A conceptual model for cloud computing adoption by SMEs in Australia

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Delivery and Adoption of Cloud Computing Services in Contemporary Organizations

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Chapter 5
A Conceptual Model for Cloud Computing Adoption by SMEs in Australia

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ABSTRACT

Cloud Computing is an increasingly important worldwide development in business service provision. The business benefits of Cloud Computing usage include reduced IT overhead costs, greater flexibility of services, reduced TCO (Total Cost of Ownership), on-demand services, and improved productivity. As a result, Small and Medium-Sized Enterprises (SMEs) are increasingly adopting Cloud Computing technology because of these perceived benefits. The most economical deployment model in Cloud Computing is called the Public Cloud, which is especially suitable for SMEs because it provides almost immediate access to hardware resources and reduces their need to purchase an array of advanced hardware and software applications. The changes experienced in Cloud Computing adoption over the past decade are unprecedented and have raised important issues with regard to privacy, security, trust, and reliability. This chapter presents a conceptual model for Cloud Computing adoption by SMEs in Australia.

INTRODUCTION

Cloud Computing is an increasingly important area in the development of business services. Gartner Consulting defines Cloud Computing as "a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service using Internet technologies" (Plummer et al., 2009). Cloud Computing provides different types of services delivered under different deployment models on demand, and uses a pay-as-you-go method. Many developed countries are moving quickly to ensure the rapid adoption of Cloud Computing (Mudge, 2010).

In general, companies obtain Cloud Computing services (e.g. Software as a Service (SaaS)) from a Cloud Computing environment; they then have the opportunity to take advantage of new devel-

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opments in IT technologies at an affordable cost. Therefore, Cloud Computing is a cost effective IT solution which can benefit small, medium and larger organisations as well as governments and public services. For example, economies of scale for data centers (facilities used to house computer systems and associated components) can deliver cost savings of 5 to 7 times compared to typical total costs of computing (Armbrust *et al*., 2010). Cloud Computing provides shared computing resources, software, storage and information on demand to Cloud Computing users.

"Cloud Computing" could potentially revolutionize the entire Information Communication Technology (ICT) industry (Tuncay, 2010). The actual size of the Cloud Computing market is unknown. WinterGreen Research (2010) estimated the global Cloud Computing markets at US$36 billion in 2008, and anticipated it would reach US$160.2 billion by 2015. Herhalt and Cochrane (2012) reported that the adoption of Cloud Computing in Australian organisations lagged behind the US levels by a year or more. A survey by Frost and Sullivan (2011) suggests that, in 2011, 43 per cent of businesses in Australia were using some form of cloud computing services, which was up from 35 per cent in 2010. In fact, the Australian Cloud Computing market is forecasted to reach US$3.33 billion in 2016 (Philsandberg, 2012).

SMEs play a critical role in any nation's economy as it is the fastest growing sector of most economies around the world and represents a high portion of all businesses and GDP (Paik, 2011). Similarly, SMEs in Australia account for 95 per cent of all businesses (MacGregor & Kartiwi, 2010). With considerably lower start-up costs, Cloud Computing benefits SMEs and reduces their need to purchase an expensive array of advanced hardware technology and software applications (Sultan, 2010; Chang 2013). Cloud Computing is a novel business model in terms of economy and flexibility, which is particularly valuable for SMEs, as Cloud Computing can be adopted with limited investment in infrastructure (Mudge, 2010). Cloud Computing is commercially viable for many SMEs due to its flexibility and pay-as-you-go cost structure (Sultan, 2011), however, within the SME sector and despite potential benefits, the adoption rate of Cloud Computing is still relatively low in Australia compared to other countries in the Asian region (ACCA, 2012). This chapter presents a conceptual model for Cloud Computing adoption by SMEs in Australia. The issues of Cloud Computing adoption are explored within the chapter with the aim of identifying likely key factors that motivate or inhibit its use by SMEs. A further overarching research objective is to design and propose a model suitable for the adoption of Cloud Computing by SMEs in Australia by looking at the motivators and inhibitors of Cloud Computing adoption.

BACKGROUND

Cloud Computing Overview

Cloud Computing extends the current use of Information Technology as a service over the network, especially through the Internet (for instance, Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Its major goal is reducing the cost of IT services while increasing efficiency, flexibility, reliability, availability and processing. Cloud Computing has been defined differently by industry experts and researchers. So, the definition of Cloud Computing is also "Cloudy".

The National Institute of Standards and Technology (NIST) proposed a definition for Cloud Computing, "a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g., network, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This Cloud Computing model promotes availability and is composed of five essential characteristics and three service models and four deployment models" (Mell and Grance, 2011). In 1997, Cloud Computing was defined by Ramnath Chellapa as "a computing paradigm where the boundaries of computing will be determined by rationale rather than technical" (Chellappa, 1997). This was the first academic definition of Cloud Computing. According to Catteddu and Hogben (2009), Cloud Computing was defined by the European Network and Information Security Agency (ENISA) as an "on-demand service model for IT provision, often based on virtualisation and distributed computing technologies".

Another common academic definition of Cloud Computing was proposed by Buyya *et al.* (2009) as "a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and present as one or more unified computing resources based on service-level agreements established through negotiation between service provider and customer". Wang and Laszewski (2008) defined Cloud Computing as "a set of network enabled services, providing scalable, Quality of Service (QoS) guaranteed, normally personalized, inexpensive computing platforms on demand, which could be accessed in a simple and pervasive way". Luis *et al.* (2009) proposes the Cloud Computing definition as "a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms and/or services). These resources can be dynamically reconfigured to adjust a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the infrastructure provider by means of customized SLAs". Founder of Oracle, Larry Ellison, says, "we've redefined Cloud Computing to include everything that we already do..." (Farber, 2008). Richard Stallman, founder of the Free Software Foundation and creator of the operating system GNU, says, "Cloud Computing was simply a trap aimed at forcing more people to buy into locked, proprietary systems that would cost them more and more over time… it's stupidity. It's worse than stupidity: it's a marketing hype campaign" (Johnson, 2008). These different definitions showed that the different stakeholders, such as academicians, architects, consumers, developers, engineers and managers, consider Cloud Computing very differently (CSA, 2009).

Cloud Computing is being heavily promoted for mainstream adoption due to results of the latest advances in virtualisation technologies, combined with the acute realization of the increasing economic burden of maintaining proprietary IT infrastructures (Erdogmus, 2009). Cloud Computing is being perceived as a huge Internet data center in which hardware and software resources are virtualized, offering a variety of services to the customers. They use Cloud Computing from a service provider's pool of capacity and Cloud Computing infrastructure on a pay-as-you-go basis as an alternative to managing their own IT infrastructure (Lim *et al.*, 2009; Sultan, 2010). Cloud Computing offers benefits such as reduced IT overheads for the customers, greater flexibility, reduced TCO, on-demand services, and improved productivity (Wei *et al.*, 2009). According to Erdogmus (2009), economic benefits, simplification and convenience of the way computing services are delivered seem to be the key drivers to speed up the adoption of Cloud Computing. Farah (2010) highlights the Cloud Computing adoption as fast tracking cost reductions, increasing efficiency and, ultimately, creating a competitive advantage in any market.

There are many business areas where Cloud Computing has been adopted, including in higher education (Sultan, 2010; Wheeler and Waggener, 2009; Suess and Morooney, 2009), to provide solutions for human resources (Farah, 2010), software testing (Babcock, 2009), data back-up or archive services (Treese, 2008), Web 2.0 based collaborative applications (Orr, 2008), for storage capacity on demand (Kraska *et al.*, 2009), and for content distribution services (Fortino *et al.*, 2009). New IT approaches and services have taken advantage of Cloud Computing, for example, market-oriented allocation of resources (Buyya *et al*., 2009), hard discrete optimization problems (Li *et al*., 2009), corporate fraud detection using intelligence (Lodi *et al*., 2009), collaborative business intelligence (Chow *et al*., 2009), data mining algorithms and predictive analytics (Zeller *et al*., 2009; Guazzelli *et al*., 2009), software testing as a service (Ciortea *et al*., 2009), e-government solutions (Cellary and Strykowski, 2009), and architecture and implementation courses at graduate level in Cloud Computing (Holden *et al*., 2009).

Cloud Computing Services

Three service models are extensively used by the Cloud Computing community to categorize Cloud Computing services (Ahuja and Rolli, 2011; Dillon *et al*., 2010; George and Shyam, 2010). Cloud Computing provides software (SaaS), platforms (PaaS), and infrastructure (IaaS) services on demand and pay-as-you-go. Software as a Service in Cloud Computing eliminates the need to install and run an application on the client's computer (Marston *et al*., 2011). In addition, it is not necessary to worry about software licensing nor upgrading to latest versions. According to Sullivan (2010), there are various types of services that come under Software as a Service (SaaS), namely, Customer Relationship Management (CRM), Video Conferencing, IT Service Management, Accounting, Web Analytics, and Web Content Management etc. Similarly, Application Design, Development, Testing, Deployment, Hosting are services provided by Platform as a Service (PaaS). The development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers are facilitated by PaaS (Marston *et al*., 2011). Further, Sullivan (2010) explains that Infrastructure as a Service (IaaS) provides services such as Server Space, Net Working (N/W) equipment, Memory, Storage Space and Computing Capabilities. Table 1 summarizes service models used in the Cloud Computing environment. The table describes

Table 1. Cloud computing service models

Services	Description
Software as a Service (SaaS)	Cloud Computing consumers release their applications in a hosting environment, which can be accessed through networks from various clients (e.g., Web browser, PDA, etc.) by application users. Cloud Computing consumers do not have control over the Cloud Computing infrastructure that often employs multi-tenancy system architecture to achieve economies of scale and optimization. Example applications of SaaS include SalesForce.com, Google Mail, Google Docs, and so forth.
Platform as a Service (PaaS)	PaaS is a development platform supporting the full "Software Lifecycle" which allows Cloud Computing consumers to develop Cloud Computing services and applications (e.g., SaaS) directly on the PaaS cloud. Hence, the difference between SaaS and PaaS is that SaaS only hosts completed Cloud Computing applications whereas PaaS offers a development platform that hosts both completed and in-progress Cloud Computing applications. An example application of PaaS is Google App Engine.
Infrastructure as a Service (IaaS)	Cloud Computing consumers directly use IT infrastructures (processing, storage, networks, and other fundamental computing resources) provided in the IaaS cloud. Virtualisation is extensively used in IaaS cloud in order to integrate/decompose physical resources in an ad hoc manner to meet growing or shrinking resource demand from Cloud Computing consumers. An example of IaaS is Amazon's EC2.
Data storage as a Service (DaaS)	The delivery of virtualized storage on demand becomes a separate Cloud Computing service – a data storage service. Note that DaaS could be seen as a special type of IaaS. The motivation is that on-site enterprise database systems are often tied to prohibitive upfront costs in dedicated servers, software licenses, post-delivery services, and in-house IT maintenance. DaaS allows consumers to pay for what they are actually using rather than the site license for the entire database. Examples of this kind of DaaS include Amazon S3, Google BigTable, and Apache HBase, etc.

(Adapted from Dillon *et al*., 2010).

Table 2. Cloud computing deployment models

Deployments	Description
Public Cloud	The public cloud is used by the general public cloud consumers and the cloud service provider has the full ownership of the public cloud with its own policy, value, and profit, costing, and charging model. Many popular cloud services are public clouds including Amazon EC2, S3, Google AppEngine, and Force.com.
Private Cloud	The cloud infrastructure is operated solely within a single organisation, and managed by the organisation or a third party regardless whether it is located premise or off premise.
Hybrid Cloud	The cloud infrastructure is a combination of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability.
Community Cloud	Several organisations jointly construct and share the same cloud infrastructure as well as policies, requirements, values, and concerns. The cloud community forms into a degree of economic scalability and democratic equilibrium. The cloud infrastructure could be hosted by a third-party vendor or within one of the organisations in the community.

(Adapted from Dillon *et al*., 2010).

three main service models such as Software as a Service, Platform as a Service and Infrastructure as a Service. Some authors explain Database as a Service as a different service model, but it can be seen as a special type of service model under Infrastructure as a Service.

Cloud Computing Deployment Models

In reviewing the literature, services provided by Cloud Computing can be categorized according to the level of service and the way it is provided. Deployment models are recorded based on these characteristics. More recently, four Cloud Computing deployment models have been defined in the Cloud Computing community and are summarized in Table 2 (Dillon, *et al*., 2010; Sasikala, 2011).

A public Cloud Computing service is available from a third-party service provider via the Internet. It is a cost-effective way to deploy IT solutions and provides many benefits such as being elastic and service-based. This is the commonly used model and is suitable especially for SMEs because it provides almost immediate access to hardware resources, with no upfront capital investments for users, leading to a faster time to market in many businesses. This treats IT as an operational expense rather than a capital expense (‘Opex’ as opposed to a ‘Capex’ model) (Marston *et al*., 2011). Private Cloud Computing provides greater control over the Cloud Computing infrastructure and can be managed within the organisation. Therefore, it is often suitable for large organisations as they are using larger installations (Marston *et al*., 2011). Hybrid Cloud Computing is a combination of public and private Cloud Computing models which try to address the limitations of each (Zhang *et al*., 2010). The community Cloud Computing infrastructure is controlled and shared by a group of organisations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations) (Sasikala, 2011). According to Lawrence *et al*. (2010) the different business models are used in each deployment model differently.

Characteristics of Cloud Computing

Cloud Computing characteristics are more important to identify how Cloud Computing differs from information technology. These characteristics can be categorized into two - essential characteristics and common characteristics. According to Plummer *et al*. (2009), five essential characteristics of Cloud Computing were identified by NIST

Table 3. Cloud computing essential characteristics

Characteristics	Description
On-demand self-service	A consumer with an immediate need at a particular time slot can access computing resources (such as CPU time, network storage, software use, and so forth) in an automatic (i.e., convenient, self-serve) fashion without resorting to human interactions with providers of these resources.
Broad network access	These computing resources are delivered over the network (e.g., Internet) and used by various client applications with heterogeneous platforms (such as mobile phones, laptops, and PDAs) situated at a consumer's site.
Resource pooling	A Cloud Computing service provider's computing resources are 'pooled' together in an effort to serve multiple consumers using either the multi-tenancy or the virtualisation model, "with different physical and virtual resources dynamically assigned and reassigned according to consumer demand". The motivation for setting up such a pool-based computing paradigm lies in two important factors: economies of scale and specialization.
Rapid elasticity	For consumers, computing resources become immediate rather than persistent: there are no up-front commitments and contracts as they can use them to scale up whenever they want, and release them once they finish scaling down.
Measured service	Although computing resources are pooled and shared by multiple consumers (i.e., multi-tenancy), the Cloud Computing infrastructure is able to use appropriate mechanisms to measure the usage of these resources for each individual consumer through its metering capabilities.

(Adapted from Grance, 2010; Dillon *et al*., 2010).

(National Institute of Standards and Technology) (Grance, 2010; Dillon *et al*., 2010). The Cloud Computing essential characteristics are shown in Table 3. These five characteristics are crucial in a Cloud Computing environment.

Advantages of Cloud Computing

Cloud Computing offers a number of benefits to businesses based on its different deployment and delivery models (Voona and Venkantaratna, 2009; Buyya *et al*., 2009; Miller, 2008; Catteddu and Hogben, 2009; Andrei and Jain, 2009; Sasikala 2011). The advantages of Cloud Computing are described in Table 4. These advantages vary based on the different deployment and delivery models.

Some Technical and Business Issues of Cloud Computing

As Cloud Computing is still in its infancy, current adoption is associated with numerous technical and business challenges. Table 5 describes some of the issues such as the availability of a service, data confidentiality, data transfer bottlenecks, and legal jurisdiction.

Cloud Computing Adoption

Youseff *et al*. (2008) explored methods to foster rapid adoption of Cloud Computing by the scientific community. The adoption of Cloud Computing has been perceived differently by various prominent members of the computing community. For example, Microsoft did not originally foresee the trend toward Cloud Computing, which is being led by Amazon and Google (Cusumano, 2009). Even though many firms showed little early interest in Cloud Computing, with the maturation of virtualisation technology and the current almost explosive increase in interest in Cloud Computing, many firms are joining the Cloud Computing wave.

The Open Cloud Manifesto was signed by a group of 38 companies and academic organisations, calling for open standards in Cloud Computing (Merritt, 2009). This manifesto is an effort to promote common standards for Cloud Comput-

Table 4. Advantages of cloud computing

Advantages	Description
Cost-effectiveness	According to the literature, it is obvious that using Cloud Computing to run applications, systems, and IT infrastructure saves staff and financial resources.
Flexibility	Cloud Computing allows organisations to start a project quickly without worrying about upfront costs. Computing resources such as disk storage, CPU, and RAM can be added when needed. Therefore, a company could started on a small scale by purchasing necessary resources and added additional resources later.
Data safety	Organisations are able to purchase storage in data centres located thousands of miles away, increasing data safety in case of natural disasters or other factors. This strategy is very difficult to achieve with traditional off-site backup.
High availability	Cloud Computing providers such as Microsoft, Google, and Amazon have better resources to provide more up-time than almost any other organisations and companies do.
Ability to handle large amounts of data	Cloud Computing has a pay-for-use business model that allows academic institutions to analyze terabytes of data using distributed computing over hundreds of computers for a short-time cost.
Reduced costs	Cloud Computing technology is paid incrementally, saving organisations money.
Increased storage	Organisations can store more data than on private computer systems.
Highly automated	IT personnel need not to worry about keeping software up to date.
More mobility	Employees can access information wherever they are, rather than having to remain at their desks.
Allows IT to shift focus	No longer need to worry about constant server updates and other computing issues, and government organisations will be free to concentrate on innovation.

(Adapted from Yan, 2010).

ing in areas such as security, portability, interoperability, management, and monitoring. The National Institute of Standards and Technology is also working on Cloud Computing standards (NIST, 2009). If such standards are adopted by the majority of Cloud Computing vendors, it would make it easier to move applications from one Cloud Computing provider to another, which is currently not possible with some vendors, because of proprietary Cloud Computing applications. Although many major corporations, such as Advanced Micro Devices, Juniper, and IBM, along with the Open Cloud Consortium, are backing this manifesto, some major Cloud Computing partici-

Table 5. Technical and business issues of cloud computing

Issues	Description
Data confidentiality	Most academic libraries have open-access data. This issue can be solved by encrypting data before moving to the clouds. In addition, licensing terms can be negotiated with providers regarding data safety and confidentiality.
Data transfer bottlenecks	Accessing digital collections requires considerable network bandwidth, and digital collections are usually optimized for customer access. Moving huge amounts of data (e.g., preserving digital images, audios, videos, and data sets) to data centres can be scheduled during off hours (e.g., 1–5 a.m.), or data can be shipped on hard disks to the data centre.
Legal jurisdiction	Converting to Cloud Computing involves legal restraints. For example, there are legal restrictions prohibiting on the provider transmitting data outside of Australia without the prior approval of the agency (DFD, 2011b)(DFD, 2011b)(DFD, 2011b)(DFD, 2011b)(DFD, 2011b)(DFD, 2011b)(DFD, 2011b)(DFD, 2011b). Since Cloud Computing providers can be multi-national, it is imperative that such providers are aware of and abide by national regulations where they do business.

(Adapted from Yan, 2010).

pants, namely, Amazon, Microsoft, and Google, are conspicuously absent (Merritt, 2009). The Open Cloud Consortium, which includes Cisco Systems, Yahoo, and several academic partners, runs a Cloud Computing test bed and has developed Cloud Computing services benchmarks (Merritt, 2009). This movement toward Cloud Computing standards and the conspicuous absence of some major Cloud Computing providers appears to be a battle between some early major Cloud Computing participants to attempt to protect their initial market and the others that want to make Cloud Computing a more open, standardized technology. Such common standards could also make it easier and more affordable for potential Cloud Computing customers to participate in Cloud Computing. Cloud Computing providers, both existing and planned, have a vested interest in the future of Cloud Computing (Weiss, 2007).

There is currently widespread interest in Cloud Computing and the growth in the available options for using Cloud Computing. Low *et al.* (2011) found that Cloud Computing in the high-tech industry depends on the firm's technological, organisational and environmental contexts. There are many advantages, such as economy of scale and the availability of large computing resources (Greenberg *et al.*, 2008), ability to test their business plan quickly and increase business agility (Wang *et al.*, 2011). In addition, Cloud Computing providers can keep a very high level of availability, often with considerably less downtime than individual organisations (Greenberg *et al.*, 2008). Parthasarathy and Bhattacherjee (1998) and also Rogers (1962) found that when clients were displeased with a technology they had adopted, they tended to discontinue its use. Because of this issue, it is important for a Cloud Computing provider to maintain customer satisfaction to retain its clients. Maintaining customer satisfaction involves continuing to satisfy client needs, staying cost-competitive, maintaining system reliability and availability, and ensuring information security and confidentiality. One illustration of a process for running a successful Cloud Computing organisation is given by Kaliski (2008). In describing how to promote a well-run Cloud Computing entity, Kaliski says that the Cloud Computing entity should run like a container ship or cruise liner, with standardized products, set costs, and non-interference with other customers' products. This model could appeal to cost-conscious, organized people. Various organisations are beginning to adopt Cloud Computing, ranging from individuals and small to larger organisations.

Although there is extensive current interest in Cloud Computing, there can be a gap between the promise of Cloud Computing and market adoption. Greenberg *et al.* (2008) anticipated that, while individuals are already adopting Cloud Computing for applications readily available, and small organisations will adopt Cloud Computing in the near term, it may take from fifteen to twenty years for larger corporations to convert to Cloud Computing. Aligning a company's technology and corporate strategy by addressing the needs of management, resource issues, and external factors improve organisational functioning (Chen *et al.*, 2008). Adopting Cloud Computing can meet the technology and corporate needs of smaller, resource poor organisations and individuals, while large organisations can afford to purchase and maintain their own large computing resources. As a result, larger organisations have less of an incentive to go to outside providers than do smaller organisations (SMEs) or individuals. An example of the gap between the potential and the actual are the recent survey results presented by Delahunty (2009), where the participant responses showed that eleven per cent of their firms currently use Cloud Computing for data and information storage, with another nineteen per cent considering using Cloud Computing. This leaves seventy per cent of the respondents showing little interest in Cloud Computing.

Even with the movement toward transitioning computing and storage applications to Cloud Computing, there are some applications that organisations are choosing not to. These applications are typically mission critical applications, which are expected to be retained by their owners rather than being transitioned to Cloud Computing (Greenberg *et al*., 2008). These applications are retained in-house for reasons such as the criticality of response times or concerns about the inadvertent release of very sensitive information.

User training can further an organisation's adoption of Cloud Computing by making users more comfortable with using the technology (Marshall, 2008). The younger and more technology savvy workers may adopt Cloud Computing more easily than those who are technology averse. Even though some potential users adopt new technologies more rapidly than others, any user when faced with the ability to perform a job more easily, more completely, at lower cost, and faster, can find Cloud Computing attractive (Aljabre, 2012).

SMALL AND MEDIUM-SIZED ENTERPRISES (SMEs)

A number of definitions for SMEs exist, many coming from various governmental and official sources such as SME agencies, ministries, governmental institutions and national statistical institutions or bureaus around the world. The Australian Bureau of Statistics (ABS) defines a small business as having fewer than 19 employees, whereas micro businesses have fewer than 4 employees. Medium-sized enterprises are defined as businesses with from 20 to 199 employees (DIISR, 2011). For this study the following criteria (see Table 6) are considered to define the SMEs in Australia.

Some researchers have criticized these definitions for only using a simple quantitative criterion such as the number of employees (Brytting, 1999; Curran *et al*., 1991). Van Hoorn (1979) proposed the five additional characteristics below to differentiate SMEs from larger firms, rather than considering only the number of employees:

1. A comparatively limited number of products, technologies and know-how;
2. Comparatively limited resources and capabilities;
3. Less-developed management systems, administrative procedures and techniques,
4. An unsystematic and informal management style;
5. Senior management positions held by either the founders of the firm and/or their relatives.

SMEs in Australia

SMEs account for 95 per cent of active businesses and employ 70 per cent of the nation's workforce (MacGregor and Kartiwi, 2010), thus, they are the major component of the Australian economy. Globally, SMEs make a substantial contribution to national economies and are estimated to account for 80 per cent of global economic growth. In Australia they contribute over 33 per cent of Australia's GDP (ASMEA, 2012). In other words, SMEs performs a critical role in the Australian economy, in particular, as suppliers to large firms, as customers of large firms, and as suppliers to end-user customers in their own right. Australia's SME sector plays a vital role in the new job venture creation, emerging export markets, sustainable

Table 6. SME definition

Micro Enterprises	Micro enterprises are enterprises with 0 to 4 employees.
Small Enterprises	Small enterprises are enterprises with 5 to 19 employees.
Medium-Sized Enterprises	Medium sized enterprises have greater than 20 and fewer than 199 employees.

(DIISR, 2011).

economic growth and business resilience (Wei, 2010). SMEs are also a significant customer segment for financial service providers (MacGregor and Kartiwi, 2010).

Australian SMEs use a wide range of ICT in their business operations with their use of Internet technologies. The Australian Communication and Media Authority reported that 94 per cent of SMEs in Australia were estimated to be connected to some form of Internet service (ACMA, 2010).

Cloud Computing Adoption in SMEs

Marks & Lozano (2010) proposed a Cloud Computing Reference Model that supports major business drivers. It consists of four supporting models such as Cloud Enablement Model, Cloud Deployment Model, Cloud Governance Model and Cloud Ecosystem Model. The Cloud Enablement Model describes different tiers of cloud services from them Cloud business tier that can be selected according to the user's business necessity. This Cloud Computing Reference Model corroborates the ideas of Surendro & Fardani (2012), who identifies the needs of SMEs. According to their survey carried out in Indonesia on IT needs and readiness to adopt Cloud Computing technologies, SaaS is the paramount business necessity of SMEs which is covered under Cloud Enablement Model. Further, this survey reveals that, type of cloud computing deployment that best fits the characteristics and needs of SMEs is the Public Cloud. However, such explanations tend to awkward with the Cloud Adoption Reference Model (CARM) introduced by Keung & Kwok (2012) as it completely based on confidential data.

Carr (2005) suggests that, in many instances, using Cloud Computing might provide the first opportunity for SMEs to try new software approaches in a cost effective manner. Often SMEs are unable to afford their own dedicated IT but have a sufficient IT budget to buy the bandwidth and pay according to their need and usage (Monika *et al*., 2010). In a Cloud Computing environment, SMEs can reduce their capital expenditure for IT infrastructure and, instead, utilize and pay for the resources and services provided by Cloud Computing (Rittinghouse and Ransome, 2009).

As previously explained, there are various types of business models related to Cloud Computing adoption, and their application depends on the nature and size of an enterprise (Handler *et al*., 2012; Rahimli, 2013). Chang *et al*. in 2013 mentioned that a number of SMEs have followed the classification of the appropriate business models and even adopted a combination of different business models to improve performance of their businesses. According to Lawrence *et al*., (2010), all direct and indirect go-to-market models in Cloud Computing are able to cater for SMEs needs, however, they are not necessarily suitable for large enterprises because of their scale and complexity. It has been found that the current charging pattern and other aspects of Cloud Computing make it more suitable for SMEs than for larger organisations (Misra and Mondal, 2010). Further, the public Cloud service provides a more valuable service to Micro-Small Businesses (non-employer business and with 1-4 employees) as they require many of the same business services provided to large organizations even though they may have only a PC and an Internet connection (Handler *et al*, 2012).

In addition, the findings of Sultan (2011) and Bharadwaj & Lal (2012) suggest that Cloud Computing is likely to be a more attractive option for most SMEs because of flexible cost structures and scalability. Traditional in-house Enterprise Resource Planning (ERP) implementation incurs high costs for SMEs, whereas, by using the Cloud they can buy ERP components relevant to their business and pay per component instead of buying a whole ERP suite (Sharif, 2010). Findings also show that SMEs can expand their usage and services easily using Cloud Computing. The Cloud services are more acceptable by SMEs because of relative advantage, flexibility and scalability features (Salleh *et al*., 2012). In 2009, Gorniak demonstrated the first three reasons behind the possible use of cloud computing by SMEs is: 1) avoiding capital expenditure in hardware, software and IT support, information security by outsourcing infrastructure / platforms / services; 2) flexibility and scalability of IT resources; and 3) business continuity and disaster recovery capabilities. The prior Cloud Computing constructs previously identified were analyzed against the requirements of the different SMEs types (Table 7). The factors affecting Cloud Computing adoption is investigated separately for micro, small, and medium enterprises filling the research gap identified from the literature with micro organizations.

CONCEPTUAL MODEL

Cloud Computing provides different services which are delivered under various deployment models on demand, and uses a pay-as-you-go method. Several leading researchers in Cloud Computing domain attempt to develop Cloud Computing Business models (Papazoglou and Georgakopoulos, 2003; IBM, 2008; Hanna *et al*., 2009; Chen *et al*., 2010; Li, 2010; Chang *et al*., 2013). In the design of a Cloud Computing adoption model, it is necessary to understand the differences between technology adoption and Cloud Computing adoption. Rather than directly applying the Technological, Organisation and Environment (TOE) framework in Cloud Computing adoption, Cloud Computing provides a complete service-based environment for SMEs.

Table 7. Analysis of cloud computing constructs in the SME context

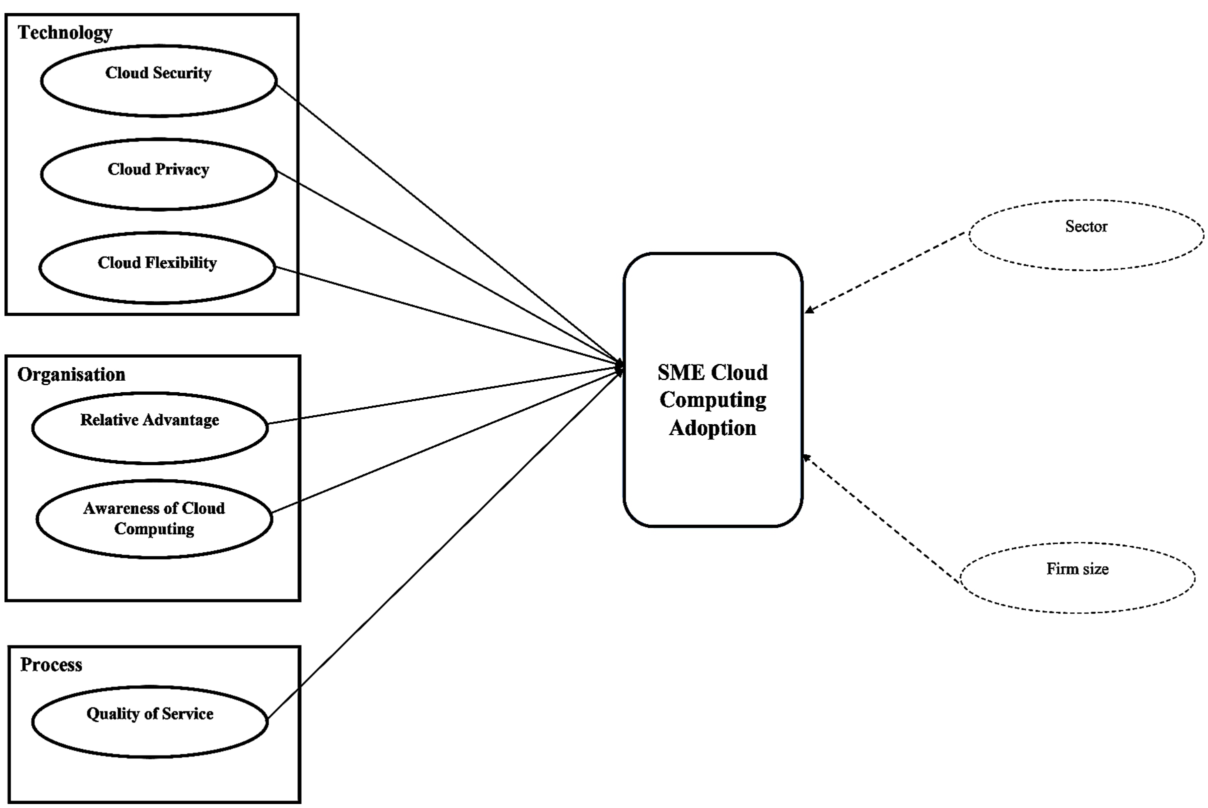
Construct	Size of SME	References
Cloud Security	Micro	
	Small	(Sahandi *et al*., 2012; Kelly, 2011; Monika *et al*., 2010)
	Medium	(Sahandi *et al*., 2012; Kelly, 2011; Monika *et al*., 2010)
Cloud Privacy	Micro	
	Small	(Sahandi *et al*., 2012)
	Medium	(Sahandi *et al*., 2012)
Cloud Flexibility	Micro	
	Small	(Brian *et al*., 2008; Sahandi *et al*., 2012; Monika *et al*., 2010; Salleh *et al*., 2012)
	Medium	(Brian *et al*., 2008; Sahandi *et al*., 2012; Monika *et al*., 2010; Salleh *et al*., 2012)
Relative Advantage	Micro	(Handler *et al*., 2012)
	Small	(Salleh *et al*., 2012; Monika *et al*., 2010)
	Medium	(Salleh *et al*., 2012; Monika *et al*., 2010)
Awareness of Cloud	Micro	(Handler *et al*., 2012; Rath *et al*., 2012)
	Small	(Rath *et al*., 2012; Salleh *et al*., 2012; Surendro & Fardani, 2012)
	Medium	(Rath *et al*., 2012; Surendro & Fardani, 2012)
Quality of Service	Micro	
	Small	(Brian *et al*., 2008; Keung & Kwok, 2012; Monika *et al*., 2010; Salleh *et al*., 2012)
	Medium	(Brian *et al*., 2008; Keung & Kwok, 2012; Monika *et al*., 2010; Salleh *et al*., 2012; Chang *et al*., 2013)

Various researchers indicate that adopting Cloud Computing includes expectations of the quality of service provided by Cloud service providers, such as availability, reliability and ongoing updating services (ITIIC, 2011). Therefore, the process is more important for SMEs than just the environmental factors considered in most of the technology/Cloud adoption models under the TOE framework. Thus, the proposed model is a variation of the TOE framework in regard to SME Cloud Computing adoption. This framework is considered to be a Technology, Organisation and Process (TOP) framework. The TOP multiple-perspectives approach can be used to best describe the factors influencing Cloud Computing adoption. A multiple perspectives method can be applied to any phenomenon, sub-system or system to analyze a problem in different ways (ASMEA, 2012). Linstone (2005) and Mitroff and Linstone (2012) have used it to demonstrate the different ways of looking at a TOP model. Figure 1 presents the conceptual model.

The proposed conceptual model constitutes adoption factors under the technology, organisation and process contexts. Cloud security, Cloud privacy and Cloud flexibility are considered under the technology context. The organisational context includes relative advantages and awareness of Cloud Computing. The quality of service (QoS) of the Cloud is considered under the process context.

The biggest challenge with the security of Cloud Computing is the delegation of the confidentiality, availability and integrity of data to a third party. The security of Cloud Computing is complicated because of the multi-tenancy of the virtualized resources (Opala, 2012), and is one of the concerns about Cloud Computing that is delaying its adoption (Jamwal *et al.*, 2011).

Figure 1. Conceptual model for adoption of cloud computing for Australian SMEs



Further, privacy is also a leading reason for not adopting cloud solutions Pearson (2009). According to Pearson (2009), poor user control, loss of trustworthiness and lack of transparency create most of the privacy issues. In addition, lack of transparency creates legal issues that are caused by the Cloud's physical location which creates difficulties in determining its jurisdiction. Because of this key issue, the Australian government is extremely concerned about the location of outsourced personal data storage and there is a strong desire for Cloud services to be only located within Australia's borders (Hutley, 2012). Frequently, SMEs are not able to invest large amounts in IT infrastructure (Foster, Zhao, Raicu, & Lu, 2008) compared to larger organisations. However, a KPMG report (2009) on Australian lessons and experiences, shows that using Cloud Computing allows them to adopt innovative IT technologies quickly without paying upfront for capital investment (McCabe & Hancook, 2009). Further, Cloud Computing provides greater flexibility to encompass the innovations of the Australian government and industry (Mudge, 2010).

Dong *et al.* (2009) highlight the Cloud's ability to reduce costs, provide more flexibility, reduce development time, and allow for scalability and centralized data storage as some of the more significant gains in Cloud adoption. The Australian government traces the key drivers as, value for money for organisations adopting Cloud Computing, such as reductions in duplication and costs, leveraging economies of scale, increased savings through virtualisation, pay-as-you-use and, reduced energy use (DFD, 2011a). Further, with the characteristics of scalability and elasticity of services in the Cloud, relative advantages are more easily achieved. The Information Technology Industry Innovation Council (ITIIC) in Australia has published information on the importance of educating Australian business and consumers on how best to harness the benefits and manage the potential risks of adopting Cloud Computing solutions (ITIIC, 2011). They indicate that knowledge about Cloud Computing and its benefits for SMEs could be increased among the Australian business community; and similar statistics are indicated in the readiness index published by the Asia Cloud Computing Association (ACCA, 2012).

Previous studies have found that Cloud Computing is a service process where availability and reliability are coupled with ongoing service updates (ITIIC, 2011; Lippert & Govindarajulu, 2006)). Armbrust *et al.* (2010) have identified that business continuity and service availability are significant factors in considering Cloud adoption. Reliability is another thought-provoking feature of Cloud adoption. One of the most welcome characteristics of Cloud Computing compared with traditional IT provision, are the ongoing service updates. The debate continues on the QoS as an important characteristic in Cloud adoption with its combination of availability, reliability and ongoing service updates.

The constructs used to examine Cloud Computing adoption in this study are explored in Table 8. Based on the literature, six major adoption factors are identified for this study, namely: Cloud security, Cloud privacy, Cloud flexibility, relative advantages of Cloud, awareness of Cloud, and quality of service. These constructs are analyzed using theoretical, practitioner and government underpinnings.

RESEARCH APPROACH

Accurate methodological assumptions lead to the identification of research methods and techniques that are considered to be appropriate for the gathering of valid empirical evidence. Therefore, the cornerstone for undertaking successful research study depends on making the correct methodological assumptions (Myers & Avison, 2002). Correct assumptions shape "how we conduct research and how we use the results...the science that seeks to understand the underlying assumptions associated with different approaches is called the philosophy of science" (Polonsky & Waller, 2011, p. 4).

Table 8. Constructs used to examine cloud computing adoption (developed for this study)

Constructs	Academic	Government	Practitioner
Cloud Security	(Anthes, 2010; Behl, 2011; Bhayal, 2011; Jamwal et al., 2011; Krautheim, 2010; Lippert & Govindarajulu, 2006; Mahmood, 2011; Nir, 2010; Opala, 2012; Rittinghouse & Ransome, 2009; Ross, 2010; Sahandi et al., 2012; Sarwar & Khan, 2013; Subashini & Kavitha, 2011; Sultan, 2011; Wei et al., 2009; Yoon, 2009; Zhang et al., 2010)	(Anthony, 2012; DFD, 2011b, 2011c; ITIIC, 2011; Mudge, 2010; Sullivan, 2010)	(Carlin & Curran, 2011; Chakraborty, Ramireddy, Raghu, & Rao, 2010; Dave, 2012; Friedman & West, 2010; Herhalt & Cochrane, 2012; Hutley, 2012; Joanna & Chiemi, 2010; Kelly, 2011; Martin, 2010; McCabe & Hancook, 2009; Mudge, 2010)
Cloud Privacy	(Abadi, 2009; Grobauer et al., 2011; Jamwal et al., 2011; Katzan, 2010; Mark, 2011; Pearson, 2013; Sahandi et al., 2012; Sarwar & Khan, 2013; Sultan, 2010; Svantesson & Clarke, 2010; Tancock et al., 2013)	(Anthony, 2012; DFD, 2011b, 2011c; IMO, 2013)	(Friedman & West, 2010; Pearson, 2012);(Hutley, 2012; Wijesiri, 2010)
Cloud Flexibility	(MacGregor & Kartiwi, 2010; Marian & Hamburg, 2012; Marston et al., 2011; Mvelase et al., 2011; Opala, 2012; Son & Lee, 2011; Sultan, 2010; Wu, 2011)	(DFD, 2011a, 2011b; ITIIC, 2011; Sullivan, 2010)	(Herhalt & Cochrane, 2012; Joanna & Chiemi, 2010; McCabe & Hancook, 2009; Mudge, 2010; Ning, 2013)
Relative Advantage	(Cragg & King, 1993; Dong et al., 2009; George & Shyam, 2010; Kerr & Bryant, 2009; Lee, 2004; Li et al., 2011; Low, Chen, & Wu, 2011; Marston et al., 2011; Moghavvemi et al., 2012; Molla et al., 2006; Oliveira & Martins, 2011; Rogers, 2003; Shareef et al., 2011; Son & Lee, 2011; Thong, 1999; Tweel, 2012; Yang & Yoo, 2004; Yoon, 2009)	(DFD, 2011a; ITIIC, 2011)	(Herhalt & Cochrane, 2012; Hutley, 2012; McCabe & Hancook, 2009)
Awareness of Cloud	(Moghavvemi et al., 2012; Opala, 2012; Alshamaila et al., 2009; Shareef et al., 2011; Singh et al., 2013 ; Zhang et al., 2010)	(Anthony, 2012; ITIIC, 2011; Sullivan, 2010)	(ACCA, 2012; Hutley, 2012; Kelly, 2011; Martin, 2010; Ning, 2013; Pearson, 2012)
Quality of Service (QoS)	(Armbrust et al., 2010; Habib et al., 2012; Hailu, 2012; Lippert & Govindarajulu, 2006; Ross, 2010; Sarwar & Khan, 2013; Uusitalo et al., 2010; Wang et al. 2011)	(DFD, 2011a; ITIIC, 2011)	(Herhalt & Cochrane, 2012; Hutley, 2012; McCabe & Hancook, 2009; Scott, 1987; Wu & Chen, 2005)

Swanson and Holton (2005) suggest that "Quantitative research can be exploratory; it is used to discover relationships, interpretations, and characteristics of subjects, which suggest new theory and define new problems" (Swanson and Holton, 2005, p. 33). A considerable amount of literature has shown that the quantitative survey method can be used effectively to evaluate the acceptance of new technologies (Flick, 2009; Jahangir and Begum, 2007; Lease, 2005). A quantitative research method will therefore be applied in this research. The survey method is chosen as an efficient way to reach larger numbers of SMEs quickly, while protecting their anonymity. A longitudinal design would not have been appropriate to answer the research questions in a timely manner since such research requires years to complete. Interviews and direct observations would have been costly, difficult to schedule and time-consuming. An in-depth examination of previous research found that quantitative survey methodology had been successfully applied within each research study.

There are three phases in the research design. In phase one, academic and practitioner literature on technology adoption, Cloud Computing and SMEs will be studied to identify the key factors for successful Cloud Computing adoption by SMEs. In phase two, a structured questionnaire will be used to collect the quantitative data from Australian SMEs. A questionnaire is the major instrument to be designed for a survey to collect data from SMEs. Data analysis, model verification and modifications will be conducted in phase three.

DATA COLLECTION AND ANALYSIS

Quantitative research is most often used in studies with clearly-stated hypotheses that can be tested. It focuses on well-defined studies. A quantitative method discusses the problem from a broader perspective, often by providing a survey with specific answer alternatives (Merriam, 1998). Further the most of the cloud business models and frameworks proposed by leading researchers are quantitative (Armbrust *et al.*, 2010, Brandic *et al.*, 2009 and Buyya *et al.*, 2009). Therefore, it was decided that the best method to adopt for this investigation is surveys and this research will be performed using a survey data collection method and data will be collected by IT managers or decision-makers in the IT sections of selected SMEs.

Online surveys have numerous strengths compared to other survey methods (Evans & Mathur, 2005). The method is quite flexible as surveys can be conducted in several formats such as by e-mail with a link to a survey URL, or by e-mail with an embedded survey etc. Online surveys can be administered in a timely manner, minimizing the time taken in the field and for data collection (Kannan *et al.*, 1998). As a result of self-administered surveys, costs can also be kept down as postage or interviews are not required (Evans & Mathur, 2005). Further, the online surveys can use larger samples. The Australian Communications and Media Authority reported that 94 per cent of SMEs are estimated to be connected to some form of internet service (ACMA, 2010). With this high level of Internet usage by SMEs, an online survey tool is considered to be the best choice to collect data for this study, especially in Australia.

The most frequently-used ordered scale in survey instruments is a ranked one-to-five Likert type scale. However, this scale suffers some limitations. With only five points, two at the extreme ends and one midpoint, the scale suffers its own bounded parameters. Many respondents are reluctant to select extreme values, which leads to a restricted set of scores and making it difficult to measure differences. The seven-point Likert type scale avoids the limitations of the five-point scale and provides more flexibility such as a larger array of options (Carey, 2010). Therefore, an online survey questionnaire with a seven-point scale will be administered in Australia, to collect data for the study. The population for this study will be SMEs in Australia. The questionnaire has been pilot tested with 30 samples in an effort to assist in validating the questionnaire design. This pilot survey was developed by framing relevant questions under each of the six core variables identified from the literature survey. The questionnaire was divided into two parts. The first part of the survey captured the demographic details of the responding organisations and the second part of the survey captured perception of the security, privacy, relative advantage, quality of service of the Cloud Computing and the awareness of Cloud Computing. For each construct, three to six questions were formulated capturing the perception and adoption of Cloud Computing by SMEs. All of the reflective indicators of a construct were measured on a 7-point Likert scale using scales from “strongly disagree” to “strongly agree”. Table

Table 9. Demographic characteristics of responding organisations

Survey (*n*=30)	Participants	Organisations
No. of Employees		
0 to 4 (micro)	18	60%
5 to 19 (small)	7	23%
20 to 199 (medium)	5	17%
State/Territory		
VIC	8	27%
NSW	7	23%
QLD	8	27%
WA	1	3%
SA	4	13%
TAS	2	7%
Use of Cloud Computing		
Yes	10	33%
No	20	67%

9 summarizes the demographic characteristics of responded organisations. The results show that 60% of organisations that responded were micro, 23% small, and 17% medium. Not surprisingly, states with larger populations provided higher response rates. Of the 30 organisations that responded, only 33% indicated that they were using some form of Cloud Computing.

Descriptive statistics are used to summarize the basic features of data. These summary measures include measurements expressing location, and dispersion. Relevant visualizations techniques will also be presented. With descriptive analysis, the raw data is transformed into a form that will make it easy to understand and interpret (Zikmund, 1994).

The reliability of the measurements have been verified using the Cronbach's alpha coefficient. The constructs are considered adequate when the Cronbach's alpha values are above the recommended value of 0.7 (Hair *et al.*, 2010; Malhotra, 2010). As shown in Table 10, Cronbach's alpha values exceed 0.7 for all constructs. Therefore, the questionnaire was taken as an acceptable instrument to be administered.

Factor analysis is commonly used in education (Hogarty *et al.*, 2005) and is considered an appropriate method for interpreting self-reporting questionnaires (Byrant *et al.*, 1999). Factor analysis is a multivariate statistical analysis method that has been used for many purposes, such as: reducing a larger number of variables into a smaller set of variables or factors; establishing dimensions between variables and latent constructs allowing formation and refinement of the theory; providing construct validity for self-reporting scales or instrument; addressing multicollinearity; developing theoretical constructs; and providing or disproving proposed theories (Tabachnick & Fidell, 2007). Exploratory factor analysis allows researchers to explore the main dimensions to generate a model from a relatively large set of latent constructs represented by a set of items (Swisher *et al.*, 2004). The aim of this study is to explore the large set of items and to generate a model for the adoption of Cloud Computing by SMEs. Exploratory factor analysis, therefore, will be performed as a multivariate analysis technique.

Regression Analysis is used to predict the value of a variable (dependent) based on the value of two or more other variables (independent). It is necessary to identify the influencing factors for Cloud adoption before developing an adoption model. Therefore, the results of the factor analysis will be used for regression analysis and variance tests. Further, most of previous Cloud adoption studies have based their analysis method on multiple regression

Table 10. Reliability validation

Overview	Cronbach's Alpha
Security	0.771
Privacy	0.733
Flexibility	0.722
Relative Advantage	0.754
Awareness	0.729
Quality of Service	0.819
Adoption	0.866

(Rahimli, 2013; Gupta *et al*., 2013). It is therefore proposed that multiple regression be used to gain insight into the nature of the relationship between the independent variables and a dependent variable. The independent variables (factors) of this study are Cloud security, Cloud privacy, Cloud flexibility, relative advantage, awareness of Cloud Computing and quality of service of Cloud Computing. Cloud Computing adoption is the dependent variable of this study and is measured based on level of usage of Cloud Computing by SMEs.

SOLUTIONS AND RECOMMENDATIONS

This preliminary pilot-study set out with the aim of discovering the importance of enablers and inhibitors of Cloud Computing adoption in SMEs in Australia and develop a model for Cloud Computing adoption. The results indicate that the majority of SMEs are micro organisations and that they are situated in Victoria, Queensland and New South Wales. Results reveal that the Cloud Computing usage by the SME sector is comparatively less than other sectors, and that this observations needs to be investigated further. Considerably more work will need to be done to determine the enabling and inhibiting factors affecting Cloud Computing adoption in SMEs. Statistics reveal that there is a growing level of interest in Cloud adoption in Australia (Anthony, 2012). Hence, designing a more attractive adoption model is necessary for addressing the difficulties faced by SMEs in Australia.

FUTURE RESEARCH DIRECTIONS

The scope of this research will be limited to Australian SMEs. This can be expanded to other countries in the future. The research will be undertaken targeting a specific Cloud Computing deployment method known as Public Cloud Computing. Studies could be done using other deployment methods as well. Many variables are available that can influence adoption decisions on Cloud Computing, but some of them are more important than others. This study, therefore, evaluates a few of the important factors but future studies could develop this study framework with other variables as well. Cloud Computing is a dynamic operational model, so influencing factors considered in this study may vary in future situations.

CONCLUSION

The literature indicates that the main inhibiting factor for Cloud Computing adoption is the fear of dispatching organisational data to a third party. It also indicates that Public Cloud Computing is more economical when compared to private Cloud Computing, and that all business models can be used in Public Clouds. In general therefore, it appears to be more beneficial for SMEs compared to larger organisations to adopt a Public Cloud Computing model, as it can provide them with a relatively better economic solution. Further, previous findings suggest that Cloud Computing adoption is more than just technology adoption. It includes a number of important changes such as cross-border data transfer, keeping data with a third party, remotely accessing resources and applications through the Internet and so on, which will need to be made when considering Cloud Computing adoption, but they do not necessarily apply to IT adoption. Furthermore, it is interesting to note that IT adoption mainly refers to in-house IT infrastructure, however, Cloud Computing adoption includes accessing resources outside the organisation through the Internet as a service. The research will be targeting a specific Cloud Computing deployment method known as Public Cloud Computing. The proposed model will be useful in a variety of countries exhibiting a range of economic settings as this is intended to be a generic Cloud adoption model for SMEs.

This research makes a number of contributions to research and practice. This study extends the current understanding of Cloud Computing adoption by SMEs (micro, small and medium enterprises) using a technology-based service adoption framework. The conceptual framework has been developed through the synthesis of a critical literature review for investigating Cloud Computing adoption by SMEs. Therefore, it bridges the research gap and contributes to the Cloud Computing adoption literature, especially in the context of SMEs. The study offers a view from the perspective of the process factors, in addition to the organisational and technical factors, to assess Cloud Computing adoption. On a practical front, these research findings offer insights for SMEs that are planning or are in the process of implementing a review of their Cloud Computing initiatives. Service providers can also use the model to understand the requirements of SMEs in their provision of the service. Further, it will be beneficial for consulting companies that are assisting SMEs with Cloud Computing implementation. In addition, the government could use the Cloud Computing model to assist with developing awareness, support programs and policies for SMEs.

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KEY TERMS AND DEFINITIONS

Cloud Computing: 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.

Community Cloud: A community cloud is a multi-tenant infrastructure that is shared among several organizations from a specific group with common computing concerns.

Database-as-a-Service (DBaaS): DbaaS is a service that is managed by a cloud operator (public or private) that supports applications, without the application team assuming responsibility for traditional database administration functions.

Hybrid Cloud: A hybrid cloud is a cloud computing environment in which an organization provides and manages some resources in-house and has others provided externally.

Infrastructure as a Service (IaaS): IaaS is a provision model in which an organization outsources the equipment used to support operations, including storage, hardware, servers and networking components. The service provider owns the equipment and is responsible for housing, running and maintaining it. The client typically pays on a per-use basis.

Platform as a Service (PaaS): PaaS is a way to rent hardware, operating systems, storage and network capacity over the Internet. The service delivery model allows the customer to rent virtualized servers and associated services for running existing applications or developing and testing new ones.

Private Cloud: A private cloud is a particular model of cloud computing that involves a distinct and secure cloud based environment in which only the specified client can operate.

Public Cloud: A public cloud is one based on the standard cloud computing model, in which a service provider makes resources, such as applications and storage, available to the general public over the Internet. Public cloud services may be free or offered on a pay-per-usage model.

Software as a Service (SaaS): SaaS is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network, typically the Internet.