A Study of Government Cloud Adoption: The Australian Context

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Abstract

The literature is scant around the take up rates of cloud computing by organisations. Cloud computing is nonetheless expected to be a major computing paradigm in the future. The benefits of the cloud vis-à-vis outsourcing many current in-house IT services and applications – both hardware and software based, are numerous. However, governments and many enterprises are still relatively unclear on the motives for adopting cloud technologies and the consequent benefits gained in a real-world operational environment. This paper examines the results from a survey conducted at a forum of senior government IT managers and their views towards cloud computing adoption. The paper provides insights both from technological and non-technological perspectives in the overall context of cloud adoption in Australian government enterprises.

Keywords

Cloud computing, Adoption, Digital Economy, Australian organisations, New South Wales State Government.

INTRODUCTION

The phenomena of cloud computing can be a valued addition to business environments to facilitate online business and improve digital productivity (Gill, Bunker and Seltsikas, 2011). There is significant opportunity for organisations of all sizes to gain tangible benefits, such as scalability, flexibility, affordability, maintainability, and online operating service availability (Zhang *et al.,* 2010). In particular, cloud computing provides opportunities for Australian government enterprises to increase their productivity and therefore boost the national economy (Gill *et al.,* 2014). Cloud computing claims to provide several benefits, however there is an absence in academic studies about cloud computing adoption from Australian government enterprise perspectives. In order to address this, a survey was recently undertaken identifying Australian government professionals' perspectives about cloud computing adoption in the public sector. This paper analyses the survey results conducted in February 2014 with 150+ CIOs, IT and business managers across the New South Wales public sector, examining their attitudes toward cloud computing adoption in Australian government agencies and enterprises. The next section in this paper will discuss the background to cloud computing and some of its features.

WHAT IS CLOUD COMPUTING?

There are many definitions that continue to emerge around the concept of cloud computing. A recent example is delivering everything as a service (XaaS) (Mladenow e*t al.,* 2012), where X means "everything". XaaS refers to the availability of the IT infrastructure, platforms, software, databases, and the other IT resources on the internet that can be accessed remotely (Winkler, 2011). Another definition of cloud computing states that "it 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.,* 2010) as illustrated in figure 1 below.

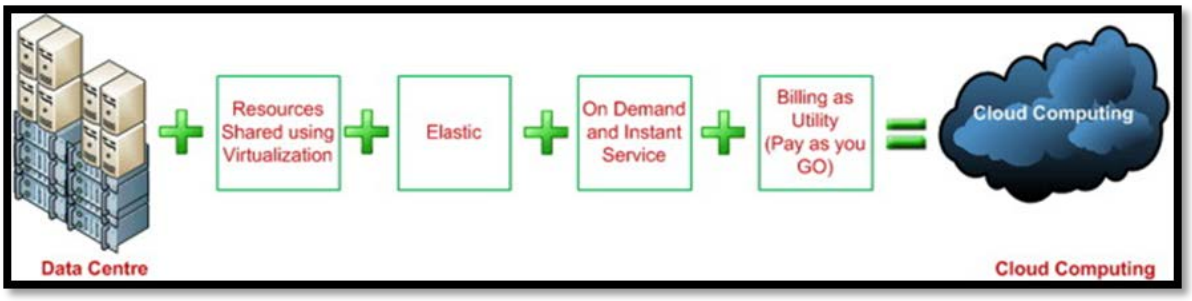

Figure 1: What is Cloud Computing? (source: Khorshed, Ali and Wasimi, 2012)

The National Institute of Standards and Technology (NIST) defines cloud computing as "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" (Mell and Grance, 2011). There is another way to view cloud computing which is from the business point of view, which defines such computing as a model of delivering, enabling and consuming the IT services with the flexibility of economical scaling up and down as well as adding, changing or removing the IT based business processes (Isom and Holley, 2012). However there does seem to be some consensus that the basic model of cloud computing consists of users, organisations, and/or applications that share different IT resources; such as applications, data, servers, and storage through the internet (Harding, 2011) as illustrated in figure 2. The previous view may define cloud computing as an innovation of facilitating business processes by utilising flexible and scalable online on-demand IT hardware and software resources, to achieve the flexibility of adding, removing, and reengineering business processes with minimum cost.

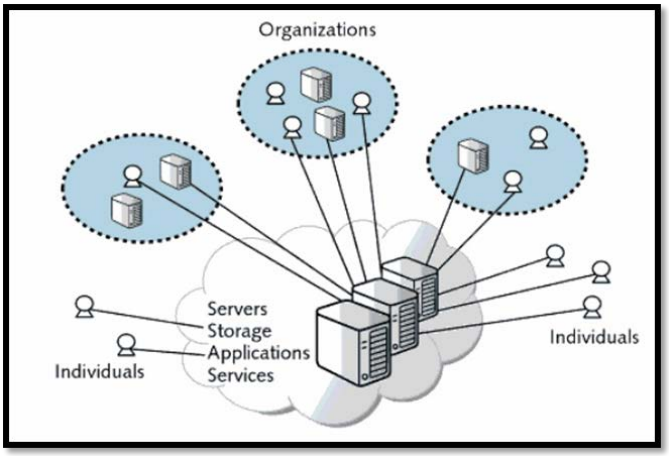

Figure 2: The basic model of Cloud Computing (source: (Harding 2011)

In short here are three main service delivery models of cloud computing, which are *Infrastructure as a Service (IaaS)*, *Platform as a Service (PaaS)*, *and Software as a Service (SaaS)* (Mell and Grance 2011). IaaS provides hardware resources for customers, such as storage and processing. IaaS supplies a virtual data centre in the cloud. In this model developers are responsible for installing the required software assets, such as operating systems, backup systems, developing platforms, and databases. The main feature of this model is the ability to configure and customise most of the hardware and software resources. PaaS acts as a superset of IaaS by providing IaaS plus the necessary operating systems and development environments.

This includes providing network support, dedicated or virtual servers, operating systems, development environments, databases, and data storage. The hardware and software resources are managed by the cloud service provider, which is a feature of PaaS to allow developers to focus on development, rather than consuming time in other administrative tasks. SaaS lies further on top of this stack by providing the required applications to customers via the cloud. The main advantages of SaaS are scalability (adding or removing resources), cost (data centres are in the cloud), and simple integration, where users mostly need web browsers only to interact with systems. However, there are some drawbacks of using SaaS, such as security and customization. Salesforce.com is one of the well-known examples of SaaS (Jamsa, 2012). From the business perspective, there is an additional service delivery model called *Business Process as a Service (BPaaS)*, which is used to deliver any vertical or horizontal business processes via the cloud, such as e-procurement, and business travel services (Isom and Holley, 2012).

What is clear is that cloud computing technologies are used to save, manage, and control data remotely and are stored in unknown and distant places from the enterprise's geographical location. However, some business organisations *do* choose the geographical location of their data, such as companies that require management of their customers' information in a specific location (Sultan, 2011). *YouTube* and *Twitter* are two such examples that target both businesses and individuals (Lin and Chen, 2012). While *Google Apps* and the Customer Relationship Management (CRM) system from Salesforce.com are two well-known examples of leveraging from SaaS in business environments (Jamsa, 2012). The deployment of cloud services relies on one of four deployment models. The first model is the *public cloud*, which is deployed by the provider and open for all internet customers. It is usually used by small and medium organisations as a cost effective method to deploy their IT services. Opposite to the public model, the *private* model comes as the second deployment model, in order to provide cloud services to a specific customer. The third model called *hybrid*, is a mix of the public and private model: it allows cloud customers to utilise some of cloud services privately for their local systems, and generally for their clients. The fourth or *community* model allows only a group of companies to utilise provided services (Marston *et al.*, 2010).

BACKGROUND TO CLOUD COMPUTING

The term *Cloud Computing* was first mentioned in 1999 for business purposes when www.salesforce.com introduced its business applications. Major online retailer www.amazon.com followed in 2002 when it provided its cloud based storage services, followed by Amazon Elastic Cloud Computing (EC2) in 2006 for small businesses. During this time several cloud applications and services from various companies, such as Microsoft

and Google as well as Force.com and Amazon were developed (Withee and Reed, 2012). Some features of cloud computing existed prior to the internet, one of the main features of which was centralised processing, for example service providers used their substantial resources to process all clients' transactions. This method was originally used during the 1960s and '70s (Lageschulte *et al.*, 2011), when a computing expert called McCarthy predicted that if computing services could be facilitated like a public utility, it would become an important new industry (Gillam, 2010). Medium sized computers then came to change this concept slightly by distributing processing via computers, but *within* the enterprise. In the 1990s, Microsoft Windows changed this concept by assigning the processing to clients' desktops as well as to enterprises in general, which then in turn changed some of their processes to work on client desktops. Since then cloud computing has turned the processing trend back on to the centralised concept of data processing, and can thus be considered the modern version of the mainframe (Lageschulte *et al.*, 2011).

Cloud computing is predicted to be an evolving trend that will provide organisations with the flexibility they need to compete effectively in a rapidly changing business environment. This is particularly important in the Australian public sector (Australian Government, 2011). Thus the overarching question explored here is: *what are the take up rates and critical success factors for Australian public organisation's adoption of cloud computing to achieve competitive advantage and increase national productivity?* The next section explores the evolution of cloud computing.

CHARACTARISTICS OF CLOUD COMPUTING

Cloud computing technologies are considered to possess several characteristics. The National Institute of Standards and Technology highlighted five main features of cloud computing, which were:

1- *On demand self service* allows customers to select the appropriate service, whether it is software, platform and/or infrastructure services, and pay as they need to use only.

2- *Measured service.* The systems of cloud computing have the ability to measure, monitor, report and control the resources used automatically and provide accurate costing and invoices to customers.

3- *Rapid elasticity.* Cloud computing service consumers are able to add or remove any of the IT resources at any time as required without any major investments in their own IT resources. There are three distinct benefits:
   - *linear scaling*: performance remains the same among users.
   - *on-demand utilisation*: clients allocate resources as they need to use them.
   - *pay-as-you-go*: paying only for the resources that are used.

4- *Resource pooling.* Is able to provide a high level of *Quality of Service* (QoS) at a competitive cost by sharing the tasks of IT management and administration, with a high commitment to service efficiency.

5- *Broad network access.* Is the ability and availability to access services among different platforms and devices. Broad network access via telcos can increase the users of the cloud services which would in turn improve their business (Alliance, 2011; Harding, 2011).

Cloud computing services can bring several advantages to business organisations. First of all, utilising the cloud can provide the ability to empower innovation trends in organisations from the IT side, by providing several solutions with a distinct reduction of IT obstacles (Marston *et al.*, 2010). Secondly, it provides direct access to hardware infrastructure remotely via the internet, with each client separated from others (Marston *et al.*, 2010). Moreover, cloud computing facilitates the scalability of IT resources, where enterprises are able to scale resources up and down depending on their requirements (Dubey and Wagle, 2007), which is one of the main features of cloud computing, such as pay-as-you-go, allowing users to pay only for resources utilised (Leavitt, 2009). Reducing IT investment and operational costs is another advantage in adopting cloud computing. For investments, companies can rent the required IT resources from the cloud provider instead of building dedicated IT centres. On the other hand, organisations can cut operational costs of servers, licenses, energy, staff, and other IT resources by authorising a third party - the cloud provider, to do such tasks (Choo, 2010; Marston *et al.*, 2010). This financial saving can help SMEs for example, to manage their limited budgets through saving IT service costs and scaling up their capital to empower their business (Miller, 2008).

CURRENT IS RESEARCH AREAS IN CLOUD COMPUTING

There are several fields of research in cloud computing that can be applied within a specific region or country. For example at the Australian level, Dr. Renato Iannella: principal scientist of National ICT Australia; proposed research to build Australian cloud services to put all local data under Australian control and protection in order to mitigate the fear of migrating data overseas that could be affected by foreign rules and policies (Choo, 2010). Organisations in Australia have to comply with the Australian Government's *Privacy Act*, an Australian law that

sets the rules with regard to the handling of individual information including the disclosure, storage, use and collection of personal information (Privacy_Act 2013). In the *economic* space, there is a need to show how cloud enablers can add economic value as well as what the most suitable pricing strategies are. Different pricing strategies are used in cloud computing, such as flat rate, payment per use or a combination of payment strategies (Marston *et al.*, 2010). Decisions on the most appropriate pricing strategy require an analysis of each method to ensure the relationship between quality and investment, as well as determine the best practice in this field. *Regulation* could be part of all other research areas, from the government level such as the Australian government privacy act; down to issues inside the organisation, such as budgeting. Regulation also includes pricing, Service Level Agreements (SLAs), security, international standards, risk assessments, adoption, and partnerships. With regard to research on the *adoption* of cloud computing there are many issues that need to be addressed. Implementing cloud computing requires an understanding of best practice and development of risk assessment methodologies, such as security in hardware and software and policy in general (ENISA, 2009). Research relating to *strategy* could target clients to determine the most important factors in order to meet their business goals, whilst targeting IT organisations that attempt to provide cloud services, this also includes matching business goals, issues of change management as well as staff training. *Policy* research may vary from managing the migration from on-premises to a third party in the cloud, setting a road map for migrating standards to cloud providers, and setting the rules of monitoring and auditing the cloud services locally and internationally. Having discussed some of the key research issues surrounding cloud computing generally, let us turn our attention to the Australian context more specifically.

CLOUD COMPUTING WITH REGARD TO AUSTRALIA

There exists an opportunity for Australian organisations to adopt cloud services to develop flexible IT platforms at a relatively low cost. These three broad services: IaaS, PaaS and SaaS provide the IT resources for organisations to take advantage of online services, such as e-commerce; without a massive investment in IT resources (Galer, 2013). Not surprisingly there has been a significant growth in the cloud computing market over the last few years. Gartner Group (2013) reported that the global cloud services' market was valued at $110.3 billion in 2012, and was predicted to grow 18.6% to $131 billion in 2013. The IaaS market was $6.1 billion in 2012 and this number was forecast to be $9 billion in 2013. The Gartner report also mentioned the major sectors of cloud computing market. Advertising in the cloud was classified as a top investment sector in the cloud by 48% of the total market in 2012. Moreover, the cloud investment was estimated to rise to $677 billion from 2013 to 2016, where around $310 billion is dedicated for advertising. The second largest industry in the cloud is the Business Process as a Service (BPaaS) market by 28%. SaaS comes in third at 14.7%, followed by IaaS by 5.5%, and cloud security and management at 2.8%, while the last sector was PaaS at only 1% (Anderson *et al.*, 2013).

A survey undertaken in 2010 (CIO and IDG, 2011) conducted in 636 companies in five countries (USA, UK, China, Japan, and Australia) showed that 88% of IT decision-makers agreed that cloud computing would be a priority in their organisations. Cloud computing was identified as important for achieving eight key objectives, which were e-industry regulatory change, disaster recovery, improving capability and availability, minimizing IT investment in infrastructure, enhancing IT control, business agility, mitigating IT maintenance and management as well as improving IT productivity. Business agility was identified by 75% of interviewees as the most important contribution of cloud computing. The second most important contribution at 56% was reducing IT infrastructure investment. The third most important at 53% was decreasing IT maintenance and management resources. Other cloud contributions included improving capability and availability (50%), improving IT productivity (46%), disaster recovery (40%), enhancing IT control (32%) and industry regulation (17%).

Cloud computing is thus considered as one of the business success factors that could lead to improvements in business outcomes and the national economy as a whole (Mladenow *et al.*, 2012). Cloud computing is described as a group of innovative IT utilities that provide on-demand on-line services (Surendro and Fardani, 2012), which provide several benefits to SMEs with limited budgets which cannot support a specific investment in their IT resources. It can help SMEs by providing most of the needed utilities online by renting the required resources which varies from hardware infrastructure to operating systems, software, file storage, databases and more. This utilisation is supposed to mitigate the IT resource issues for those companies, improving their income and adding value to the Australian economy. Cloud computing can also act one of the most important success factors for business survival in improving and managing business processes as well as innovating new business ideas, for example using mobile computing, dealing with Big Data issues, and for social media (Isom and Holley, 2012).

In order to be effective, cloud computing requires access to fast and reliable internet infrastructure to guarantee the quality of service and to ensure online availability for 24/7 operations. The Australian government has moved an important technological step forward by introducing the *National Broadband Network (NBN)* which is planned to reach 93% of Australian buildings in order to provide peak speeds of up to 25Mbps (Department_of_Broadband 2013c), with several options of speed and three different technologies, being fixed wireless, optical fibre and internet by satellite technology, where the last one is proposed to work by 2015

(Department_of_Broadband 2013a). This shift can support the Australian government's trend in its regulation of cloud computing through three main strategies. The first strategy is increasing the business value of cloud computing in the government digital environment (Gill *et al.,* 2014). Secondly, promoting the utilisation of cloud services for SMEs and non-profitable organisations as noted in Fakieh, Blount and Busch (2014). The third strategy is focused on supporting the cloud services sector (Department_of_Broadband 2013b). Globally, Japan is one of the leading countries in internet and computing technologies in providing internet services, a critical factor to gaining global competitive advantage. Japan leads the world's internet speed through the introduction of the fastest internet in the world, reaching speeds of up to 2Gbps (Alabaster, 2013); this shows for Australia to be competitive it needs to have fast ubiquitous broadband.

CURRENT CHALLENGES FACING CLOUD COMPUTING ADOPTION

As with any technology, there are several threats that could affect the evolution of cloud computing. In general, the challenges of adopting cloud computing can be categorised into four main groups, which are: *technical*, *organisational and policy*, *legal*, and *miscellaneous* risks that do not fall in to the previous three categories (Khajeh-Hosseini *et al.,* 2012).

Cloud computing *regulation* is a critical political and legal issue from the business perspective. Regulation is required in order to regulate dealing with cloud computing on local, national and international levels to ensure availability, accessibility, and privacy under any possible conditions (e.g. natural, financial or political), to avoid any unexpected consequences, such as the failure of data privacy, which could lead to administrative, local, national, or even international problems. Therefore cloud stakeholders are required to set clear SLAs highlighting all possible issues (Alliance, 2011).

Data availability is one of the main technical and organisational issues in cloud computing. Organisations need to gain the highest availability of their businesses online, and they might not accept faults that could hinder their work. Such availability issues are connected to *regulation* in order to set rules to avoid unexpected issues (Choo, 2010).

Data privacy and security is another data-related dilemma than hinders the expansion of cloud computing. Clients wonder if cloud service providers can provide better or even the same level of data privacy and data security compared with an in-house model. Moreover, clients typically have several questions about who can access their data, and how to insure the privacy from the staff side of the cloud service provider (Zhang *et al.*, 2010).

Lack of cloud standards is another technical threat that inhibits cloud growth. There are no clear interfaces between platforms from different service providers (Armbrust *et al.,* 2010). As a consequence, cloud clients may face several problems when they decide to move to another cloud provider. However, some of the main industrial cloud players; such as Microsoft and Google; have commenced attempting to solve this issue through developing different solutions to move data to and from their systems (Marston *et al.,* 2010).

Multi-tenancy and cyber-attacks are one of the major technical issues in cloud computing. While data from different clients are stored in a single multi-tenant server, the server needs to run at the maximum protection level to ensure security. If one of the virtual environments faces attack, the server must provide complete protection to the other virtual tenants (Choo, 2010) as well as protect physical resources, because hackers are always trying to reach all of the cloud's clients in the victim's server (Alliance, 2011).

Lack of data control could be considered as a major legal and organisational deal in adopting cloud services to the business. Organisations may refuse to take advantage of cloud services, because they feel their valuable data is owned and controlled by a third party, namely the cloud service provider (Armbrust *et al.,* 2010). Furthermore, the sense of data being controlled by others leads companies to think they lack flexibility; compared with an in-house option to edit or change their own applications (Leavitt, 2009; Miller, 2008).

GOVERNMENT CLOUD

Traditionally Government agencies collected, created, maintained and managed their operational data individually, essentially if they owned the data collected. Recent technology innovations allows agencies to contemplate the adoption of 'cloud' sourced services and software for the three broad categories (IaaS, PaaS and Saas) of cloud computing. This represents a significant shift in the way agencies manage and deliver services, and also raises legislative challenges around ownership and control of information. The driver for this move was the need for greater efficiency (cloud is a cost-effective solution), infrastructure and also a need for legislative reform. In July 2013 the NSW government CIO and Finance Minister (Bender, 2013) issued a statement announcing that the state government would be shifting their agencies towards the cloud. In the previous month they released the "NSW Government Cloud Services Policy and Guidelines" (NSW Government, 2013) to match cloud delivery models to agency business requirements. This *directed* NSW Government agencies to consider

adopting cloud technology on a cost benefit framework. Nonetheless, there exists a lack of academic study with regard to Australian government cloud adoption.

RESEARCH APPROACH

In general, there are several social research methods, however there are three main epistemologies, which are *positivist, interpretive*, and the *critical social research method* (Myers and Avison, 2002). Positivism assumes reality is a given and it can be measured by its features and is mostly applied as observations, precision and the independence of values and theory (Neuman, 2010). Interpretive research starts with assumptions that might lead to reality. It is usually used to understand an phenomena, such as the influences of information systems (Walsham, 1993), with its purpose being to learn how the world works by understanding people and knowledge (Neuman, 2010). Critical Social Research assumes there are some realities that need to be criticized in order to transform them to other forms (Neuman, 2010). The role of this paper is to present the results of a cloud computing survey conducted with IT managers in NSW Government. The complementary paper (Fakieh, Blount and Busch, 2014) in this ACIS track, discusses the literature, research approach and theory in further detail. In this study over the next couple of years, the epistemology will be interpretive initially for several reasons. It is useful to collect the opinions of public sector employees' on cloud computing adoption through an administrative survey. After collecting data, the reality then begins to form. From this point, a positivist epistemology will prove beneficial in order to analyse the collected data. The initial survey results are hence further discussed in next section.

SURVEY QUESTIONS

From the discussion above the major issues may be summarised in two main points: (1) there is no clear academic study on Australian Government cloud adoption, thus (2) there exists a need to study Australian public sector employees' perspectives on cloud computing adoption. Enhancing our understanding from employees' perspectives will potentially provide insights into how Australian public organisations should proceed with cloud computing adoption to increase competitive advantage and improve national productivity. In order to understand the state government agencies' perspectives on cloud computing, a workshop involving public sector employees was held on the 18th February 2014 in Sydney at the MLC Tower in the offices of NSW Trade and Investment. This workshop was attended by 151 CIO's, IT and Business Managers across several NSW government agencies. The survey was conducted within a forum using electronic 'clickers' to record the participant's responses. The discussion, forum and survey were moderated by the Director of Intel Asia-Pacific Region. A total of twelve questions were asked through a close-ended administrative survey questionnaire,[1] of which only the more relevant ones (table 1) are addressed here.

Table 1. Cloud workshop questions and answers

Questions	Answers
Q2. [2] Do you now feel you understand about using the cloud?	Not really, Somewhat, Moderately, I have a pretty good idea, I am a subject matter expert
Q3. Following today's debate, are you more likely or less likely to use cloud services at your agency?	Much less likely, Less likely, About the same, More likely, Much more likely
Q4. Which team had the most compelling argument?	The 'extreme' cloud team were much more compelling, The 'extreme' cloud team were a little more compelling, I think both arguments were equally compelling, The 'considered approach' team were a little more compelling, The 'considered approach' team was much more compelling
Q5. Cloud services will do me out of a job within 5 years	For sure, Probably, Don't know, Unlikely, No it won't
Q6. Cloud computing is a fad like outsourcing. It will swing back again to in-sourcing when people get tired of poor service	This won't happen, Maybe it will happen to some extent, I don't know, It could happen, It will definitely happen
Q7. Would you prefer to use a government cloud or a public cloud?	I would only use a government cloud, I would prefer to use government cloud, I have no particular preference, I prefer to use public cloud, I would only use a public cloud
Q8. It is time to stop trying to manage things that can be provided better and cheaper out of a cloud. Do you	Totally agree, Partially agree, Don't know, Partially disagree, Totally disagree
Q9. Are you planning to change jobs in the next 12 months	Yes, trying to change now, Yes, like to change this year; I don't know; Like to change in 2-5 years; I am not looking
Q10. The one thing I would like to change about my job is	For my boss to appreciate me more, To work closer to home, To get promoted, To work less, To have more of a say in what happens at work
Q11. The biggest issue that keeps me up at night is	Staff capability; The work budget; Too much work; System problems; Organisational changes

[1] Refer to appendix 1, which provides a more structured presentation of results.

[2] Q1 simply asked respondents what type of cloud they like: cumulus, cirrus, stratus etc.; Q12 asked what the respondents liked about working in the NSW public sector.

DISCUSSION

The survey results provide some useful insights about government cloud computing for both academics and professionals. Cloud computing is a relatively new and emerging concept in the Australia public sector. Surprisingly, the analysis of Q2 suggests that most of the survey participants (43%) have a good grasp of the cloud. Only 7% of the participants indicated non-familiarity with the cloud. More surprisingly, only 10% indicated that they are subject matter experts in the cloud; this seems to suggest that professionals from the public sector are only beginning to become fully cognizant of cloud computing. Awareness of emerging cloud computing is one thing, it is important however to know whether public sector professionals are aware of how the cloud can be incorporated into ICT strategies in their respective agencies. The responses to Q3 highlighted that in total 90% (60+21+9) of the participants are interested to use the cloud services in their agencies. This high number may well be due to the government cloud strategy (Australian Government, 2011). However, it is more likely driven by the threat of IT budget freezes or reductions while maintaining the same customer service levels.

Cloud awareness and willingness to adopt it, show positive perceptions. It is important here to understand the Australian public employees' concerns about job losses due to cloud computing. A large response of 72% (Q5: 37% + 35%) indicates that they will not be out of job in next 5 year if their agencies decided to embrace cloud computing. This seems to suggest that most of the public sector employees do not see cloud adoption as a threat to their jobs. Although, cloud computing may not directly impact their job, there may be indirect impacts. Question 9 and Q10 further expand on job aspects in the overall context of cloud computing in the Australia public sector. The analysis of Q9 indicates about 46% respondents intend to change their job in next 12 months. Question 10 further highlights some non-technology aspects that may cause employees to change their job (see Appendix 1). Question 6 indicates 55% (19+36) of the respondents believe cloud computing will not fade away like outsourcing, 42% (25+17) of the respondents believe otherwise, whereas only 4% remain silent or neutral in response to this question. This seems to us a mixed response, and we believe that organisations go through natural back and forth strategies in response to the changing business and technology landscape.

There are a number of cloud service deployment models such as private government cloud or public cloud etc. (Gill *et al.,* 2014). Question 7 assumes that governments will adopt a cloud service model and seeks to understand whether agencies would prefer a private government or public cloud. Most of the respondents (62%) favoured the use of government cloud; only 12% preferred to use public cloud, whereas 25% respondents have no particular preference. This seems to suggest that public cloud is not an option in most agencies, mainly due to a number of potential risks attached to it (e.g. Perepa, 2013) or the cost/time to build infrastructure. This issue has been highlighted by Government enterprises across developed countries such as the UK, Canada, and the USA (e.g. Gov UK, 2013; Kundra, 2011). Following on from the strategies of these countries, the Australian government (2011) has a similar strategy that suggests "agencies may choose cloud-based services where they demonstrate value for money and adequate security." Australia has a value and risk driven strategy to cloud adoption; Q8 relates to this and is intended to determine the participants' response on this strategy. An overwhelming 78% of participants (31+47) favoured this strategy, while only 16% thought otherwise with 6% remaining neutral, indicating perhaps they did not know about this strategy. In addition to technology, Q11 and Q12 highlighted some other non-technological aspects within the context of cloud adoption. The responses to Q11 indicated that 47% (12+35) of the respondents believed that system problems and organisational changes gave them cause for concern. This factor needs to be taken into account when adopting cloud computing, as the adoption of the cloud will not only require system changes but also organisational changes (Gill *et al.,* 2014). Finally, Q12 is focused on their motivation for working in public ICT environment. Some 40% of respondents believed that helping the community was the motivating factor. The question is how can the adoption of cloud computing impact this motivation factor? - certainly a question for further research. Finally 31% of the respondents (Q12) indicated they appreciated the work/life balance. One may be interested to research the impact of cloud computing on the work/life balance.

In summary, the analysis of the survey results provided a number of insights both from technological and non-technological perspectives. The overall conclusion is that Australian enterprises are aware of the cloud opportunity and willing to take the next steps to embrace cloud, the question however is *how* should they proceed with the adoption of cloud computing? Hence it is appropriate that researchers and practitioners collaborate and develop the methods and frameworks necessary for systematic cloud adoption in Australian enterprises.

CONCLUSION

Australian government enterprises play a significant role in the digital economy and national productivity, through the hiring of a significant number of employees in Australia. Utilizing cloud services has the potential to increase individual, organisational, and national productivity. The literature shows a clear gap in our knowledge about cloud computing adoption in Australian government agencies and how cloud computing can be used for achieving competitive advantage. This research consists of two phases. In the first phase, the study attempted to

highlight the Australian government agencies' views on adopting cloud computing from both technological and non-technological perspectives. The overall conclusion is that Australian agencies are aware of cloud opportunities and are willing to take steps to embrace cloud, however the question is *how* they should proceed? Researchers and practitioners can collaborate and develop methods and frameworks for systematic cloud adoption in Australian enterprises. The findings of this study will be further analysed in phase two (2) to develop and implement cloud adoption methods and frameworks for Australian government agencies. This paper presented partial results of the first phase, by using a structured survey providing insights to both researchers and practitioners on government cloud adoption in the Australian context. The first phase results will help toward establishing the second phase of this research.

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APPENDIX 1: SURVEY RESULTS