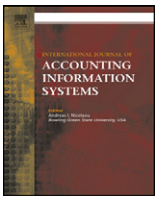
International Journal of Accounting Information Systems 15 (2014) 335–356

Contents lists available at ScienceDirect

International Journal of Accounting Information Systems



On governance structures for the cloud computing services and assessing their effectiveness ☆

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ARTICLE INFO

Article history:
Received 1 June 2013
Received in revised form 12 December 2013
Accepted 15 May 2014
Available online 8 July 2014

Keywords:
Cloud computing services
Cloud governance structures
Utility computing
Relational theory

ABSTRACT

This research suggests information technology (IT) governance structures to manage the cloud computing services. The interest in acquiring IT resources as a utility from the cloud computing environment is gaining momentum. The cloud computing services present organizations with opportunities to manage their IT expenditure on an ongoing basis, and access to modern IT resources to innovate and manage their continuity. However, the cloud computing services are no silver bullet. Organizations would need to have appropriate governance structures and policies in place to manage the cloud computing services. The subsequent decisions from these governance structures will ensure the effective management of the cloud computing services. This management will facilitate a better fit of the cloud computing services into organizations' existing processes to achieve the business (process-level) and the financial (firm-level) objectives. Using a triangulation approach, we suggest four governance structures for managing the cloud computing services. These structures are a chief cloud officer, a cloud management committee, a cloud service facilitation centre, and a cloud relationship centre. We also propose that these governance structures would relate directly to organizations' cloud computing services-related business objectives, and indirectly to cloud computing services-related financial objectives. Perceptive field survey data from actual and prospective cloud computing service adopters suggest that the

☆ The authors thank Carla Wilkin and Sajith Nair for their valuable comments and suggestions, as discussants of an earlier version of this paper presented at the 2013 University of Waterloo Research Symposium on Information Integrity & Information Systems Assurance.

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http://dx.doi.org/10.1016/j.accinf.2014.05.005

suggested governance structures would contribute directly to cloud computing-related business objectives and indirectly to cloud computing-related financial objectives.

1. Introduction

This study suggests and validates possible information technology (IT) governance structures for cloud computing services. Cloud computing is an information technology service model where computing services (both hardware and software) are delivered on-demand to customers over a network in a self-service fashion, independent of device and location (Marston et al., 2011). The IT governance structures relate to the configuration of organizational resources to govern IT resources — in this case the cloud computing services. This research is timely because internal and external pressures (for example market share, processes efficiencies, cost reduction) are compelling organizations to find better and more economical ways to continue to embed modern IT resources in their information systems (IS). This effort is necessary to ensure that the IS continues to be the best abstraction of an organization's surrounding reality.

Cloud computing is an example of the IT provisioning model (Böhm et al., 2011). However, cloud computing represents a shift from the traditional product-based IT provisioning model (for example, outsourcing) to a service-based provisioning model (Armbrust et al., 2010). A way to understand this shift is to compare the outsourcing and the cloud computing value chains. Within the traditional IT outsourcing value chain, categories (for example, infrastructure, applications, and business processes), may be outsourced separately and managed by the outsourcing organization. In this situation, an organization could manage a large number of providers with complex outsourcing relationships. In contrast, the cloud computing model is a service-oriented (Jacob and Ulaga, 2008) model. The cloud computing services link the stronger service-oriented hardware outsourcing to the as-a-service concept for software. Within this environment, infrastructure-based services are now offered dynamically to the needs of customers. Furthermore, the cloud environment integrates both hardware and software as-a-service offerings. From a value chain perspective, this resonates to a marketplace, where various cloud computing services from different levels are integrated and offered to the customer as a utility. This setting requires a change in the way of managing the IT provisioning arrangements.

The utility-based concept is an affordable way to obtain modern IT resources and services. Utility-based computing resources relate to obtaining computing resources on an ongoing basis at a charge. Organizations have already taken, or are considering a path to acquiring cloud computing services in this manner. However, while the adoption of the cloud services would further externalize the IT service delivery landscape, its governance functions will remain central to organizations that acquire the cloud computing services (Blair, 2010; Plummer, 2012). The change in the IT provisioning model means organizations will need to update or evolve their IT governance functions to realize the business value associated with cloud computing services (Block, 2012). In fact, organizations would need to consider their governance issues relating to their path to the cloud computing services before making any decisions to engage with the cloud service providers, and reorganize their IT infrastructure and processes. For example, Marston et al. (2011) suggest that "*CIOs and CTOs should proactively develop an overall "cloud strategy" in order to determine a time-based plan about which of their applications they can move to the cloud, and the timeframes associated with each of them*" (page 185). Similarly, Fratto (2009) asserts "*cloud computing is coming to your organization, like it or not. A governance plan gives IT the proactive control needed to proceed safely*" (page 34). These considerations on governing the cloud computing services should complement organizations existing structures for governing the IT resources. The resulting IT governance environment would assist organizations in achieving their objectives for acquiring their IT resources from the cloud computing environment.

Thus, in this research we address a key question: What are the appropriate IT governance structures for managing the cloud computing services to achieve cloud computing services-related business objectives? Our review of the extant literature suggests that there are practice-based conceptual deliberations on the

benefits of the cloud computing services and the surrounding technologies (for example, KPMG and Gartner resources). Academic contribution is starting to focus on the business-related issues surrounding cloud computing (see for example, Sultan, 2010; Marston et al., 2011; Misra and Mondal, 2011; Brumec and Vrček, 2013). Our effort of focusing on governance structures appropriately complements these business-fit considerations. The outcomes of the cloud governance initiatives will have direct ramifications on organizations' business processes. These ramifications relate to the extent to which the cloud computing services would influence the agility and innovation of organizations' business processes.

We posit that organizations' cloud-based IT governance structures will have a relational element in relation to the providers of the cloud computing services. This situation concurs with the conceptual underpinning of the relational view of the firm (Dyer and Singh, 1998; Borgatti and Cross, 2003). Within this conceptual underpinning, organizations should identify their IT governance competences, but should also be able to identify synergies with the partners (cloud service providers) to improve the relational rent of the cloud infrastructure. Relational rent relates to superior value jointly generated in an exchange relationship that cannot be generated by either organization in isolation (Dyer and Singh, 1998). That is, organizations that acquire the cloud computing services will benefit the most from these services if they maintain a strong and consistent relationship with the cloud service providers. This relationship will be in the form of related thought on cloud computing services that sustain the relationship between the cloud service users and the cloud service providers. The cloud computing governance structures that embrace these thoughts will have a better chance of directing the cloud computing services to contribute directly to organizations' cloud computing services-based business objectives. The cloud computing services-based business objectives relate to achieving outcomes relating to improved agility, better creativity and innovation, and simplicity of IT systems (Peiris et al., 2010). These outcomes are possible because organizations can acquire the cloud computing services rapidly, and will have the flexibility in acquiring various elements of the cloud computing services. For example, organizations could manage the user-base of applications swiftly, and can obtain processing and storage capacity instantaneously. Achieving these business objectives should assist in the achievement of cloud computing services-related financial objectives of better returns on investment in IT, improvement in total IT lifecycle costs, and better response to economic conditions. Better financial objectives are possible because investing in the cloud computing services would mean acquiring ready-to-use flexible IT resources with minimum lag time between their acquisition and their actual use. This situation means that appropriate governance of the cloud computing services would contribute to cloud-related financial objectives through achieving the cloud-based business objectives. We present the following conceptual model, as shown in Fig. 1, of governance of cloud computing services, and assessing their effectiveness for the users of cloud computing services.

We adopted a triangulation approach, which included analysis of the conceptual deliberations, and an interpretive exercise with the champion adopters of the cloud computing services to suggest the governance structures for the cloud computing services. Champion adopters are successful first movers in adopting the cloud computing services. Our evaluation suggested a chief cloud officer, a cloud management committee, a cloud service facilitation centre, and a cloud relationship centre as the possible governance structures for the cloud computing services. These cloud governance structures would ensure appropriate direction of the cloud computing services from its acquisition to fit into organizations business processes. We then modeled and evaluated whether organizations perceive these IT governance structures would contribute their cloud computing services-related business and financial objectives.

Survey data suggests that organizations perceive that the suggested governance structures would contribute to achieving their cloud computing services-related business objectives. Data also suggested that organizations perceive that cloud computing services-related business objectives would contribute to their cloud computing services-based financial objectives. The rest of the paper progresses as follows. We present an overview of the cloud computing environment in the next section. Following this, we present the study's theoretical underpinning and discuss the hypotheses development approach. This approach includes discussion of an interpretive study. We then discuss our survey research design, and present and discuss the results. The final sections note the contributions and limitations of the research, and provide directions for future research.

2. Cloud computing services — an overview

Organizations are facing the common challenges in adopting of the cloud computing services. That is, organizations would adopt the computing resources that are exponentially more powerful with decrease in per unit costs (Turban and Volonino, 2011). On the other hand, the pervasive use of the computing resources and the resultant complex infrastructure is making the management of computing resources an expensive exercise for organizations (Marston et al., 2011). However, the impetus for organizations to adopt the cloud computing services is predominantly from a cost perspective. The capital investment in the IT resources are often underutilized as servers, desktops and other computing resources purchased are used well below their power and capacity (Marston et al., 2011). Furthermore, organizations are incurring significant cost in managing their computing resources. For example, a major State Government in Australia plans to outsource most of its IT functions after an alarming report warned it would cost up to $7 billion to repair outmoded systems at the mercy of hackers (Houghton, 2012). The perceived benefits of the cloud computing services has echoed expectations of cloud computing to be a $206.6 billion business by 2016 (Gartner, 2012). This level of interest in this environment provides a timely call to consider decision and management structures of adopting and utilizing the cloud computing services.

The cloud computing services provide two important initiatives. First is the promise of IT efficiency in terms of access and use of modern IT resources through a utility-based concept. Organizations are able to acquire scalable software and hardware resources at a fraction of the conventional capital expenditure cost. Second, organizations are able to use these modern IT resources to become agile, and achieve or protect their competitive advantage. Organizations would be able to radically redefine their business processes, and use modern business intelligence tools on real time data to meet changing consumer expectations. The cloud computing environment offers several opportunities to organizations. Essentially, these opportunities relate to the different delivery models of cloud computing services, all of which refer to the different layers of the cloud computing architecture. Fig. 2 presents the layers of the cloud computing environment as suggested by Youseff et al. (2008).

Table 1 below presents a summary of these layers of the cloud computing environment.

Organizations could also deploy the cloud computing models in different ways. A public cloud computing service environment serves a wider community where computing resources are available from a third party service provider via the Internet. This model is a cost-effective way to deploy IT solutions. A private cloud computing service is managed within an organization. Private cloud computing services provide greater control over the cloud infrastructure, and appeal well to the larger organizations. A hybrid cloud computing service is also available where non-critical information is managed through the public cloud computing service, while business-critical services and data are kept within the control of the organization.

Many ideas and concepts within the cloud computing environment are not new. The concept of acquiring resources as a utility has been present for a long time. However, today, there is a compelling fit between the cloud computing services and the nature of need of the IT resources in organizations. The cloud computing environment offers several compelling promises for today's businesses. There is an opportunity for immediate access to critical software and hardware services as an operational rather than a capital commitment. This situation makes the outcomes of investment in IT more apparent. This nature of access to computing services opens the opportunity for innovation across organizations — something previously deemed a luxury commodity to larger organizations. For example, Small and Medium Enterprises (SMEs) would be able to access critical business analytics tools and resources for their data to

Fig. 1. Conceptual model.[1]

[1] Our conceptual model focuses only on governance structures for cloud computing services because this is our initial attempt to suggest governance structures for the cloud computing resources. Once established, these governance structures for cloud computing services would need to have synergy with organizations existing IT governance structures. That is, organizations would need to consider ways to reconfigure their resources to include the above governance structures in their IT governance environment.

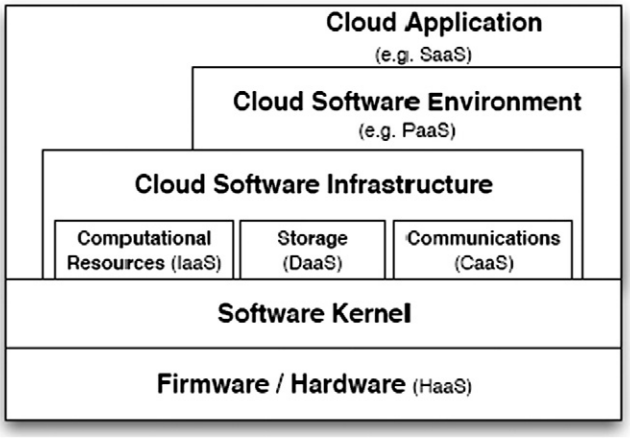

Fig. 2. The layers of cloud computing (source — (Youseff et al., 2008).

identify important trends and opportunities. The cloud computing services also make most IT resources more accessible to developing markets that lack the resources for widespread deployment of IT services. Organizations also have a better control of service scalability through access to more reliable information

Table 1
Summary of the layers of cloud computing.

Cloud computing layer	Description
Cloud application layer	The most visible layer to the end-customer. A service in the application layer may consist of a mesh of various other cloud services, but appears as a single service to the end-customer. This model of software provision, normally also referred to as Software-as-a-Service (SaaS). Organizations have shifted applications like customer relationship management (CRM), accounting applications, human resource management, and content management on the SaaS platform.
Cloud software environment layer	The cloud software environment layer provides a programming language environment for developers of cloud applications. This service provided in the software environment layer is also referred to as *Platform-as-a-Service* (*PaaS*). In this environment, the service seeker organization manages the software configuration in collaboration with the PaaS provider using the PaaS provider's resources. The PaaS provider then provides the platform in the form of networks, servers, storage, and other services. Common examples of the PaaS environment include the Google's App Engine, which provides developers a Phyton runtime environment and specified APIs to develop Applications for Google's cloud environment. Another example is Salesforce's Apexchange platform that allows developers to extend the Salesforce CRM solution or even develop entire new applications that runs on their cloud environment.
Cloud software infrastructure layer	The cloud software infrastructure layer provides resources to other higher-level layers, which are utilized by cloud applications and cloud software platforms. Computational resources in this context are usually referred to as *Infrastructure-as-a-Service* (*IaaS*). IaaS facilitates storage and computing capabilities as a service. IaaS cloud providers have a large pool of these resources, and supply these resources on an on-demand basis. IaaS service seekers generally use the Internet or dedicated virtual private networks (VPN) to access these services. Amazon's S3 storage service is a common example of an IaaS. *Storage-as-a-Service* (DaaS) allows users to obtain demand-flexible storage on remote disks which they can access from everywhere. *Communication-as-a-Service* (CaaS) focuses on communication capabilities such as network security, dedicated bandwidth or network monitoring.
Software kernel layer	Represents the software management environment for the physical servers in the datacentres.
Hardware/firmware layer	The actual physical hardware, which forms the backbone of any cloud computing service offering.

to meet stakeholder demands for these services. Organizations can swiftly reorganize their IT resources to areas of need without causing distress to existing operations.

Significant commentary exits on the issues surrounding the adoption of cloud computing services. Common concerns relate to privacy and ownership of organizational resources (Takabi et al., 2010). The new cloud computing frameworks are also putting additional pressure on existing IT security models (Armbrust et al., 2010). However, continuous attempts are made to manage the security of data and applications in the cloud computing environment. Organizations are also faced with meeting increased compliance issues. For example, the businesses in the European Union (EU) contracting with the cloud service providers outside the EU/European Economic Area (EEA) have to adhere to the EU regulations on export of personal data (Helbing, 2013). Another issue on the adoption of cloud computing services is the ongoing vendor dependency and lock-in issues (Armbrust et al., 2010). However, the new cloud platform standards would contribute towards standardizing the provider platforms and reducing the dependency and lock-in costs.

In its entirety though, the opportunities of the cloud computing services offers much promise to organizations in facilitating the fit of the IT resources to their business process, and achieving their anticipated returns on their investment in the IT resources. However, as with other resources, optimum leverage of the opportunities of the cloud computing services will also require sound governance structures. Further, the nature in which these resources would be acquired, and the relationships that need to be managed, suggests a need to reconsider the governance structures. In the next section, we discuss the theoretical framework through which we would suggest appropriate governance structures to manage the cloud computing services.

3. Theoretical framework

Organizations have the responsibility to govern their resources to meet the expectations of various stakeholders (Eisenhardt, 1989). A change in the nature of acquiring the IT resources within the cloud computing environment does not alter this responsibility. However, organizations will have to adopt more liberal governance approaches to manage today's dynamic IT resources, like the cloud computing services. Cloud computing services are dynamic because they would continually evolve with their increased adoption. Sourcing these cloud computing services as a utility means organizations would adopt these resources on a continuous basis, and would face the challenges of leveraging them uniquely for competitive reasons. This situation implies that organizations' governance efforts should be one of their capabilities. An organizational capability is a unique know-how to leverage the enabling potential of other common resources. The cloud computing services are common resources, meaning any organization could obtain or mimic a particular bundle of cloud computing services. In this situation, the role of cloud governance structures would be to fit these cloud computing services into organizations' existing business processes in unique ways to achieve competitive advantage. This situation is consistent with the resource-based view (RBV) of the firm (Wernerfelt, 1984; Barney, 1991). Under the RBV, organizations have common and unique resources. Common resources are readily available to all organizations, whereas unique resources are competencies specific to organizations. The RBV articulates that a resource is a capability if it is rare, appropriable, and valuable (Mata et al., 1995). These qualities of the resource will enable it to provide an initial competitive advantage to an organization (Melville et al., 2004). If these qualities of a capability are non-substitutable, inimitable, and immobile, then it could provide a sustainable competitive advantage to an organization (Melville et al., 2004). When this articulation is considered within the cloud computing services adoption environment, it implies that organizations need to develop unique governance competencies, and sustain these governance competencies over a period of time to leverage the acquired cloud computing services on unique ways.

The importance of the cloud computing providers cannot be ignored when considering the governance structures for the cloud computing services. This situation means the governance of cloud computing services would require governance capabilities and competencies across a network of alliances (with the cloud providers). The relational view of the firm (Dyer and Singh, 1998; Borgatti and Cross, 2003) offers a useful framework to suggest IT governance structures inclusive of the cloud computing service providers and other stakeholders. The relational view of the firm posits that organizations' critical resources may extend beyond organizational boundaries (Dyer and Singh, 1998). This situation means that for the governance of

cloud computing services, organizations would require to link their idiosyncratic capabilities to that of the cloud resource providers to secure competitive advantage. The outcome of this effort would be governance efforts that provide relational rent to an organization (Dyer, 1997; Dyer and Singh, 1998). This relational rent is possible through the creation of specialized capabilities (Amit and Schoemaker, 1993), which would be a product of synergy of the capabilities of the adopting organizations and the cloud computing resource providers.

A fundamental prerequisite in an effective cloud computing environment would be the partner-based knowledge sharing. Organizations often learn by collaborating with others (Levinson and Asahi, 1995). Collaboration within the partners in the cloud computing environment is the key source of new ideas and innovation. New sources of ideas will direct organizations to develop and invest in performance-enhancing technology and infrastructures. The nature of the relational governance structures in the cloud computing environment should be based on informal social contracts (Hill et al., 2009). Many IT governance structures within informal social contracts rely on personal trust relationships, reputation, and goodwill (Uzzi, 1997; Dyer and Chu, 2003). Within the cloud computing environment, this situation relates to establishing the cloud governance structures with the cloud service providers and other stakeholders, which is based on the informal elements of trust, relationship, and goodwill. The need to participate in cloud governance cannot be enforced on the outside stakeholders. IT governance structures that embed the above stated values are likely to be less costly, and promote elements of self-enforcement and monitoring (Dyer and Singh, 1998). Organizations, however, could develop hard matrices to evaluate their cloud-based performances. Provan and Kenis (2008) also share similar thoughts, and suggest that networks could be participant-governed, lead-organization governed, or administratively governed. Shared participant governance (Provan and Kenis, 2008) is a way to govern in a collaborative environment where there is a small number of participants and goal consensus amongst these participants is high. In shared governance, partners collectively make decisions and manage the network activities (Venkatraman and Chi-Hyon, 2004; Provan and Kenis, 2008). Power in this network regarding decisions is symmetrical (Provan and Kenis, 2008), which calls for equitable contribution of resource utilization capabilities. These arguments suggest that aspects of governance of the cloud computing services require sharing and identifying synergies between the adopting organizations and the cloud service providers. In the following section, we adopt the above theoretical framework and suggest an appropriate research design to identify the IT governance structures for the cloud computing services.

4. Hypotheses development

4.1. A design to obtain an understanding on governance structures for governing the cloud computing services

There have been significant discussions on the benefits and issues surrounding the cloud computing environment and services (see for example, Gartner, 2012; Plummer, 2012). Further, a number of organizations are making dedicated use of the cloud computing services. For example, Gartner predicts the public cloud services market will total $109 billion in 2013. While the shift away from traditional IT acquisition models to public cloud services is still in the very early stages, there are organizations that have championed the adoption of cloud computing, and have achieved much success. For example, the Commonwealth Bank of Australia and Telstra Corporation have achieved much success from the cloud computing initiatives (Foo, 2012). We believe optimal understanding of the IT governance structures for the cloud computing services could be obtained by assimilating the knowledge of cloud computing champions, from the extant literature, and from the commentaries of various stakeholders. Fig. 3 presents our research design to obtaining information to suggest governance structures for the cloud computing services.

As depicted in Fig. 2, we adopted a triangulation approach that includes a mixed method interpretive design. An interpretive study (Yin, 1994) is useful to unpack the diversity of issues involved in governing the cloud computing services. The interpretive approach affords an in-depth look at the dynamic relationship that exists between adopters and providers of the cloud computing services. This approach considers the shared meanings and experiences of people involved (Walsham, 1995), in this case, the cloud computing stakeholders. One interprets these meanings and experiences from perspectives of individuals themselves, given that multiple realities exist in organizations, shaped by their experiences and actions. That is, appropriate understandings on the governance of the cloud computing services exist

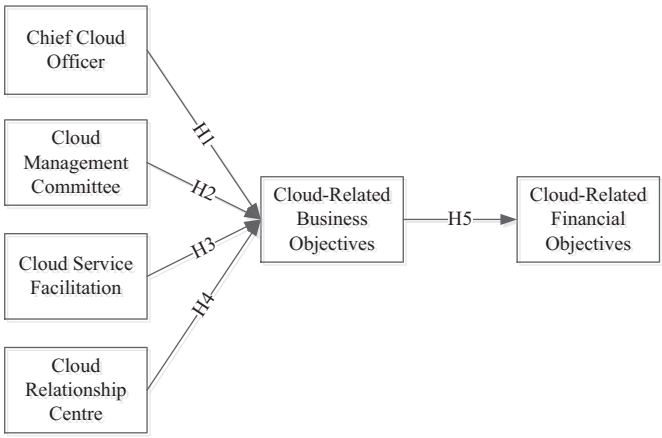

Fig. 3. Design to suggest governance structures for cloud computing services.

in the interpretation of these understandings of the stakeholders of the cloud computing environment. This effort, together with the related extant literature, becomes instrumental in making generalized assertions on appropriate governance structures for the cloud computing services.

We collated various academic and practice-related commentaries on the cloud computing environment. We used key words such as cloud computing, cloud computing services, cloud computing platform, cloud infrastructure, cloud computing management, cloud computing governance, and service-oriented architecture to filter the cloud computing commentaries from the Internet and the IEEE Xplore Digital Library, the Science Direct, and the Business Source Elite databases. Then, we searched the Internet using search terms like cloud computing payoffs, cloud computing strategy, cloud computing support, and first movers to the cloud to collate a list of organizations that have successfully adopted cloud computing services. Thus, our sampling of the target organizations whom we could interview was purposeful. We identified twenty-three organizations in our sampling frame. We communicated to these organizations about the purpose of the study, the personnel of interest, and the nature of their involvement in the intended discussion. We were able to interview fifteen individuals from four organizations. The semi-structured phone and face-to-face interviews lasted about one hour, and we were able to interview more than one person in some organizations representing different levels of management. Table 2 presents the demographics of the interviewees. The collection of data from different

Table 2
Interviewee demographics.

Interviewee	Position	Age	Industry	Experience (years)
1	IT Manager	36	Retailing	8
2	Chief Information Officer (CIO)	41	Retailing	12
3	Manager Mobile Services	32	Communication	13
4	Manager Logistics	55	Retailing	15
5	IT Manager	33	Banking	6
6	CIO	38	Banking	20
7	Department Manager	28	Distribution	6
8	Department Manager	29	Distribution	8
9	Customer Service Manager	35	Banking	11
10	Risk and Operations Manager	42	Retailing	8
11	Director Operations	49	Banking	12
12	CIO	48	Distribution	3
13	IT Manager	33	Communication	5
14	Operations Manager	39	Communication	16
15	IT Manager	34	Distribution	13

management levels permitted the elicitation of multiple viewpoints from individuals within the same division, and we could use these viewpoints to contrast across divisions. The intent of this approach was to identify common conceptions that represent the key governance structures for the cloud computing services. The interviews were semi-structured. The opening question was very general, seeking opinion on competencies required to govern the cloud computing services. The interviews then progressed with some focus around the capabilities and relations in governance of the cloud computing services, but with enough flexibility to capture perceptions on various perspectives on the governance of the cloud computing services.

We tabulated the key deliberations on general management of the cloud computing services and cloud computing services relationship management from the academic and practice commentaries. We then analyzed the transcribed interview data for its thematic content, resulting in a number of conceptions relating to possible governance structures for the cloud computing services. The conceptions emerged using the steps suggested by Dey (1993). These steps included establishment of the units of analysis, code attachment, and conception categorization into broader conceptions. We used both open and pre-set coding because our theoretical framework provided some guidelines on possible governance structures for the cloud computing services. Three individuals performed coding, and the coding report was then compared and analyzed to finalize the key themes and resulting broad conceptions — governance structures for the cloud computing services. The coding refinement process involved detailed discussions between the three coders on the identified themes and the meanings of these themes. We also provided copies of the transcribed notes and thematic analysis to the interviewees for verification and additional comments to ensure validity of our analysis. We then considered the synergies between the key deliberations of the academic and practice commentaries, and the key conceptions from the interview data to suggest possible governance structures for the cloud computing services. The next section discusses the findings of this study.

4.2. Business value from the cloud computing services governance structures

There is a need to map the cloud computing services governance structures to the business intentions and requirements, and the benefits that could be acquired form the cloud services and platforms (Peiris et al., 2010). We posit that the cloud computing services-related business value from its governance structures will follow the business process performance-firm performance path (Davamanirajan et al., 2002; Dehning and Richardson, 2002; Prasad et al., 2010). The initial value from the governance of cloud computing services would relate to the cloud computing services-related business objectives. These objectives relate to the improvement in the business processes with the cloud computing services. That is, effective governance of the acquired cloud computing services would lead to efficiency gains, improved agility, better creativity and innovation, better security and risk management, and simplicity of IT systems (Peiris et al., 2010). Improvement of above aspects of the business processes would result in achievement of cloud computing services-related financial objectives of better returns on investment in IT, improvement in total lifecycle cost of IT deliverables, reduction of ongoing recurring costs, and better response to financial distress or economic slowdown conditions (Peiris et al., 2010). Thus, to validate our study's research model, we relate the cloud governance structures directly to the cloud computing services-related business objectives and indirectly to the cloud computing services-related financial objectives.

4.3. Governance structures for cloud computing services

In the cloud computing environment, governance will be managing “who gets their say, and who has their say” (Plummer, 2012, page 28). While the cloud computing service providers may initially have a stronger say in this, as the cloud computing services adoption grows, organizations would require significant control of their acquired cloud computing services.

This governance of cloud computing services will have to be at three levels — business, service, and technical governance. The business-related governance of the cloud computing services deals with consumption and management of the cloud services. Service governance is provider-related, and deals with tracking, measurement, monitoring, and enforcement of the cloud services. Technical governance relates to governing of cloud computing technology, and is better applicable to the private or the hybrid cloud environment. Our analysis of the interview transcripts and academic and practice-related

commentaries led to suggestions of four governance structures for the cloud computing services. We discuss these governance structures in the following subsections and suggest their relationship with organizations cloud computing services-related business objectives.

4.3.1. A chief cloud officer

A Chief Cloud Officer (CCO) relates to having an individual or a team led by an individual in an organization with expertise in the cloud computing services and logistics. There was a strong consensus on the importance of this capacity in the commentaries and in the interviewees' views. This capacity mimics the role of the Chief Technology Officer, but in a cloud computing services intensive environment. The CCO would monitor the cloud market, and would be a cloud subject matter expert (Block, 2012). According to Gartner (2012), a CCO would assist the organization with cloud services brokerage and suggesting extras, as most cloud service providers will provide the basic. A CCO would also manage aspects of the technical governance (Plummer, 2012). According to Speed (2011), organizations must maintain knowledge of all critical information and processing assets held in the cloud environment, and maintaining sufficient skills (in-house or with a vendor independent of the provider) to be able to repatriate and re-establish the systems and the services. The interviewees shared the following on this capacity on their organization.

> "*One important consideration when thinking about cloud computing is to have local expertise with us. This is especially important as there are many cloud providers, and there is a risk that one could be taken for ride. We have to ensure that we drive our cloud initiatives and know and what and how we need cloud services.*" *T6*

> "*It is important that we know what we need to know before we engage in cloud services. This means we should have a proactive approach to adopting cloud services and should be drivers of our decisions. To do this, we need to build expertise on how cloud services will help our organization.*" *T11*

The CCO will also aid with the coordination of the cloud computing services-based technological efforts between the business units and the corporate goals to ensure synergy and economics of scale (Cetindamar and Pala, 2011). The role of the CCO will embrace various roles of Chief Technology Officer (CTO) suggested by Adler and Ferdows (1990). These roles of the CCO will ensure streamline use of the cloud computing services. The CCO would represent cloud technology and services within the top management, and will present them with a sustainable view of the cloud computing services. This situation means that the CCO would ensure that a strategic focus of the cloud computing services is maintained (Cetindamar and Pala, 2011). A path to the cloud computing services would necessitate monitoring the technological advances to capture developments that may impact organizational operations. As Christensen (1997) notes, many organizations go bankrupt for not recognizing the disruptive impact of emerging technologies. This aspect of introduction of the cloud computing technologies in businesses would require monitoring, and would best fit into the portfolio of the CCO.

These roles and responsibilities of the CCO would ensure an appropriate direction for the adoption of the cloud computing services. This focus will contribute to the mapping of cloud-related decisions to the business requirements of the cloud computing services. Thus, a better fit of the cloud technologies to the business processes is possible. Consistent with the above arguments, and related views and commentaries, we hypothesize that:

H1. The presence of a Chief Cloud Officer as part of a cloud computing services governance structure will positively relate to an organization's cloud computing services-related business objectives.

4.3.2. Cloud management committee

In addition to the local expertise on the cloud computing environment, there was strong mention in commentaries, and in the interviewees' views on the need to have a management structure to govern the cloud computing services. The Cloud Management Committee (CMC) relates to bringing together different levels of management and other stakeholders to oversee the adoption of the cloud computing services. Views were shared that there needs to be an understanding on the impact and the trajectory of benefits of

the cloud services to organizations. According to Gartner (2012), organizations should not go chasing ghosts (ROI) in the cloud. As the cloud computing services adoption continues to grow, the ability to govern the services used will be a critical success factor, and the need for some degree of coordination of the cloud computing services is essential. Within this governance structure, there should be a balanced representation of members to this committee, and there should be regular invitation of the cloud-service stakeholders. These stakeholders would be the current or potential cloud resource providers, the cloud resource intermediaries and other authorities, like the industry sector committees promoting cloud adoption. This structure will have the primary role of setting strategic importance of the cloud computing services. The interviewees' views related to this governance structure were:

> "*There needs to be a strategic focus on cloud services from the outset. Organizations should only move to cloud when its alignment with strategic objective is ensured. Otherwise we could be assuming things that may never eventuate.*" *T8*

> "*The decision makers need to understand the cloud environment. There is a need to move to the cloud as an organization-wide rather than a pocket-of-interest initiative. In addition, the sheer nature of the cloud computing means we may not be able to do all the things on our own. We will have to start including the providers of the services in our decision making relating to cloud.*" *T12*

> "*While cloud providers will deliver standard service to all, organizations will have to convert them into their unique elements. To do this, we need to have a good understanding across our organization on how we need to include these services and make it a strategic tool for us. People (the various decision makers) need to get together and understand and set direction of organizations' cloud use. It will end up being a big thing and we need to think about it strategically.*" *T3*

A CMC will bring the cloud computing services decision makers and the cloud computing services users together. It will have the role of steering the adoption of the cloud computing services to various aspects of organizations' business processes. The role of the CMC is similar to that of the IT steering committee (Torkzadeh and Xia, 1992; Karimi et al., 2000; Prasad et al., 2009; Huang et al., 2010). The element of difference, though, would be the relational component that would include the cloud service providers in the configuration. Consistent with the relational view, the cloud computing service providers would be invited to the CMC structure. However, their participation would be voluntary, and based on understanding, trust, and goodwill towards the organization. The CMC would bring together the custodians (the top management) and the elements of particular cloud computing decisions and the subsequent decision executors (middle-level managers). The engagement of this committee will ensure focus on the cloud computing initiatives that is recursive in nature, similar to the nature of engagement suggested by Prasad et al. (2009) for IT steering committees. That is, the consequences of earlier cloud-related decisions will form the basis for organizations' future commitments to the cloud computing services. This situation will ensure a coordinated and well-thought path to the adoption and implementation of the cloud computing services. Furthermore, the involvement of the cloud services providers within this decision structure would result in some degree of personalized cloud computing services to an organization (Marston et al., 2011).

The results of deliberations and actions of the CMC would ensure adoption of the cloud computing services that would have a higher chance of fit into existing business processes. As a result, organizations are more likely to meet their cloud-related business objectives in the presence of the CMC. Consistent with the above arguments, and related views and commentaries, we hypothesize that:

H2. The presence of a Cloud Management Committee as part of a cloud computing services governance structure will positively relate to an organization's cloud computing services-related business objectives.

4.3.3. Cloud service facilitation

The Cloud Service Facilitation (CSF) relates to operational management of the cloud computing services in organizations. This governance structure considers the issues in an organization after the adoption of cloud computing services. The main resource within this structure will be the Cloud Service

Manager (CSM). According to Block (2012), this structure will be a single point of contact for the organization, and will be a key issue resolution centre, develop and administer performance monitoring, manage change facilitation, and consider tactical decisions relating to the cloud computing services. The CSM will deal with the economics of cloud, which will include cloud provider risk assessment, and enterprise agreements. According to Gartner (2012), "there's nothing worse for an IT leader than waking up one morning to discover that business users have bought cloud services with a credit card and no due diligence" (page 28). Organizations must have a cloud servicing purchase requisition system, which should embed the traditional purchase requisition processes and controls. The interviewees shared the following:

> "*There needs to be a central cloud operational nervous system. This will complement the strategic initiative of the organization. A cloud requisition system is vital to keep a good control of cloud services and must manage a strong database of cloud suppliers.*" *T10*

> "*The end product of cloud services to an organization must be carefully managed. Organizations have to ensure that service does not entail self-service, rather, it is a process of standard acquisition of commodities. Further, a requisition process, especially when it comes to increasing or decreasing services, must justify the economics of a level of change of cloud services. T2*

> *A cloud management system is important. We need to manage it like any other commodity. Being another piece of technology, the IT productivity paradox will always be a concern. We must not get complacent with the utility nature of the technology; we need to justify every aspect of consumption of our cloud services. T6*

The CSF will act as the administrative arm of organizations' cloud initiatives. This structure will execute the decisions that follow from the CMC. A CMC would address the "what" question relating to the cloud computing services, but the "how" issues of the cloud computing services would be addressed by the CSF. An organization's strategic path to the cloud computing services would mean that commitments to the cloud environment be continuous and sustainable. The potential risks of working in the cloud are well documented (see for example, Gold, 2012; Kalyvas et al., 2013b). Hasty commitments and lock-ins with providers could result in high switching costs. Further, a key reason for organizations to move to the cloud environment is to source IT services on a need basis (Marston et al., 2011). All these factors mean the adopting organizations need to have governance structures in place to determine a careful path to acquiring the cloud computing services. This would be the role of the CSF.

A well-thought entry or further commitment to the cloud computing services means that the acquired services are deemed the most appropriate for the current state of the business processes. Further, this type of exercise will also assist organizations to source the most appropriate cloud computing services to improve or reengineer their business processes. Thus, the execution of the "how" decisions from the CSF would greatly assist organizations in meeting their cloud-related business objectives. Consistent with the above arguments, and related views and commentaries, we hypothesize that:

H3. The presence of a Cloud Service Facilitation Committee as part of a cloud computing services governance structure will positively relate to an organization's cloud computing services-related business objectives.

4.3.4. Cloud relationship centre

A Cloud Relationship Centre (CRC) is a cloud computing services governance structure dealing with relationship management. A CRC acts as a cloud services gateway, and would sit between the cloud computing service provider and the cloud computing service users. The task of this centre would include ensuring dynamic and continuous relationship between the corporate IT and business units, communication of the cloud computing services-related security, architecture standards and integration requirements, and business unit compliance. According to Plummer (2012), issues relating to the security in the cloud

environment, and the possibility of changing business models quickly are pertinent to organizations, and should be considered within a CRC.

A CRC would need to monitor the use of the cloud computing services, ways to stop someone from using the services, ensuring security, and enforcing policies about the use of the cloud computing services at all times. A CRC would broker all the requests from users of the cloud computing services. The CRC would intercept and interpret the requests to see if they fit within the cloud computing services policy and are safe. In a nutshell, service level governance means to track, measure, monitor, and enforce the services you provide. The interviewees also felt a service-level governance structure is important. They shared:

> "*An acquired service does not mean automatic use. Service does not override the controls that are in place. Also, being a commodity does not mean sharing at will. There needs to be a coherent set of policies in place on how resources acquired through cloud should be used on a day-to-day basis.*" *T8*

> *Acquired cloud services should be treated like a managing cupboard stationary when cutting cost. There needs to be coherent policies in place to monitor daily use of service resources.*" *T11*

> "*Since cloud applications come from outside, there would effectively be no control of it once they are acquired. This is a dangerous contemplation. There is a need to ensure that users do not perceive the acquired IT as an unmanaged commodity.*" *T15*

A CRC would manage the day-to-day use of the cloud computing services, and ensure that the set policies of the cloud services use are maintained. Essentially, CRC would mimic an IT-based performance management system (Burney and Matherly, 2007). A central role of the CRC would be the regular evaluation of the appropriateness of the acquired cloud computing services in assisting with achieving the planned business objectives. A CRC would also monitor that the cloud service providers fulfill their service level agreements. At the business unit level, a CRC would ensure that the cloud services are used as agreed within the set polices, as deviations from the set policies would introduce elements of risks in business. At the cloud computing service-provider side, service/vendor dependency can affect organizations cloud services-based plans. A CRC would ensure that mutual understanding between the organization and the cloud services providers is maintained.

The activities of CRC would ensure that the day-to-day adoption and use of the cloud computing services is consistent with the set cloud computing services-based objectives of the organization. This nature of control on interactions with the cloud computing services would provide clarity in linking the cloud computing services' use with the organization's strategic intent. Importantly, micro management of cloud computing services' use through a CRC would ensure that organizations cloud computing initiatives contribute to meeting their cloud-related business objectives. Consistent with the above arguments, and related views and commentaries, we hypothesize that:

H4. The presence of a Cloud Relationship Centre as part of a cloud computing services governance structure will positively relate to an organization's cloud computing services-related business objectives.

4.4. Cloud computing services-related business objectives and financial objectives

A key objective of an organization's decision to seek the cloud computing services is to manage the cost of development and management of its IT infrastructure (Marston et al., 2011; Iyer et al., 2013; Kalyvas et al., 2013a). The capital commitments into IT resources could be substantial. The changing nature of business environment and stakeholder expectations means maximum use of the acquired IT resources is rarely achieved. However, achieving the set financial objectives from cloud computing services requires its appropriate fit into the business processes. The preceding discussion suggests how various cloud governance structures could facilitate the cloud computing services-business processes fit in organizations. Further, organizations need to follow the IT business value trajectory (Dehning and Richardson, 2002; Tallon, 2007; Prasad et al., 2012) to achieve the cloud-based financial objectives. Organizations' appropriate fit of their cloud computing services to their business processes would indicate their

competencies in managing their cloud commitments. This outcome would be indicative of their ability to manage better their financial commitments to the cloud computing services. The result of this outcome would be better returns on their IT investment, and their ability to manipulate better their IT resources in changing business conditions. Consistent with these arguments, we hypothesize that:

H5. The *Cloud computing services-related business objectives will positively relate to the cloud computing services-related financial objectives.*

We present the following research model of structural considerations for governing the cloud computing services and assessing their effectiveness.

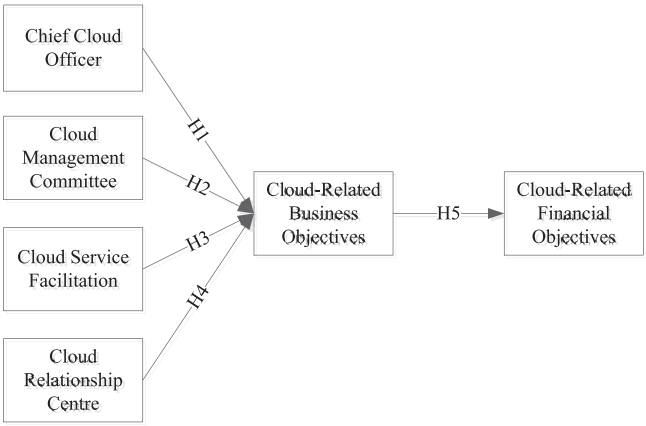

Fig. 3 Research Model

We now discuss our approach to validating the above research model.

5. Research design

5.1. Research approach and instrument development and test

We validated the proposed research model with a wide audience. This audience included organizations that have adopted the cloud services, or are planning to adopt the cloud services. Thus, we employed a field survey, which allows data collection from a broad area, and is the best way to reach geographically dispersed contacts.

Since our suggested governance structures for the cloud computing services have not been evaluated empirically in prior research, their measurement items did not exist. Thus, we had to develop new measurement items for our model's constructs. We adopted the approach suggested by Davis (1989) and Moore and Benbasat (1991) to develop and validate the measurement items of this study's constructs. The validation steps included item generation, item sorting and refinement, and a pilot test. We considered various dimensions of the suggested cloud computing services governance structures and cloud computing services-related business and financial objectives in the interview transcripts, and in the practice and academic commentaries. We pooled ten measurement items for each construct. Then, we sought assistance from eight fellow faculty colleagues and doctoral students with interest and expertise in the subject matter to sort and refine the constructs' measurement items. This process led to elimination and refinement of the measurement items. The sorting inter-rater scores, the Cohen's Kappa (κ), of the refined pool of measures indicated that inter-rater reliability for the participants was within the full agreement range ($\kappa = 0.60$–0.80) or within almost perfect agreement ($\kappa = 0.81 - 1.00$). The outcome of this sorting and subsequent refinement process was a set of near-final measurement items for each construct.

We sought assistance from fifteen fellow colleagues and other graduate students who did not participate in the initial item sorting process to pilot test our survey research instrument. They shared some issues with the framing of the questions, which we addressed to develop our final research instrument. We did not have enough pilot test data to perform initial factor analysis to assess the measurement qualities of data. Table 3 presents the final measurement items for the constructs in the

Table 3
Final measurement items — actual cloud computing services adopters.

Chief Cloud Officer
Our organization has a person who is an authority on cloud services.
Our organization initiates ideas that results in obtaining cloud services.
Our organization has an independent authority who evaluates cloud service proposals by cloud provider.
Cloud Management Committee
Our organization has a structure that steers our cloud activities.
Our organization has a structure that ensures that cloud activities are consistent with our strategic objectives.
Our organization has a structure that coordinates the requirements of cloud services.
Cloud Service Facilitation
Our organization has a structure that executes the cloud service decisions of top management.
Our organization has a structure that maintains information about cloud service providers.
Our organization has a structure that looks after day-to-day management of cloud services.
Cloud Relationship Committee
Our organization has a structure that is a one-stop facility to manage relationship with cloud providers.
Our organization has a structure that considers the nature of use of cloud services by individual business units.
Our organization has a structure that develops, implements, and maintains cloud services policies on a regular basis.
Cloud-Related Business Objectives
Our organization has achieved better creativity and innovation in products and customer services.
Our organization has improved the simplicity of its IT systems.
Our organization has improved security and risk management of its IT systems
Cloud-Related Financial Objectives
Our organization has achieved better return on its investment in IT.
Our organization has improved its total lifecycle cost of its IT deliverables.
Our organization has improved its ability to respond to financial distress or economic slowdown conditions
Final Measurement Items — Potential Cloud Computing Services Adopters
Chief Cloud Officer
Our organization sees it important to have a person who is an authority on cloud services.
Our organization sees it important to initiates ideas that results in obtaining cloud services.
Our organization sees it important to have an independent authority who evaluates cloud service proposals by cloud provider.
Cloud Management Committee
Our organization sees it important to have a structure that steers our cloud activities.
Our organization sees it important to have a structure that ensures that cloud activities are consistent with our strategic objectives.
Our organization sees it important to have a structure that coordinates the requirements of cloud services.
Cloud Service Facilitation
Our organization sees it important to have a structure that executes the cloud service decisions of top management.
Our organization sees it important to have a structure that maintains information about cloud service providers.
Our organization sees it important to have a structure that looks after day-to-day management of cloud services.
Cloud Relationship Committee
Our organization sees it important to have a structure that is a one-stop facility to manage relationship with cloud providers.
Our organization sees it important to have a structure that considers the nature of use of cloud services by individual business units.
Our organization sees it important to have a structure that develops, implements, and maintains cloud services policies on a regular basis.
Cloud-Related Business Objectives
Our organization anticipates better creativity and innovation in products and customer services from cloud resources.
Our organization anticipates improved the simplicity of its IT systems from cloud resources.
Our organization anticipates improved security and risk management of its IT systems from cloud resources.
Cloud-Related Financial Objectives
Our organization anticipates better return on its investment in IT.
Our organization anticipates improvement in its total lifecycle cost of its IT deliverables.
Our organization anticipates improvement in its ability to respond to financial distress or economic slowdown conditions.

proposed research model. These questions are framed for the actual and the potential cloud computing services adopters.

5.2. Sample frame construction and survey administration

We obtained contact details of organizations that may have adopted cloud computing services, or are thinking about adopting cloud computing services from the ORBIS database. ORBIS is a publication of Bureau van Dijk Electronic Publishing (BvDEP). ORBIS provides information on listed and unlisted companies across the globe. For survey administration reasons, we limited our sampling frame to a single country — Australia. The business and technology adoption environment in Australia is consistent with the ones of other developed economies. To date, databases do not have information on organizations' engagement with cloud computing services. Further, one can assume intuitively that a small number of organizations have adopted cloud services, but current commentaries suggest that a large number of organizations are thinking about sourcing services from the cloud. For this reason we decided to include all the publicly listed and private companies in our sampling frame. To avoid sending more than one instrument to a contact person/organization, we examined organizations' subsidiary and partnership relationships. We evaluated the database for such relationships, and also examined their Websites for associations and affiliations. At the end of this exercise, we ended up with 2476 target respondents (companies) from this database as our sampling frame. As we could not identify the level of organizations' engagement with the cloud computing environment, this sampling frame is expected to include the actual and potential adopters of the cloud computing services, and organizations that may not have yet thought about adopting the cloud computing services. Organizations that participated in the interpretive study were not included in this sampling frame.

We adopted Dillman's (2007) methodology to develop and administer the online research instrument. We developed the survey instrument for the actual and the potential cloud service adopters. We planned to have separate instruments to ensure that items are personalized for each group of cloud computing services adopters. To achieve this, we had two links in our cover email note to the participants, one with survey questions for the actual adopters, and other for the potential adopters. The email link directed the potential respondents to access the appropriate survey questions. We approached the contacts with an initial instrument package delivery via email and two email reminders. The email contained the link to the survey. At the conclusion of the instrument administration process, we received 120 valid responses. We felt that while this dataset was appropriate for testing our proposed model, we could obtain more responses from face-to-face engagements. We collected further 16 responses from meeting with the prospective contacts. These contacts were part of the sampling frame and did not respond to our survey. They were located within reasonable proximity for a face-to-face meet.[4] At the end of this exercise, our dataset had 136 responses with an overall response rate of 5.5%. This response relates to all organizations in the sampling frame as we could not identify the actual and potential adopters of the cloud computing services, and organizations that have not thought about adopting cloud computing services.

5.3. Descriptive statistics and diagnostic checks

Table 4 presents the descriptive statistics on the dataset. Eighty percent of the responses were received from organizations that have adopted or are planning to engage in the cloud computing services. Reponses were received from contacts with some IT background and there is a fair representation of major industries in the dataset.

We tested for non-response bias with first and last thirty responses for all measures, including the demographic variables. Contacts that responded after first and second reminders acted as proxies for non-respondents. We did not find any significant differences on any of the variables. We also tested for differences in responses from actual and potential cloud services adopters. Our *t*-test did not show any differences. Examination of common methods variance using Harman's single-factor test, where all items

[4] As per the ethical guidelines, we had to keep our survey data in an identifiable manner to allow the respondents to withdraw their participation within a reasonable time.

Table 4
Descriptive statistics.

Total responses	136	*Industry representation*	
Actual adopters of cloud services	26	Construction	3
Potential adopters of cloud services — email	94	Education	7
Potential adopters of cloud services — face-to-face	16	Financial services (banking, insurance)	16
Average age of respondent	47	Manufacturing	18
Average size of organization (no. of employees)	450	Other services	18
Capacity of respondents		Others	10
Chief Information Officer	36	Retail	41
Chief Technology Officer	21	Telecommunications	13
IT Manager	25	Transportation	13
Chief Financial Officer	18		
Senior Accountant	15		
Senior Business Analyst	21		

were subject to exploratory factor analysis (EFA), revealed common methods variance was not an issue. More than one factor emerged from un-rotated factor solutions, and more than one factor explained a majority of the variance. There were no issues of missing data.

6. Results

6.1. Assessment of measurement model

Table 5 presents the details of the measurement items, which include factor loadings, cross-loadings, mean, standard deviation, and t-statistics. Confirmatory factor analysis (CFA) showed factor loadings for constructs load highly only on their designated constructs. Measurement items have a factor loading of above the rule of thumb of 0.70, indicating at least 50% of the variance in a manifest variable is accounted for by the construct (Hair et al., 2008). Cross-loadings analysis revealed manifest variables load highly only on desired latent variables. However, there are some cross loadings in the 0.400–0.500 range.

Table 6 presents the results of the measurement model assessment, including Cronbach's alpha, average variance extracted, and inter-construct correlations. The alpha coefficients of all constructs were

Table 5
Factor loadings, loading descriptive, and cross loadings.

	Factor loading	Mean	Std. dev.	T-stat	CBO	CCO	CFO	CMC	CRC	CSF
CBO1 ← CBO	0.799	0.801	0.029	27.39	**0.799**	0.435	0.547	0.302	0.524	0.326
CBO2 ← CBO	0.866	0.864	0.025	34.80	**0.866**	0.281	0.452	0.498	0.485	0.303
CBO3 ← CBO	0.857	0.857	0.022	38.43	**0.857**	0.351	0.432	0.486	0.500	0.408
CCO1 ← CCO	0.904	0.900	0.026	35.14	0.296	**0.904**	0.313	0.155	0.159	0.400
CCO2 ← CCO	0.953	0.952	0.010	99.91	0.395	**0.953**	0.380	0.192	0.291	0.305
CCO3 ← CCO	0.932	0.934	0.012	75.77	0.455	**0.932**	0.427	0.173	0.349	0.333
CFO1 ← CFO	0.967	0.967	0.006	153.26	0.336	0.366	**0.967**	0.283	0.422	0.362
CFO2 ← CFO	0.943	0.944	0.013	72.81	0.377	0.377	**0.943**	0.312	0.423	0.391
CFO3 ← CFO	0.894	0.895	0.022	41.35	0.463	0.410	**0.894**	0.317	0.355	0.358
CMC1 ← CMC	0.880	0.880	0.018	50.30	0.491	0.137	0.370	**0.880**	0.497	0.189
CMC2 ← CMC	0.796	0.792	0.034	23.13	0.466	0.075	0.221	**0.796**	0.439	0.115
CMC3 ← CMC	0.798	0.796	0.044	18.19	0.401	0.270	0.197	**0.798**	0.338	0.212
CRC1 ← CRC	0.874	0.874	0.017	52.04	0.352	0.193	0.283	0.425	**0.874**	0.200
CRC2 ← CRC	0.860	0.857	0.030	28.61	0.485	0.308	0.460	0.406	**0.860**	0.296
CRC3 ← CRC	0.715	0.714	0.054	13.29	0.424	0.246	0.322	0.456	**0.715**	0.211
CSF1 ← CSF	0.933	0.933	0.009	109.40	0.453	0.430	0.379	0.267	0.303	**0.933**
CSF2 ← CSF	0.845	0.844	0.025	34.10	0.296	0.476	0.281	0.115	0.169	**0.845**
CSF3 ← CSF	0.839	0.834	0.039	21.29	0.293	0.392	0.373	0.117	0.257	**0.839**

Note: CCO — Chief Cloud Officer; CMC — Cloud Management Committee; CSF — Cloud Service Facilitation; CRC — Cloud Relationship Committee, CBO — Cloud Computing Services-Related Business Objectives; CFO — Cloud Computing Services-Related Financial Objectives.

Table 6
Measurement properties.

	AVE	CA	CBO	CCO	CFO	CMC	CRC	CSF
CBO	0.708	0.793	**0.841**					
CCO	0.865	0.923	0.422	**0.930**				
CFO	0.875	0.928	0.565	0.409	**0.935**			
CMC	0.682	0.766	0.551	0.188	0.324	**0.826**		
CRC	0.672	0.752	0.520	0.300	0.430	0.520	**0.820**	
CSF	0.763	0.847	0.412	0.567	0.396	0.206	0.286	**0.873**

Note: CCO — Chief Cloud Officer; CMC — Cloud Management Committee; CSF — Cloud Service Facilitation; CRC — Cloud Relationship Committee, CBO — Cloud Computing Services-Related Business Objectives; CFO — Cloud Computing Services-Related Financial Objectives; AVE — Average Variance Extracted; CA — Cronbach's Alpha.

higher than 0.70 (Nunnally, 1978), suggesting good internal consistency and that the items measure an underlying (or latent) construct. The square root of average variance extracted (shown diagonally in bold), which represents the average association of each construct to its measures, was higher than correlations with other constructs. This statistic indicates that the constructs relate closely to their own measures rather than to those of other constructs.

6.2. Assessment of the structural model

Table 7 presents the outcome of the assessment of the structural properties of data for hypotheses 1–4. The four suggested governance structures for the cloud computing services (chief cloud officer, cloud management committee, cloud service facilitation, and cloud relationship committee) relate positively and significantly to organizations' cloud computing services-related business objectives. Together, these governance structures explain 60.9% variance in cloud computing services-related business objectives. Cloud relationship management has the most significant association with the cloud computing services-related business objectives (path coefficient — 0.535, p-value — 11.266). Overall, data supports Hypotheses 1–4.

Table 8 presents the assessment of the relationship between the cloud computing services-related business objectives and cloud computing services-related financial objectives. The outcome shows that cloud computing services-related business objectives relate favorably and significantly to the cloud computing services-related financial objectives. The Cloud-related business objectives explain 31.9% variance in the cloud computing services-related financial objectives. The data supports hypothesis 5. Overall, it is feasible to infer that the suggested governance structures for cloud computing services improve organizations' cloud related financial objectives. The next section discusses these outcomes.

7. Discussion

The impetus to seek the cloud computing services is gaining momentum. Organizations IT costs are soaring, and the changing economic conditions mean they are finding it difficult to achieve economies of scale from their IT resources. The result of these situations is significant capital commitment in IT resources and less flexibility in the ways these resources could be leveraged. The cloud computing

Table 7
Cloud governance structures ➔ cloud-related business objectives — hypotheses 1–4.

Relationship	Path coefficient	p-Value	Sig.
Chief cloud officer ➔ cloud-related business objectives	0.136	2.737	*
Cloud management committee ➔ cloud-related business objectives	0.228	5.284	***
Cloud service facilitation ➔ cloud-related business objectives	0.110	2.601	*
Cloud relationship management ➔ cloud-related business objectives	0.535	11.266	***
Explained variance (R^2)	0.609		
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$			

Table 8
Cloud-related business objectives ➔ cloud related financial objectives — hypothesis 5.

Relationship	Path coefficient	p-value	Sig.
Cloud-related business objectives➔ cloud-related financial objectives	0.566	9.975	***
Explained variance (R^2)	0.319		
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$			

environment is providing a timely alternative to acquire cloud computing services as a utility. However, this opportunity means organizations are exposed to new challenges. Our approach suggests that organizations need to be proactive and ready themselves before they take up these challenges. Thus, this study is our effort to suggest possible governance structures for the cloud computing services.

Organizations' primary motive in adopting cloud computing services is to manage their capital and operational IT costs (Marston et al., 2011; Block, 2012). This effort, however, will commence with an appropriate fit of the cloud computing services to the existing business processes. Thus, we suggest that well governed cloud computing services would first contribute directly to the cloud computing services-related business objectives, and indirectly to the cloud computing services-related financial objectives. We also suggest that the governance structures for the cloud computing services include a relational element with the cloud service providers and other stakeholders. However, all cloud computing-based initiatives must be driven from within the organization. As a commencing (higher-level) governance structure, organizations need to have the capacity to evaluate the potential of the cloud computing services. Our evaluation suggested the presence of a chief cloud officer to initiate potential cloud computing service acquisition (hypothesis 1). Actual and potential cloud service sourcing organizations perceive that this structure contributes to achieving the cloud computing services-based business objectives as it would bring relevant cloud computing services to the attention of the decision makers.

At the next level, we suggested a cohesive committee to decide on the cloud computing services proposals (hypothesis 2). This committee would steer the adoption of the cloud computing services with considerations from different management groups. Actual and potential cloud computing services sourcing organizations perceive that this governance structure contributes to achieving the cloud computing services-based business objectives. Decisions from this structure would ensure agreement on the most appropriate cloud computing services for the organization. Once a decision is made on the need for particular cloud computing services, the next important step is finding the most appropriate cloud computing services provider. We suggested (hypothesis 3) and the actual and potential cloud service sourcing organizations perceive that a cloud service facilitation committee would contribute to achieving the cloud computing services-based business objectives. Sourcing the cloud computing services is not a one-off commitment. Rather, it is a continuous engagement that would require regular maintenance and evaluation by the adopting organizations. We suggested that a governance structure in the form of a cloud relationship management would ensure the continuity of the cloud computing initiatives, and would also include the end users to provide directions for future cloud computing service requirements. We suggested (hypothesis 4) and actual and potential cloud service sourcing organizations perceive that a governance structure of cloud relationship management contributes to achieving cloud computing services-based business objectives. The four governance structures provide a holistic management of the cloud computing services from its inception to ensuring its continued fit to organization's IT needs.

From an IT cost perspective, organizations would not only want to achieve operational objectives from the cloud computing services, but would like to see that a utility-based approach to adopting the IT resources improve their financial commitment to the IT resources. This anticipated improvement would be in the form of better economics of scale from the IT commitments. This outcome would be possible when organizations improve the reach (flexibility), and the richness (degree of fit) of their IT resources. We posited that our suggested cloud governance structures would ensure careful initial and subsequent thoughts on the cloud computing services. Such forms of commitment in managing the IT services would result in a careful spend of the IT dollar, and the reduction in residual leverage of the IT resources. Essentially, the suggested suite of governance structures for the cloud computing services would mean a continuous and careful thought, perceived good fit of the prospective cloud computing services, and subsequent actual implementation of the cloud computing services into the business processes. Thus, we

suggested (hypothesis 5) and actual and potential cloud service sourcing organizations perceive that improved cloud computing services-based business objectives would contribute to the cloud computing services-based financial objectives. This outcome implies that organizations appropriate management of their cloud computing services in relation to their fit to the business processes would assist them in managing their IT expenditure constrains. These constraints relate to ascertaining the returns from IT investments within a reasonable period. Next, we discuss the contributions of this research.

8. Research contributions and implications for theory and practice

This research contributes to the IT governance literature in the following ways. First, we suggest a number of governance structures for managing the cloud computing services in a challenging environment. Future research could consider the effectiveness of these governance structures for the cloud computing services in various organization settings, or consider other structures that may be appropriate for specific cloud computing services. Second, we present a theoretical framework to suggest IT governance structures for the cloud computing services that includes a relational element. That is, organizations need to develop and sustain their relationships with the cloud computing service providers and other stakeholders as part of their governance structures for the cloud computing services. An implication of this suggestion through the subsequent validation of these governance structures is the need to possibly consider cloud service providers and other stakeholders when considering cloud governance structures, yet ensuring that the cloud computing services is managed and controlled from within the organization. Importantly, the cloud computing services governance structures should be an avenue to promote sustainable relationships with the cloud service providers and the related stakeholders. Third, we suggest that the best way to ascertain effectiveness of the cloud governance structures is to relate them to the initial objectives of sourcing cloud services. These objectives relate to improving the fit of IT resources to organizations business processes to achieve business agility, and ensuring better innovation from this agile environment. The implication of this suggestion is the need for organizations to think proactively on their intended outcomes before committing to the cloud computing services. Finally, we contribute to understanding how organizations could link their cloud computing services-related business objectives to their cloud computing services-based financial objectives. This understanding is important because organizations need to ascertain that their option to acquire the IT resources on a utility basis is feasible compared to the conventional capital commitment to the IT resources.

This research also has implications for practice. First, the cloud computing services presents opportunities to organizations to manage their IT requirements. However, organizations need to control their path to adopting the cloud computing services. This effort would require building the internal capacity, and accommodating the thoughts of cloud computing service providers and other stakeholders. Organizations need to manage their cloud computing service initiatives from its inception to its continued use to source the full benefits of the opportunity to acquire the services on a utility basis. Failure to manage such a level of control would mean that the cloud computing services would become another IT commitment that provides little room to maneuver the IT resources to take advantage of presented opportunities. Finally, organizations must continually relate their operational use of the cloud computing services to their financial exposure on these services. This effort is important to ensure that organizations leverage the utility environment by changing their cloud computing service adoption strategies if the anticipated financial benefits are not forthcoming.

9. Research limitations

A number of issues need consideration when interpreting the outcomes of this research. First, it was challenging to collect data to validate our proposed model. It was difficult to develop a sampling frame of only the current cloud computing services users. Thus, we had a bigger sampling frame that included the current and prospective users of the cloud computing services, and organizations that have not yet thought about the cloud computing services. Despite a number of data collection methods, we had a low the survey response rate. Twenty-six (26) responses were received from the actual adopters of the cloud computing services in relation to the entire sampling frame giving a response rate of 1.05%. Further, we received one hundred and ten (110) responses from potential adopters of cloud computing services,

which equates to a response rate of 4.44%. These response rates are based on the overall sample of 2476 target respondents. However, our dataset with 136 responses from actual and potential cloud service adopters was adequate to test the model fit (5 paths) and make statistical inferences from the analysis. Second, we did not focus on a specific cloud computing service, or the cloud computing services from a specific vendor. These situations may present some bias to the research outcomes owing to comparisons of cloud computing services in different business environments and from different service providers. However, despite the varied environment or service provider, their governance structures for the cloud computing services would be similar. Third, despite rigorous attempts to validate the perceptive measures, and careful administration of the survey instrument, perceptions are susceptible to bias and error. However, we envisage our efforts have minimized these errors and biases. Fourth, while we would have preferred to use objective measures of business and financial objectives, published data for these measures is difficult to obtain. Fifth, we collected and collated data from the actual and prospective users of the cloud computing services. For the prospective users, we also collected data through face-to-face meetings. This may introduce some bias in the dataset. However, we framed our questions carefully to both groups, and our bias analysis did not identify any significant differences.

10. Conclusion

The importance of sourcing the cloud computing services from the cloud computing environment is gaining momentum, and cloud computing is here to stay. While the concept of acquiring and consuming resources and services as a utility is not new, the thought of sourcing IT services as a utility is presenting excellent opportunities to organizations to manage their IT cost, and have modern IT services to facilitate innovation. However, a change in the way of acquiring the IT services does not negate organizations' responsibility of appropriately managing these services, and ensuring that these resources fit into their existing business processes. Therefore, organizations need to consider appropriate governance structures to manage the cloud computing services. We adopted a triangulation approach and have suggested four possible governance structures for the cloud computing services. These structures relate to having a strategic thought on the cloud computing services, the importance of having a cloud expert, cloud service polices, and manage and integrate the cloud computing services in organizations. We also showed that organizations perceive that the suggested governance structures do relate directly to their cloud computing services-related business objectives, and indirectly to their cloud computing services-related financial objectives. We hope our effort will increase the understanding on ways to approach the adoption of the cloud computing services by establishing procedures at the outset to ensure the acquired IT resources contribute to the strategic intent of organizations, and swiftly fit into their existing business processes.

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