et al. (2010) was a notable exception with empirical evidence about the consumer preferences for different service attributes in cloud computing. They found that the reputation of the cloud provider and the use of standard data formats are more important for customers than cost reductions or tariff structures when choosing a cloud provider.

Under practitioner arguments and anecdotal evidence, a 2010 Davos World Economic Forum report envisioned the market for public IT cloud services at $55 billion by 2014 and indicated that cloud computing market would grow at 30% in 2011 or more than five times the entire IT industry rate. The report highlighted the benefits of cloud technologies and has called for empirical research on benefits and contextual complementarities (World Economic Forum 2010). It has called for exploring if cloud technologies can deliver higher order benefits transcending beyond cost efficiencies. A 2012 report by Computer Associates has mentioned that CIOs in Thailand are spending more time on strategy and innovation upon cloud computing adoption (Computer Associates 2012).

There are three implications of our review in this literature stream. First, despite the potential, there is scant empirical research, to our knowledge, on the business value of cloud computing and the existing literature is largely conceptual or analytical or anecdotal. Empirical studies are required to validate the theoretical arguments and to develop a deeper understanding of an emerging phenomenon (Whitaker et al. 2007). For emerging technologies, positive evidence may allay some of the fears when a technology is still maturing. Second, cloud computing adoption can deliver IT efficiency related benefits and can ease the constraints on the IT departments. Pertinent to our study, this implies that cloud computing adoption can handle IT efficiency aspects and thus can free up time and attention of the CIOs to focus more on strategic activities (McAfee 2011; Marston et al. 2011). Third, organizations may vary in the extent to which they adopt and leverage cloud computing to create CIO strategic focus. Hence our study will also investigate the differentiating role of the organizational complementarities in maximizing value from adoption (Aral et al. 2011; Brynjolfsson et al. 2010).
**Literature on CIO role and CIO contributions**

Information system (IS) leadership is a critical area for many organizations because of the increasing dependence on IS both for operational stability and for enabling innovation and business strategy. The role of CIO is evolving from managers of IT operations to a strategic business leader who can create competitive advantage (Ross and Feeny 1999). CIO responsibilities in interacting with customers, other executives of the firm and involving in product development processes are becoming an imperative to drive innovation (Terence and Krishnan 2011).

The IS Leadership and IT-Business alignment research stream has increased our understanding around the CIO role and how CIOs can be effective to create organizational impact. One stream of research focused on the CIO effectiveness dimension. For example, Smaltz et al. (2006) demonstrated that CIO capabilities as reflected in their business and strategic IT knowledge, interpersonal communication and political savvy were significant predictors of CIO effectiveness. This study further highlighted how such CIO capabilities mediate the relationship between CIO-top management team relationships and CIO effectiveness. Enns et al. (2003) found that successful CIOs champion IT initiatives that are consistent with the strategic direction of the firm, that the CIOs possess a sophisticated understanding of the role of effective influence and thus leverage well-established relationships to gain commitment to these initiatives. Wu et al. (2008) found that higher levels of business technology and business management competencies are antecedents of CIO effectiveness and the CIO effectiveness in turn will significantly enhance a firm’s IT assimilation capability.

Another stream of research has focused on how CIOs can support IT’s contribution to firm performance. For example, Johnson and Lederer (2005) highlighted the role of convergence between the CIO and CEO to successfully exploit IT investments. Their study highlighted that higher communication frequency between the CIO and CEO leads to greater convergence on the current priorities, future enhancements and future differentiation role of IT investments. In addition, the study suggested that channel richness plays a role in CIO-CEO convergence regarding the future differentiation capability of IT investments. Banker et al. (2011) suggested that firms should ensure that their CIOs report to appropriate executive based on the firm’s strategic positioning. Their study found that CIO-CEO reporting structure is beneficial for firms adopting a differentiation strategy while CIO-CFO reporting structure is recommended for firms aiming for cost leadership. Preston et al. (2008) found that CIOs have a greater influence on IT’s contribution to firm performance when provided with strategic decision making authority. They further suggested that organizational climate, organizational support for IT, the CIO’s structural power, CIO’s strategic effectiveness and a strong CIO-TMT partnership strongly influence endowing the CIOs with the required decision-making authority. Sobol and Klein (2009) related CIO’s background and attitude towards IT investment to firm performance and found that firm performance was higher when CIO was from IT than from general management background. In addition, they found that CIOs who have a strategic orientation rather than utilitarian orientation were associated with more profitable returns.

Despite the recognition in research about the strategic importance of CIO, there is limited research to advance our understanding of the mechanisms that enhance CIO effectiveness. The extant literature is largely anecdotal or has attempted to understand the role of CIO personal characteristics and organizational relationships in driving CIO effectiveness (Karahanna and Watson 2006). The changes in business landscape are further limiting our understanding as these changes are impacting the CIO role and the potential sources of CIO value (Ross and Feeny 1999). Past IS research has highlighted this gap and has called for studies to elaborate upon and enhance our understanding of specific constructs, relationships, processes, structures, and mechanisms that underlie the reasons affecting the effectiveness (Karahanna and Watson 2006; Preston et al. 2008).

The implication of review of this stream of research to our present study is that the extant literature is largely anecdotal or has attempted to focus on CIO and CIO role characteristics and that there is a need for empirical research to enhance our understanding of the specifics enablers that can drive CIO effectiveness.

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2 Due to page limit, we limit our review to briefly present representative studies from CIO Leadership research. Please refer Preston et al. (2008) and Karahanna and Watson (2006) for a more comprehensive list of studies on CIO research.
Literature on an Attention Based View of the firm

The Attention Based View (ABV) is a theoretical framework in organizations literature the core argument in ABV is “that to explain firm behavior is to explain how firms distribute and regulate the attention of their decision-makers” (Ocasio 1997). Herbert Simon’s (1947) pioneering perspective on the Attention Based View highlighted the limits of human rationality in explaining how firms make decisions. Organizations influence individual decision processes by allocating and distributing the stimuli that channel the attention of administrators in terms of what selected aspects of the situation to attend to and to be ignored (Simon 1947). Building on Simon’s work, literature has described how the senior executives are steeped in the past or the daily grind and fail to perceive the strategic opportunities developing in the environment (Finkelstein 2005). As creativity requires some time and cognitive resources, high job demands hinder novelty and fresh thinking (Cho and Hambrick 2006).

Ocasio (1997) made explicit the structure of the ABV. In particular, his work explained how stimuli are noticed, encoded, and transformed into a limited set of organizational moves as a result of how a firm formally and informally structures the flow of attention to its boundedly rational decision makers. ABV recognizes that managerial attention is the most precious resource in a firm and the decision to allocate attention to particular activities is a key in explaining why some firms adapt and innovate. Further, ABV emphasizes that a firm’s decision makers have limited cognitive ability to assimilate the unlimited stimuli in the environment and they need to ‘concentrate their energy, effort and mindfulness on a limited number of issues and tasks’ to achieve successful strategic performance (Ocasio 1997: 203).

ABV has received wide adoption in the management literature to improve our understanding on how the allocation of attention of decision makers leads to differential organizational outcomes. For example, Yadav et al. (2007) demonstrated how the CEOs by exercising their discrete allocation of scarce attention resources could have significant implications on the innovation outcomes of the firm. Their study found that CEOs who exhibit greater future and external focus increase the chances for innovative outcomes of the firm. Koput (1997) reasoned on why distractions from over-searching can have a negative influence on performance. This work explained that there may be too many ideas for the firm to manage and choose from and since there are many ideas, few of these ideas are taken seriously or given the required level of attention or effort to bring them into implementation. Verona (1999) advocated how organizational capabilities originate from individuals while at the same time influencing their actions. This study illustrated how the strategies designed by managers to gain improvements in firm performance will guide in structuring the attention of the actors involved in the strategy implementation (Verona 1999: 139).

However, ABV has limited adoption in IS literature to our knowledge. ABV was leveraged in IS to study how to capture users’ visual attention in organizational computing and e-commerce scenarios than looking at the cognitive strategic attention emphasized in ABV. For example, Shen et al. (2009) attempted to understand how online reviewers compete for attention when writing online reviews and suggested that reviewers are more likely to post reviews for popular but less crowded books to gain attention. Carlsson (2008) theorized that ABV can guide effective decision support systems design to gain user attention.

In this study, we extend ABV to IS research, to our knowledge, to understand the role of cloud computing in enabling CIO focus and there are two implications of this literature stream for the present study. First is that, as ABV advocates, managing the limited attention of the executives is important and firms should create enabling mechanisms that assist the executives in focusing on strategic value-added activities than spending their time and effort on the daily grind. Second, looking specifically in the cloud computing context, cloud computing adoption may enable firms to mitigate operational demands on CIOs as there is an opportunity to move the services to the cloud and also there is a potential for reducing the number of IT personnel working on operational issues. Hence cloud computing adoption has the potential to reduce the number of ideas a CIO has to work on and use his/her attention to focus on strategic activities. Hence we use the attention based view to see if cloud computing adoption can in fact enable CIO strategic focus.

Research Question

CIO effectiveness and CIO contribution has been a research stream for some time now. Our literature review on CIO highlights that despite the emphasis on understanding how CIOs can be more effective, there is limited understanding on this subject and the evidence is largely anecdotal. Somehow the results
were neither generalizable nor conclusive and gaps in research limit our understanding as highlighted by past researchers. To improve our understanding in this area, we surveyed the extant management literature and realized that ‘attention’ is an important construct widely studied in management literature but understudied in IS research. We conjectured that one of the reasons that can impact CIO effectiveness is his inability to focus more on strategic activities due to the competing demands from operational aspects. We believed that the ‘attention’ perspective discussed in the management literature can be used as a framework to study CIO strategic focus and can provide insights for allowing the CIOs to prioritize their time and attention on strategic activities than on operational demands. We explored further on the mechanisms to handle operational efficiency and relieve the CIO from these issues as much as possible. Our supposition based on our understanding of the cloud computing literature was that cloud computing adoption can mitigate efficiency demands so that the limited CIO attention can be spent on strategic activities. Consistent with this discussion, we pose two research questions: Can Cloud Computing adoption enable CIOs to focus on more strategic activities? If so, do these technologies by themselves enable this benefit upon adoption or do organizational complementarities have a role in augmenting the impact?

**Theory and Hypotheses Development**

The emphasis on systems and process capabilities in creating value from IT investments was investigated in the past from organizational capability perspective (Gold et al. 2001). Complementarity between IT systems capabilities and organizational process capabilities was instrumental in increased productivity and performance in organizations (Aral and Weill 2007). In addition, process management capabilities were found to be an enabler of effective inter-firm collaboration. Within the inter-firm partnering arrangements, the ability of firms to learn from one partnership to apply it in other partnering situations was studied from an organizational learning capability perspective in the IT and business process outsourcing context (Whitaker et al. 2010). As cloud computing adoption shares some characteristics of partnering arrangements and that organizational capabilities play a role in effective inter-firm collaboration, we hypothesize the relevance of systems, process and organizational learning capabilities in cloud based sourcing arrangements. We study the relevance of coordination-centric IT systems capabilities, process management capabilities and learning from past outsourcing experience.

**Cloud Computing and CIO Strategic Focus**

IT provides the infrastructure upon which other business functions and processes depend (Lewis and Byrd 2003). IT infrastructure capability has been recognized as an important capability that enables valuable dynamic capabilities (Mithas et al. 2007; Teece et al. 1997). IT infrastructural capabilities are a substantive capability that allows an organization to use its resources efficiently and have an important impact on the speed and nature of business process change (Broadbent et al. 1999). The sophistication of IT infrastructures was found to significantly impact IT assimilation into the firms and put it to competitive use (Armstrong and Sambamurthy 1999). IT capability has been found to be critical for responding to opportunities in IT-driven industries. Similarly, IT capabilities were found to be imperative for addressing the changing dynamics of relationships in the external environment that required frequent modifications to the supporting information (Sambamurthy et al. 2003). Thus IT capability directly supports sensing and responding in contemporary competitive environments (Haeckel 1999).

Ross et al. (1996) highlighted that firms should develop an effective IT capability with an ability to control IT-related costs, deliver systems when needed and affect business objectives through IT implementations. This echoes with the needed ability of the firms to dynamically reconfigure their resources to be able to innovate in response to the demands of today’s market (Prahalad and Krishnan 2008). Within the CIO effectiveness context, past research has highlighted that even the CIOs perceive the ability to develop an efficient and flexible infrastructure is an important requirement in enabling their firms achieve innovation and better performance (Grover et al. 2010). In addition, it was argued that one of the leadership roles of CIOs is in provisioning responsive IT infrastructures and in managing relationships with external providers (Carmel and Agarwal 2002; Lacity and Hirschheim 1993; Ross et al. 1996).
Cloud computing has the ability to deliver IT efficiency wherein computing power is more efficiently used through scalable hardware and software resources (Marston et al. 2011). Cloud computing models provide the capacity to deliver systems as needed and to dynamically reconfigure the resources on demand. We believe this has two important implications for the CIO among others. First, the CIO is in a position to provide efficient and flexible IT systems and thus enabling agility in the organization. Cloud computing adoption would deliver new capabilities to the organization in terms of agility and the administrative capacity to execute strategy-oriented activities. Second and more importantly, the inherent efficiency advantage in the cloud-based model would allow the CIO to focus less on efficiency related aspects of IT and use his attention towards value-added strategic activities. This is because cloud computing adoption moves IT infrastructure to the cloud and may reduce the operational burden (McAfee 2011). In addition, cloud computing adoption may reduce the number of IT personnel within the IT departments who work on operational issues (Marston et al. 2011). Hence this can reduce the number of ideas that need CIO attention and the CIO can focus his attention more on strategic priorities. Thus we hypothesize that:

\( H1: \) Cloud Computing adoption is positively associated with CIO's strategic focus

The role of Complementarities

Our primary hypothesis is that cloud computing adoption enables CIO strategic focus. However, organizations may vary in the extent to which they leverage the benefits of cloud computing adoption and particularly for the construct of interest in this study, CIO strategic focus. Hence our study will also investigate the differentiating role of organizational complementarities in enabling CIO Focus.

The role of past outsourcing experience

Organizational learning is a dynamic capability wherein firms acquire useful knowledge and use it to build higher order capabilities that enable competitive advantage of the firm (Bhatt and Grover 2005). Organizations build capabilities by learning from doing and thereafter use the learning from past activities towards future endeavors. For example, Neo (1988) found that firms that were successful in IT implementations had already implemented similar systems in the past and had accumulated experience. Once a firm gains experience with an activity, the firm develops routines associated with the activity and systematizes them to repeat using them in the future. To exemplify, organizations that were engaged in IT outsourcing (ITO) and in coordination with international vendors or coordination with geographically distributed internal teams learn from the experience of dealing with international teams and are more likely to engage in Business Process Outsourcing (BPO) with international partners (Whitaker et al. 2010).

We extend the concept of organizational learning from other sourcing contexts to cloud computing. We posit that organizations with learning from ITO and BPO would have learned about vendor relationship management and would be in a better position to apply them to cloud computing sourcing. This can be a valid expectation as cloud computing shares some characteristics with ITO and BPO including the need for contractual obligations and the nature of some of the associated risks (Xin and Levina 2008). We suggest that firms with vendor management experience from outsourcing would leverage the learning, be able to better coordinate with vendors and absorb cloud based delivery into internal operations.

Within the CIO context, creating a core internal capability to manage external relationships and a strong informed buying capability would result from past sourcing experience. This maturity reduces the sourcing risks and positions the CIO to embrace a business innovator role (Barthelemy and Adsit 2003; Feeny and Willecocks 1998). Consistent with this, we argue that, though cloud computing is a new concept, similarities with other sourcing contexts will ease the burden on the CIO of the elementary issues of learning around service level agreements and contractual obligations in vendor management if the firm has ITO-BPO experience. This may enable the CIO to instead focus on integrating external service delivery for organizational benefit.

\( H2: \) Past experience of the firm with ITO and BPO positively moderates the relationship between Cloud Computing adoption and CIO’s strategic focus
The role of Process Management Maturity

High process formalization contributes to successful adoption of IT innovations (Ein-Dor and Segev 1978). It enhances the fit between existing processes and the prospective innovation, reduce the adoption risks and thereby contribute to more successful outcomes (Chang and Chen 2005). Within outsourcing context, higher organizational process management maturity is related to more efficiency and less ambiguity and helps to avoid unexpected risks (Martin et al. 2008). One reasoning for this is that firms with such high process management maturity codify process management activities and can successfully coordinate the transfer of business processes to vendors (Whitaker et al. 2010).

In addition, higher process management maturity and using standard software engineering tools, methodologies and processes would reduce the project management burden and enable top executives to lead and support sourcing activities towards proactive strategic results from sourcing arrangement (Carmel and Agarwal 2002). Consistent with this, we argue that high internal process management maturity, first, allows effective vendor coordination and minimizes engagement risks. Second, it enhances the fit between external services and internal operations. Third, benefits accrue with minimized project management burden on the CIO. High process management maturity will mitigate the risks, misfit and mis-coordination and reduces operational demands in vendor management that need CIO attention. Hence we hypothesize:

H3: High process management maturity of the firm positively moderates the relationship between Cloud Computing adoption and CIO’s strategic focus

The role of coordination IT capability

IT systems enhance communication and coordination within the firm and in inter-firm relationships (Malone et al. 1987). In particular, strong internal IT maturity in enterprise coordination systems would enhance inter-firm collaboration. Organizations with IT coordination application systems are more likely to engage in outsourcing and strong IT application base would reduce coordination costs, transaction risks and asset specificity in outsourcing engagements (Whitaker et al. 2010; Xin and Levina 2008). Coordination systems improve the information processing efficiency and task execution by faster information exchange and greater concurrency when working with partners (Banker et al. 2006; Bardhan 2007). Such systems allow disaggregating and outsourcing business processes through codifiability, standardizability and modularizability (Bardhan et al. 2007). By serving as standard interfaces for business processes, these systems reduce monitoring costs and enforcement costs and provide the flexibility to integrate with multiple partners (Clemons et al. 1993).

Consistent with the above discussion, we argue that strong coordination IT capability in the firm would allow seamlessly working with external partners and would create engagements that have strong coordination and concurrency. These also reduce the demands on the CIO in terms of monitoring and enforcement. Thus they will reduce the number of operational issues a CIO has to focus in inter-firm coordination regarding monitoring and enforcement when compared to a CIO devoid of such coordination mechanisms. Thus we hypothesize:

H4: Higher coordination IT capability positively moderates the relationship between Cloud Computing adoption and CIO strategic focus.

Research Design and Methodology

Variable Definition and Empirical Model

This study is based on data from the Annual InformationWeek 500 surveys. InformationWeek is a leading IT publication and previous academic studies have used InformationWeek survey data (Bharadwaj et al. 1999; Mithas et al. 2005). The InformationWeek 500 survey is an annual benchmarking survey that targets top IT managers in large firms who are in senior management positions with sufficient overview of their firm’s IT operations and investments. The data for the three variables – ProcMgmt, ITCM and InfM was drawn from the 2008 InformationWeek 500 Survey. As these variables correspond to process
management maturity and IT capability maturity, 2-3 year lag is appropriate before the effects of the investments in IT capabilities and process management capabilities are felt (Brynjolfsson 1993; Brynjolfsson and Saunders 2010). Data for other variables comes from the 2010 Information Week 500 survey. The original dataset for each of the Information Week surveys had more than 500 firms. After combining the data sets and matching them on the firm name, we have dropped the incomplete observations and outliers per Cook’s distance (Hosmer and Lemeshow 2000). The final sample comprised of data from 227 firms. The table 1 below describes the variables used in our model.

**Table 1. Variable Definition**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Reference</th>
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<tbody>
<tr>
<td>CIOFocus</td>
<td>An ordinal variable indicating CIO’s involvement in 'Innovation', 'Partner with business units to develop new products or services', lead an R&amp;D team accountable for new products and services', 'provide the systems and support mechanisms for new product development'</td>
<td>A similar measurement approach was used in Armstrong &amp; Sambamurthy (1999)</td>
</tr>
<tr>
<td>CloudComputing</td>
<td>An ordinal variable indicating if a firm has adopted SaaS or IaaS or PaaS</td>
<td></td>
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<tr>
<td>OutsourcingExp</td>
<td>A 2-item summative index of the firm's engagement in IT Business Process Outsourcing</td>
<td></td>
</tr>
<tr>
<td>ProcMgmt</td>
<td>A 4-item summative index on the process management capabilities— if the firm has 'Established business process frameworks/defined processes', 'Modeled Business Processes using CASE or related tools', 'Implemented Business Process Mgmt software for enterprise-wide process management', 'Reengineered existing applications'</td>
<td>A similar approach was adopted in Whitaker et al. (2010)</td>
</tr>
<tr>
<td>coordIT</td>
<td>An 8-item summative index on if the firm has implemented the following applications for enterprise-wide coordination— 'Collaboration applications like SharePoint and others', 'Content management applications', 'Business performance management applications', 'Service management software', 'Business intelligence tools', 'Mobile enterprise applications', 'Customer relationship management applications', 'Scheduling software'</td>
<td>A similar measurement was adopted in Whitaker et al. (2010)</td>
</tr>
<tr>
<td>Infra</td>
<td>A 15-item summative index on if the firm has implemented the following 'infrastructure technologies'— 'Network access control technologies', 'Grid Computing', 'WAN optimization or application acceleration technologies', '802.11n Wireless LANs', 'Global storage management technologies', 'Storage virtualization technologies', 'VOIP technologies', 'desktop virtualization', 'Video conferencing', 'Unified communications', 'Quad core servers', 'IP storage technologies'</td>
<td></td>
</tr>
<tr>
<td>ITproj</td>
<td>Share of the IT budget devoted to new projects</td>
<td>Chenian et al. (2009)</td>
</tr>
<tr>
<td>Size</td>
<td>Natural Log of firm's Revenues</td>
<td></td>
</tr>
<tr>
<td>Manuf</td>
<td>A binary indicating if the firm is in the manufacturing industry (=1/0)</td>
<td></td>
</tr>
<tr>
<td>IT SectorControl</td>
<td>A binary indicating if the firm is in the IT industry (=1/0)</td>
<td></td>
</tr>
<tr>
<td>FinControl</td>
<td>A binary indicating if the firm is in the finance industry (=1/0)</td>
<td></td>
</tr>
<tr>
<td>InsControl</td>
<td>A binary indicating if the firm is in the insurance industry (=1/0)</td>
<td></td>
</tr>
</tbody>
</table>

We developed a cross-sectional model to test our hypothesis. As CIOs with strategic focus may be more likely to adopt cloud computing, we accounted for the endogeneity in Cloud Computing adoption. To control for this endogeneity, we followed Bharadwaj et al. (2007), Saldanha and Krishnan (2011) and Shaver (1998) to use Heckman two-step estimation approach (Heckman 1979). As a first step in this estimation, we created a binary variable to separate the firms based on the intensity of the cloud computing adoption. Firms with values of the Cloud computing variable above the mean of the Cloud computing variable were coded as 1 and firms with the value below the mean were coded as zero. We then ran a probit regression of the new binary variable on all the control variables. The inverse mills ratio from this step was included as a control variable in our final empirical model that we ran in the second step. Controlling for endogeneity using the two-step estimation gives consistent estimates (Shaver 1998).

Our dependent variable (CIOFocus) is an ordered variable. Since the dependent variable is ordered, we use ordered logistic regression for estimation. Ordered Logistic or Ordered Probit models are used in
estimation when the dependent variable is ordered (Greene 2008). We control for share of IT investment in new projects, Firm Size and firms in Manufacturing, IT, Finance and Insurance industries at the 2-digit North American Industry Classification System (NAICS) level. We controlled for industries in these four sectors as these industries were at the forefront of cloud adoption (Gartner 2010). We separated the IT capability into investments in IT coordination applications and investments in infrastructure and controlled for the investments in infrastructure, consistent with recent research that there are different types of IT (Aral and Weill 2007; Whitaker et al. 2010). The empirical model is as follows:

$$P(\text{CIOFocus}) = \beta_0 + \beta_1(\text{CloudComputing}) + \beta_2(\text{OutsourcingExp}) + \beta_3(\text{ProcMgmt}) + \beta_4(\text{coordIT}) + \beta_5(\text{CloudComputing}\times\text{OutsourcingExp}) + \beta_6(\text{CloudComputing}\times\text{ProcMaturity}) + \beta_7(\text{CloudComputing}\times\text{coordIT}) + \beta_8(\text{FirmSize}) + \beta_9(\text{ITProj}) + \beta_{10}(\text{Manuf}) + \beta_{11}(\text{ITSectorControl}) + \beta_{12}(\text{FinControl}) + \beta_{13}(\text{InsControl}) + \beta_{14}(\text{Infra}) \beta_i(\text{InvMill}) + e$$

**Results**

Table 2 below provides the descriptive statistics.

<table>
<thead>
<tr>
<th>#</th>
<th>Variables</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CIOFocus</td>
<td>1.914</td>
<td>0.744</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CloudComputing</td>
<td>1.457</td>
<td>0.889</td>
<td>0.15</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ProcMaturity</td>
<td>1.791</td>
<td>1.015</td>
<td>-0.001</td>
<td>0.07</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>coordIT</td>
<td>2.322</td>
<td>1.301</td>
<td>0.12</td>
<td>0.03</td>
<td>0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ITProj</td>
<td>0.963</td>
<td>0.821</td>
<td>0.12</td>
<td>0.22</td>
<td>0.17</td>
<td>-0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>ITproj</td>
<td>8.43</td>
<td>1.337</td>
<td>0.06</td>
<td>0.11</td>
<td>0.08</td>
<td>0.001</td>
<td>0.32</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>ITproj</td>
<td>8.43</td>
<td>1.337</td>
<td>0.06</td>
<td>0.11</td>
<td>0.08</td>
<td>0.001</td>
<td>0.32</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>ITSectorControl</td>
<td>0.245</td>
<td>0.491</td>
<td>-0.22</td>
<td>0.09</td>
<td>0.02</td>
<td>0.01</td>
<td>0.10</td>
<td>0.13</td>
<td>-0.14</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>ITSectorControl</td>
<td>0.245</td>
<td>0.491</td>
<td>-0.22</td>
<td>0.09</td>
<td>0.02</td>
<td>0.01</td>
<td>0.10</td>
<td>0.13</td>
<td>-0.14</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>FinControl</td>
<td>0.102</td>
<td>0.203</td>
<td>0.13</td>
<td>-0.04</td>
<td>0.05</td>
<td>0.04</td>
<td>0.11</td>
<td>0.02</td>
<td>0.10</td>
<td>-0.15</td>
<td>-0.09</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>InsControl</td>
<td>0.07</td>
<td>0.26</td>
<td>-0.01</td>
<td>-0.06</td>
<td>-0.03</td>
<td>0.01</td>
<td>0.07</td>
<td>0.10</td>
<td>-0.16</td>
<td>-0.07</td>
<td>-0.09</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Infra</td>
<td>4.327</td>
<td>2.434</td>
<td>-0.03</td>
<td>0.09</td>
<td>0.30</td>
<td>0.55</td>
<td>0.01</td>
<td>0.03</td>
<td>-0.01</td>
<td>0.05</td>
<td>-0.04</td>
<td>-0.01</td>
<td>-0.02</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 3 below shows the results from empirical estimation. In table 3, Column 2 is the estimation without interactions. Column 3 is full estimation with interactions.
Table 3. Estimation Results

<table>
<thead>
<tr>
<th>Dependent Variable - CIO Strategic Focus</th>
<th>Ordered Logit Model (1) with only the controls</th>
<th>Ordered Logit Model (2) with all independent variables without interaction</th>
<th>Ordered Logit Model (3) Full model with all interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>CloudComputing</td>
<td>0.378*** (0.162)</td>
<td>0.515*** (0.168)</td>
<td></td>
</tr>
<tr>
<td>ProcMaturity</td>
<td>-0.01 (0.14)</td>
<td>0.065 (0.144)</td>
<td></td>
</tr>
<tr>
<td>coordIT</td>
<td>0.294*** (0.123)</td>
<td>0.34*** (0.127)</td>
<td></td>
</tr>
<tr>
<td>OutsourcingExp</td>
<td>0.252 (0.18)</td>
<td>0.284 (0.183)</td>
<td></td>
</tr>
<tr>
<td>CloudComputing x ProcMaturity</td>
<td></td>
<td>0.364** (0.155)</td>
<td></td>
</tr>
<tr>
<td>CloudComputing x coordIT</td>
<td></td>
<td>0.266* (0.124)</td>
<td></td>
</tr>
<tr>
<td>CloudComputing x OutsourcingExp</td>
<td></td>
<td>-0.319 (0.199)</td>
<td></td>
</tr>
<tr>
<td>Intra</td>
<td>-0.02 (0.05)</td>
<td>-0.112 (0.07)</td>
<td>-0.12 (0.068)</td>
</tr>
<tr>
<td>Size</td>
<td>0.139 (0.10)</td>
<td>0.56 (0.79)</td>
<td>0.608 (0.817)</td>
</tr>
<tr>
<td>TProj</td>
<td>0.006 (0.008)</td>
<td>-0.014 (0.034)</td>
<td>-0.015 (0.035)</td>
</tr>
<tr>
<td>Manuf</td>
<td>-0.982**** (0.397)</td>
<td>1.027 (3.54)</td>
<td>1.072 (3.64)</td>
</tr>
<tr>
<td>ITSectorControl</td>
<td>-0.02 (0.57)</td>
<td>13.05 (21.61)</td>
<td>13.779 (22.32)</td>
</tr>
<tr>
<td>FinControl</td>
<td>0.50 (0.43)</td>
<td>0.36 (0.46)</td>
<td>0.307 (0.464)</td>
</tr>
<tr>
<td>InsControl</td>
<td>0.07 (0.52)</td>
<td>-1.04 (1.89)</td>
<td>-0.042 (1.936)</td>
</tr>
<tr>
<td>InvMillsRatio</td>
<td></td>
<td>29.51 (33.3)</td>
<td>21.65 (34.41)</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-239.99</td>
<td>-252.3</td>
<td>-225.16</td>
</tr>
<tr>
<td>Prob &gt; Chi-square</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
</tr>
<tr>
<td>McFadden’s pseudo R-square</td>
<td>0.03</td>
<td>0.052</td>
<td>0.09</td>
</tr>
<tr>
<td>Observations</td>
<td>227</td>
<td>227</td>
<td>227</td>
</tr>
</tbody>
</table>

In the model 1, the model without interactions, the positive and significant coefficient on cloud computing variable ($\beta_1=0.38$, $p=0.02$) provides statistically significant initial evidence that cloud computing can be instrumental in enabling the CIOs to focus on strategic activities like innovation and new product development.

In the model 2, which is our full estimation model with interactions, the Likelihood Ratio Chi-square value of 44.70 ($p<0.001$) indicates that we can reject the null hypothesis that the coefficients of the model are jointly zero. The positive and significant coefficient ($\beta_1 = 0.515$, $p<0.01$) on the cloud computing variable provides support for the hypothesis that cloud computing technologies can be instrumental in enabling CIO Focus. The coefficient on this term has increased in both the magnitude and significance in the presence of interaction with other complementarity variables. The results also show that the interaction between Cloud Computing and ProcMaturity is positive and significant at 2% significance level ($\beta_6 = 0.364$, $p<0.03$) rendering support for H3 about the complementarity between cloud computing.
adoption and process management maturity in enabling the CIO Focus enablement. The interaction between Cloud Computing and coordination IT capability maturity was positive and significant at 5% significance level ($\beta_7 = 0.266$, $p<0.05$), thus rendering support for our hypothesis 4 about the complementarity between Cloud Computing and coordination IT capability in enabling CIO Focus enablement. However, the results of the interaction between Cloud Computing and Outsourcing Experience were contrary to our expectation ($\beta_5 = -0.32$, $p<0.15$). One reason can be that firms in our sample may be adopting more of infrastructure as a cloud based service than adopting software applications as a service and the learning from outsourcing may be more applicable in software application procurement. Future investigation is needed into this aspect.

**Econometric Robustness Checks**

We tested the proportional odds assumption implicit in ordered probit models and a high chi-square (37.80) and high p-value (15.50) indicated that the proportional odds assumption has not been violated. As a sensitivity check, we ran an ordered probit regression for our estimation model and the results were qualitatively similar. The White’s test ($\chi^2 = 129.89$, $p=0.20$) failed to reject the constant variance of the error term and hence heteroskedasticity is not a serious problem with our data. We tested for multicollinearity by computing the variance inflation factors (VIF) and condition indices. Though VIF were below 10 with the highest VIF being 8.59 indicating no serious problem with multicollinearity, the condition number was 32.49 and condition numbers beyond 20 are suggested as indicative of a problem (Greene 2008). Higher condition numbers may result in ill-conditioned matrices. To avert any problem with multicollinearity, we have mean-centered the variables before interaction. Centering does not change the estimated effects of any variables and the effect of marginal increase in the centered version of a variable is identical to the effect of a marginal increase in uncentered variable (Franzese and Kam 2003). Our final estimation after mean centering had a highest VIF of 1.42 and a condition number of 18.64, both within the prescribed limits. We conducted link test to check for specification errors and the link test has failed to reject the assumption that the model was specified correctly. As our model used summative measures, tests for the reliability of survey measures are not applicable in our study (Jarvis et al. 2003).

We conducted sensitivity analysis by running an additional model to check if IT outsourcing can impact CIO focus. Our model comprised of IT outsourcing variable and the interactions of IT outsourcing with Maturity and coordIT with firm and industry controls included. The IT outsourcing variable and the interactions turned out to be insignificant supporting our initial premise of the impact of cloud computing on CIO strategic focus and past sourcing experience having a complementary effect.

**Discussion and Implications**

Table 4 below provides a summary of our hypotheses and findings.

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 Cloud Computing adoption is positively associated with CIO Strategic Focus</td>
<td>Supported</td>
</tr>
<tr>
<td>H2 Past experience of the firm with ITO and BPO positively moderates the relationship between Cloud Computing adoption and CIO Strategic Focus</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H3 Process management maturity of the firm positively moderates the relationship between Cloud Computing adoption and CIO strategic focus</td>
<td>Supported</td>
</tr>
<tr>
<td>H4 Higher internal coordination IT capability positively moderates the relationship between Cloud Computing adoption and CIO Strategic Focus</td>
<td>Supported</td>
</tr>
</tbody>
</table>
The role of CIO and its evolution over time has been a subject of increasing attention in IS research (Ross and Feeny 1999). Our goal in this research was to examine the CIO effectiveness from attention perspective and to understand if and how an emerging class of IT i.e. cloud computing can enable the CIOs to focus on more strategic activities. Thus, our study was an attempt to establish empirical evidence on the business value of cloud computing technologies in enabling CIOs strategic focus. Our study provides evidence on the impact of cloud computing adoption in enabling the CIO focus and how organizational assets can augment the effect. An interesting observation is that the organizational assets of the firm cultivated over time can in fact play an instrumental role in bringing together emerging technologies and CIO effectiveness. Overall, our results are consistent with the initial expectation whether cloud computing may enable CIO strategic focus.

From research perspective, this study has multiple contributions. First, it adds to the existing body of research on CIO effectiveness and particularly is a step in investigating the mechanisms that underlie value creation (Karahanna and Watson 2006). Second, this study uses the attention perspective which was underexplored in IS research, to the best of our knowledge, to explore the potential of emerging technologies and the complementary role of firm-level characteristics that can support CIO effectiveness. In particular, it explores the firm-level characteristics that can augment business value in sourcing contexts (Williamson 1999; Whitaker et al. 2010). Third, we also examine how IT itself can be instrumental in CIO effectiveness and to the best of our knowledge; limited research has explored this dimension. Fourth, this study is also one of the first, to our knowledge, to empirically examine the business value of cloud computing technologies by using a proposed measure of business value, CIO strategic focus, to understand how cloud computing can enable strategic activities. Fifth, access to archival data employed in our study by itself has strength. It helped to investigate CIO effectiveness and the business value of an emerging phenomenon of cloud computing using a large sample. This provides better generalizability of our findings beyond anecdotal evidence. This is important when empirical evidence is limited both in the CIO effectiveness and the business value of cloud computing subject areas as highlighted by past research. Lastly, our study adds to the literature on IT sourcing by investigating the impact of a new business model for sourcing arrangements and one of the business benefits that can arise out of it.

For practice, our study prompts managers to think beyond the cost efficiencies from cloud computing technologies and explore the value-added benefits it can offer (World Economic Forum 2010). For example, the findings of our study about enabling CIO focus which in turn is key in IT-enabled innovation can prompt managers to explore the strategic potential behind this class of technologies. Our study also highlights the enabling conditions in the organizations in augmenting business value and shows how the existing organizational assets can be put to strategic use in the wake of new technology adoption. The moderating effect of organizational complementarities in augmenting the impact in our study suggests that adoption of cloud computing technologies combined with complementary changes in organizational resources can maximize value (Brynjolfsson et al. 2010).

Limitations

This study has four primary limitations. First, because of the cross-sectional data, our findings are associational in nature and do not imply causality. Future research may use longitudinal datasets and modeling techniques like propensity scores to examine causality between cloud computing adoption and CIO strategic focus enablement. Second, our data pertains to large US firms which may be more innovative than, for example, firms in other geographies and our findings may not be generalizable to other contexts though they are still assuring than anecdotal evidence. In addition, our dataset comprises of large firms and future research may explore the Small and Medium Enterprise (SME) context. It may be possible that depending on the context, the focus of the CIOs may be on strategic activities or on operational efficiencies (Preston et al. 2008). Third, we use cross-sectional data to examine the role of organizational assets but these assets evolve over time. Hence future research may use longitudinal data to better understand how the co-evolution of cloud computing adoption maturity and organizational assets impacts the CIO focus enablement over time. Fourth, our study uses self-reported survey measures and though self-reported survey measures have been used in prior research (e.g., Leiponen and Helfat 2010), future research may use objective measures (Cherian et al. 2009; Saldanha and Krishnan 2011).
Future Research Opportunities

Given the emerging nature of cloud computing, we foresee several future research opportunities. Within the context of cloud computing adoption enabled business value, researchers can investigate the impact of cloud computing technologies’ adoption on other forms of business value like customer-centric and partner-centric capabilities. Investigating the impact of other organizational complementarities like IT-business alignment and customer and partner relationship management etc., in increasing the value can be an additional area to explore. While our study focuses on the moderating role of organizational assets, future research may investigate the mediation mechanisms that create higher order capabilities from cloud computing adoption (Mithas et al. 2011). With cloud computing creating new models of service subscription and licensing, studying the opportunities, challenges and constraints in cloud based implementations vis-à-vis traditional IS implementations may need exploration.

Within the CIO context, examining our results in the context of small and medium enterprises may produce similar or different results. Examining individual technologies within cloud computing i.e. SaaS, IaaS and PaaS in supporting CIO effectiveness may produce more granular results and each of these individual technologies may have differential impact. Future research may include examining the role of additional dimensions like CIO characteristics, organizational support for IT, factors in organizational climate, organizational relationships and structural authority etc., as moderating or mediating mechanisms in enabling the CIO focus in the context of technology and other organizational resources. An additional opportunity is to look at other contextual priorities of the CIOs like emphasis on operational efficiencies and how they can be accomplished.

Conclusion

Despite the considerable attention gained by CIO effectiveness in IS research, there is a research opportunity to investigate the enabling mechanisms that can allow the CIOs to focus on more strategic activities. Particularly in the realm of cloud computing, anecdotal evidence suggests the possibilities to relieve the CIOs of the daily grind and enable them to focus on strategic activities. The existing literature highlights isolated instances of success but is still devoid of generalizable conclusions at the intersection of emerging paradigms and CIO effectiveness. Our study, to the best of our knowledge, is one of the first to bridge this gap in research and in doing so, it also is one of the first to highlight the business value of cloud computing. In this study, we find evidence that cloud computing adoption can in fact be associated with enabling the strategic focus of CIOs and suggest that necessary organizational support through organizational complementarities is vital to realize this benefit.

Acknowledgments

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References


Governance and Management of IS


Gartner Inc. 2010. “Gartner Says Worldwide SaaS Revenue Within the Enterprise Application Software Market to Surpass $8.5 Billion in 2010,” *Gartner Reports*.


Governance and Management of IS


