Factors to be Considered in Cloud Computing Adoption

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Abstract. Technology plays an important role in helping organizations control quality and costs, and take advantage of opportunities in a highly competitive and increasingly complex business environment. Cloud computing offers greater access to computing power, storage, software, and remote data centres through the web. This research aims to confirm the factors to be considered for cloud computing adoption in Australian regional municipal governments. The research involved data from interviews with IT managers from selected regional municipal governments, and survey data from 480 IT staff across 47 regional municipal governments. The major factors to be considered for the adoption of cloud computing in regional municipal governments were identified as Internet connectivity, Internet speed, availability, reliability, data storage location, security, data sovereignty, cost, integration, data backup, provider dependability, employees' knowledge, and transportability. The findings of this research may help managers increase their awareness about factors to be considered when regional municipal governments planning to adopt cloud computing.

Keywords: Cloud computing; Factors; Adoption; Regional municipal governments

1. Introduction

Cloud computing joins existing advances technologies to create a standard stage for shared and configurable assets through the Internet (Kuyoro et al. 2012; Nicho & Hendy 2013). It offers the capability of reducing the requirement for expensive information technology (IT) infrastructure (Nicho & Hendy 2013; Subashini & Kavitha 2011) and can consolidate versatile innovation and broadband Internet systems (Gupta et al. 2013).

Cloud computing was recognised for its potential in more accessible processes, storage, and communication (Paquette et al. 2010). Cloud services are progressively accessible to individuals, organizations, and government agencies. It offers administration of programming and equipment and (Paquette et al. 2010) software, hardware and platform as services (Paquette et al. 2010). Cloud has changed computer services from an infrastructure investment to a service accessible at any time and place. A developing requirement for quicker service delivery was relied upon to urge organizations to embrace cloud computing for more prominent IT agility (Oliveira & Martins 2011).

Cloud has particular potential for Australian rural and regional communities which are faced with pressures that are more extreme than in cities and are worsening as services are withdrawn by government and business (Baxter et al. 2011). In many rural areas, especially the more remote, certain services are no longer available, or are available at considerably higher cost and lower quality than in urban locations (Asthana 2003; Baxter et al. 2011). New technology such as cloud computing could help to improve access to services in a more cost-effective and timely manner.

A challenge for ICT in regional areas was the lack of and cost of providing and maintaining network infrastructure (Ashton & Thorns 2004; Hammond & Paul 2006). By using cloud computing, regional municipal governments will have greater capacity to move the necessity to bolster the backend foundation to data centres in real urban communities or different data centre points (Ali et al. 2015a). This was could assist with the shortage of technical skills and institutional capacity in regional and rural areas (Ali et

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al. 2015a). Services provided by regional municipal governments could be better managed through cloud computing (Ali et al. 2015a) with minimal local IT infrastructure (Das et al. 2011; Beaubouef 2011; Sperling 2010). Despite its potential benefit the adoption rate of cloud computing in regional municipal governments in Australia was lower than in urban areas (Department on Innovation Industry Science and Research 2011).

Research about cloud computing in the public sector was limited (Janssen and John, 2011), although there was some evidence of the benefits of cloud computing (Ali et al. 2015a; Buyya et al. 2009; Marston et al. 2011; Tripathi & Parihar 2011; Zhang et al. 2010). There was a dearth of studies that provide an in-depth and holistic investigation of the factors that need to be considered when organizations such as Australian regional municipal governments are planning to adopt cloud computing (Low et al. 2011; Misra & Mondal 2011). This limitation has hindered strategy development for adoption of cloud computing in local governments (Department on Innovation Industry Science and Research 2011). There are calls for research related to cloud computing adoption to guide implementation decisions from regional municipal governments to request further research (Department of Innovation Industry Science and Research 2011).The current gap has led us to the following research problem: What are the actual factors to be considered by Australian regional municipal governments when planning to adopt cloud computing?

The paper was provides an overview about the research topic and the literature. Then, explain the methodology used to collect data for this research involved in-depth interviews with IT managers in Australian regional municipal governments and survey data from 480 IT staff across 47 regional municipal governments. Finally, the paper discusses findings limitations and suggestions for future research.

2. Literature Review

Cloud computing represents a paradigm shift in the IT domain (Kantarcioglu et al. 2011). It was the result of significant innovations in virtualization, utility computing, distributed computing, grid computing, storage, content outsourcing, security, Web 2.0, and networking (Catteddu & Hogben 2009). Cloud computing offers improvements in IT productivity through accessible hardware and software resources and business agility (Kim et al. 2009).

The most widely used definition of the cloud computing model was introduced by the U.S. National Institute of Standards and Technology (NIST) as "*a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of services (for example, networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction*" (NIST 2009). The NIST definition promotes the availability of cloud computing and describes its five essential characteristics: on-demand self-service; broad network access; resource pooling; rapid elasticity; and measured service (NIST 2009; Mell & Grance 2009).

Cloud services can be categorized on the basis of the following three service/delivery models: software as a service; platform as a service; and infrastructure as a service (Ali et al. 2014; Broberg et al. 2011; Cloud Security Alliance 2009; Mell & Grance 2009; Sohan & Zeng 2010; Velte et al. 2010; Wang et al. 2008). There are four cloud deployment models (public; private; community; hybrid) (Ali et al. 2014; Armbrust & Fox 2009; Catteddu & Hogben 2009; Cureton 2009; Cloud Security Alliance 2009; Dustin-Amrhein et al. 2010; Mell & Grance 2009).

Some researchers considered that organizations in different sectors should be evaluated before adopting this new IT innovation (Kuo 2011). He proposed four different aspects: management, technology, security, and legal issues. Staff technological capabilities and competencies will also impact an organizations when planning to adopt an innovative information technology (Lin et al. 2012; Liu 2011). If the staff has sufficient knowledge and skills to adopt cloud computing that organization can have more confidence throughout the process.

Due to the nature of cloud computing technology, data security and privacy are the major concerns for adoption; particularly in the government sector (Kuo 2011; Kim et al. 2009), because these type of organizations have much sensitive data that needs to be protected, such as financial details, company databases, email accounts, research findings, confidential research, feasibility studies, and government future plans. For success as a cloud computing provider, it was mandatory that the provider effective security protection for users' file and data. Using a multi core system with multiple processing cores help and facilitate privacy and data separation (Hewitt 2008).

Based on the research conducted by Lundblad (2003), he described that learning process or communication can develop the innovation adoption for some innovation, such as a cloud computing, to be considered for adoption, it must offer the advantages to users and be suitable with current technology. Sufficient communication was required to educate and encourage the users of technology's value. Victor in an organization and modify agents from outside the organization can prompt the adoption of new technology (Lundblad 2003).

A research conducted by Koehler et al. (2010), found that reliability of the system is one of the main factors to the adoption of cloud computing. Furthermore, another research conducted by Catteddu and Hogben (2009) found that the main factors to be considered to the adoption of cloud computing are privacy, security concerns, availability, integration, and confidentiality of information.

In general, there are no empirical studies specifically investigate the whole factors that need to be considered when planning to adopt cloud computing services in Australian regional municipal governments. This limitation has hindered strategy development to improve the adoption of cloud computing in local governments (Department on Innovation Industry Science and Research 2011). There are only a few studies that describing the importance of individual factors such as internet connectivity (Tweneboah-Koduah 2012); internet speed (Magele 2005; Voorsluys et al. 2011); reliability (Voorsluys et al. 2011); availability (Ahuja and Mani 2012); data storage location (Jaeger et al. 2008); security (Ali and Soar 2014; Paquette et al. 2010); data sovereignty (Tweneboah-Koduah et al. 2014); cost (Li et al. 2009); integration (Tripathi and Parihar 2011); data backup (Hemant et al. 2011); employees' knowledge (Kuan and Chau 2001; Lippert and Forman 2005) as factors need to be considered when planning to adopt cloud computing.

3. Research Methodology

This research paper presents the outcomes of one aspect of a larger research project; a series of research papers have been developed, each focusing on a different aspect of the adoption of cloud computing in Australian regional municipal governments. This paper focuses on only one of the research questions, relevant data and analysis. The research method explained below was used in relation to the larger research project for which the focus was on the key

factors that are perceived to influence the cloud computing adoption in Australian regional municipal governments. So, this paper is focused only on presenting the aspect that is related to the factors that need to be considered when regional municipal governments plan to adopt cloud computing.

3.1. Research design

A mixed method was used because of the ability to address exploratory and confirmatory research questions simultaneously (Johnson & Onwuegbuzie 2004). In social sciences, both methods are used because they develop a better evaluation and learning of research which included exploration. The use of mixed method makes the researcher view the research with diversity, variability, and correspondence (Teddlie & Tashakkori 2009; Venkatesh et al. 2013).

Design of the mixed methods usually begin with a qualitative study quantitative research (Sale et al. 2002; Venkatesh et al. 2013; Walsham 2006), although this order can be reversed (Soffer & Hader 2007). An exploratory qualitative study would offer the vital adaptability to consider diverse choices of discussion with participants (Venkatesh et al. 2013). The confirmatory quantitative research can provide efficient, affordable, and relatively accurate means to procure data to fulfil several goals (Zikmund 2003).

The data collection was conducted in two major studies. Study 1 involved a qualitative investigation to understand the factors that required to be considered when planning to adopt cloud computing in Australian regional municipal governments. Study 2 involved the use of quantitative questionnaire data to confirm the findings from the study 1. The next two subsections describe the methods and results from two studies in details.

3.1.1. Study 1: Qualitative investigation
Study 1 in this research was exploratory in nature seeking to investigate and provide a qualitative overview of the concepts relating to the factors that required to be considered when planning to adopt cloud computing in Australian regional municipal governments.

3.1.1.1. Data collection method
A series of in-depth interviews were conducted between May 13, 2014 and August 12, 2014. These obtained inputs from 24 local government employees at senior management levels. These occupational groups were selected based on the assumption that they represent key stakeholder groups likely to be

responsible for planning and adoption of cloud computing for Australian regional municipal governments. The sample of 24 interviewed council officials reflects the geographical spread and size classifications of government councils throughout Queensland.

The interviewer followed a sequence of steps: planning the interview, introductions at the commencement of the interview and establishing rapport with the respondent through small talk (Gaskell 2000). The interviews lasted between 30 and 50 minutes. The interview questions were designed as open-ended questions to encourage the interviewees to provide answers that revealed their attitudes and perceptions relating to the research topic (Carson et al. 2001). A total of 24 interviews were carried out with IT managers of the chosen regional municipal governments. The research reached the saturation level within the interview number 18, when the researcher noticed that, there was no more new information or patterns in the data emerging from the interview. Another six interviews were conducted to ensure inclusion of all segments and size classification of the councils to obtain a comprehensive overview of issues. Only 21 interviews were used in this research. Three interviews were excluded from the analysis because it was discovered during the interview that these three IT managers did not come from an IT background and did not have any experience or knowledge related to cloud computing.

3.1.1.2. Data analysis

The interviews data was analysed using manual content analysis method (Miles & Huberman 1984).

Manual content analysis was undertaken in this stage of the analysis which included three concurrent flows of activities: data reduction, data display and conclusion verification (Faust 1982; Hsieh & Shannon 2005; Miles & Huberman 1984). After the completion of each interview session, the recorded interviews were immediately transcribed. Interview transcripts were reviewed to create summary sheets for every interview (Rao & Perry 2007). This summary sheet included main themes, issues, problems and brief answers to each question, resulting in an overall summary of the main points in the contact (Patton 2002; Schilling 2006). Then the summary sheets were reviewed to develop a pattern code for the research data. The next step of the analysis was to develop data display, which organized assembly of information to permit the researcher to draw conclusions and taken actions (Miles & Huberman 1984).

3.1.1.3. Study 1 results

After the interview, the impact of the factors that required to be considered when planning to adopt cloud computing was giving a rating of Important, Unimportant, Not sure by the respondents. The way factors are rated will be in accordance to how the informants responded to them along with what was derived and collected from empirical sources. These rates were checked and accepted by the respondents after we sent our interviews' findings to them. This allows us to categorize each considered factor according to their importance of impact for Australian regional municipal governments and present them accordingly. For more details see Table 1.

Table 1
Study 1 results (Ali et al. 2015d)

Factors	Frequency	%	Reasons
Internet connectivity	19	90%	• Regional municipal governments were located in rural and regional locations and do not have the same level of access to high-speed Internet as councils in metropolitan area. • Internet connectivity in rural and regional areas was limited and expensive.
Internet Speed	17	81%	• Without high speed of the internet the cloud computing was useless.
Availability	9	43%	• Without the availability required, the advantages that cloud computing promises to provide will not eventuate.
Reliability	9	43%	• Cloud computing would not be as effective if the dependability of the connection for cloud computing was not proven and not as strong as it should be.
Data storage location	15	71%	• Sometimes data was stored off-shore and it was essential to know the location and details of the off-shore storage system, and make arrangements for maintenance and the identification of the parties involved.
Security	8	38%	• There are external factors that may negatively affect the storage systems and unauthorized access of data.

			• Store data within the country to ensure better protection for organizations and their stakeholders.
Data sovereignty	4	19%	• To ensure that their data, their rights, and their sovereignty are protected under Australian government laws.
Cost	11	52%	• There were no figures that were available to justify cloud computing as a cost effective solution
Integration	7	33%	• Integration to be a very important factor as the software and other systems would not perform appropriately if the organizations cannot integrate them precisely.
Data backup	4	19%	• To ensure that backup was available to them in case of unexpected and unforeseen issues.
Provider dependability	4	19%	• There was a risk about the trust that was given to cloud service providers to control over an organization's data. This trust that was given to cloud service providers might result in loss of control over the data.
Employee's knowledge	3	14%	• To make sure that the employee's knowledge or experience was comparable to known cloud computing environments.
Transportability	2	10%	• To make sure that we have the flexibility to recover back our data, in case we decided to move from one cloud service provider to another one or decided to return the data back to our house.

3.1.2. Study 2: Quantitative questionnaire

Study 2 in this research was confirmatory in nature seeking to confirm the findings from the exploratory stage relating to the factors that required to be considered when planning to adopt cloud computing in Australian regional municipal governments.

3.1.2.1. Data collection method

A questionnaire was selected as the instrument for the phase 2 of data collection in this research. A questionnaire provides quick, affordable, efficient, and relatively accurate means to procure data to fulfil several goals (Zikmund 2003; Zikmund et al. 2013). The questionnaire was developed based on the previous literature on technological and organizations studies and the findings from qualitative study (exploratory stage), we developed the questionnaire to empirically test the research question. An online survey method was chosen because of the accessibility of the internet for all intended participants and the belief that participants would prefer this approach. In order to make the survey available 24/7, an online survey service provider was found and the online survey link was offered for 3 months from March 1, 2015 to May 31, 2015. The survey was distributed through providing the online link to all the participants; to avoid participants performing the survey twice, the online server saved the IP of all the participants for 3 months. In Queensland there are 77 regional municipal governments. Each regional municipal government IT manager was asked to forward the survey link to their staff through email, SMS, or social media sites.

Seven-point Likert scales were used for all the factors' measurement, with 1 present the strongly unimportant of the scale and 7 present the strongly important of the scale. Many researchers in the field of ISs recommend using five and seven Likert scales to analyse online survey data (Hair et al. 2006; Yu-hui 2008; Premkumar & Roberts 1999; Lian et al. 2014; Zhu & Kraemer 2005). This specific research utilized a seven-point Likert-scale for ensuring extra level of accuracy and participant's actual response (Finstad 2010; Lian et al. 2014; Yu-hui 2008). Sauro (2010) argued that seven points inclined to be a fair balance between maintaining adequate points of discrimination without keeping too many options of response.

A pre-test is carried out considering one site to examine all the processes and instruments in order to recognise the required improvement in the research survey (Wholey et al. 2004). This identification of improvements which are necessary is possible only by conducting the pre-test (Waters 2011). As a result of that, feedback on the initial questionnaire was obtained from some academic staff at USQ and some IT managers from regional municipal governments. Minor modification were made based on the comments received.

An important step for the improvement of the effectiveness of the questionnaire was to do a pilot study (Shaughnessy et al. 2012). A pilot study includes actually running the questionnaire to a similar sample of respondents, under the same conditions to those anticipated in the final running of the survey (Shaughnessy et al. 2012). Running a pilot study before the final one was the best way to explore and

identify issues and improve the design of the research survey (Waters 2011). It is very important to obtain pilot study for testing the survey questions (Kothari 2008). The weaknesses in the survey and its techniques can be explored and identified by use of survey pilot study (Kothari 2008). Validity, reliability, and practicability of the survey are elevated through pilot study of survey (Cohen et al. 2005). The survey was distributed among 30 IT members from different regional municipal governments, nine curtailed surveys were discarded and entire of 21 surveys that were submitted with a 70 percent response rate. Table 2 illustrate the results of the pilot study.

Table 2
Pilot study results

Items	Total Correlation	Squared Multiple Correlation	Mean	Std. Deviation	Cronbach's Alpha of each Item	Cronbach's Alpha
Internet connectivity	.326	.396	6.78	.571	.850	
Internet speed	.349	.354	6.07	.591	.835	
Availability	.798	.732	5.63	.893	.816	
Reliability	.631	.702	5.73	.795	.816	
Data storage location	.847	.461	5.58	.920	.817	
Security	.371	.349	6.48	.609	.842	
Data sovereignty	.526	.759	4.47	1.589	.810	.938
Cost	.528	.372	6.39	.727	.843	
Integration	.481	.474	6.02	.693	.822	
Data backup	.430	.385	6.57	.656	.849	
Provider dependability	.347	.692	5.32	1.071	.807	
Employee's knowledge	.949	.487	5.49	.974	.821	
Transportability	360	.702	4.58	1.470	.811	

3.1.2.2. Respondents' demographics analysis

Regional municipal governments, are key organizations that provide public services to the citizens, community organizations and businesses. The 77 regional municipal governments in Queensland have great dependence on IT innovation to provide their services (LGAQ 2013). This research focuses on these regional municipal governments and in particular the IT department of these regional municipal governments as the main part of the target population. The survey was distributed online to Queensland's 77 regional municipal governments through USQ's Custom Survey System. IT Managers from 47 regional municipal governments responded to the survey which represented a response rate of 61 percent. For more details see Table 3.

Table 3
Survey details

Survey Details		
Survey participant	**No. of councils**	**Percent**
Survey received	47 Councils	61%
Survey not replied	30 Councils	39%
Total	77 Councils	100%
Not Respondents Councils Details		
No. of councils	**Percent**	**Reasons**
9 Councils	12%	Because of government regulations
8 Councils	11%	Because their IT were outsourcing
13 Councils	16%	Because they did not reply to the survey

The participating 47 regional municipal governments had around 786 IT staff who may have been invited to participate and 480 responded. Table 4 provides the details related to the respondents' demographics analysis.

Table 4
Respondents' demographics

Demographics	Frequency	Percent	Cumulative %
Roles in IT (*N* = 480)			
Management	238	50 %	49.6%
Systems development/ Analyst/ Programmer	138	28.8 %	78.3%
Operations/ Systems administrator/ User support	101	21 %	99.4%
Other	3	0.6 %	100%
Total	**480**	**100 %**	
Knowledge related to cloud computing (*N* = 480)			
No knowledge	5	1 %	1.0%
Little knowledge	106	22.1 %	24.2%
Some knowledge	111	23.1 %	73.8%
Good knowledge	238	49.6 %	95.8%
Excellent knowledge	20	4.2 %	100%
No knowledge	5	1 %	1.0%
Total	**480**	**100 %**	
Years' of experience (*N* = 480)			
Never	12	2.5 %	2.5%
Less than 1 year	95	19.8 %	22.3%
2-5 years	250	52.1 %	74.4%
6-10 years	111	23.1 %	97.5%
11-14 years	8	1.7 %	99.0%
More than 14 years	4	0.8 %	100%
Total	**480**	**100 %**	

As illustrated in Table 4, the demographic information consisted of three items: role in the field of IT, knowledge in relation to cloud computing, and total years' experience with IT. Most of the participants were in an IT management role with 49.6 percent, 28.8 percent were in systems development/analyst/programmer roles, and 21 percent were in IT as operations/systems administrator/user support roles. This range indicates that most roles of the participants in the field of IT were in management. The results indicated that the highest knowledgeable level, which was "good knowledge", were 238 respondents with 49.6 percent, the knowledgeable level, which was "some knowledge", was 111 respondents with 23.1 percent. These percentages indicated that most of the respondents have considerable knowledge related to cloud computing. The highest number of participants belongs to the years' of experience (2-5 years), including 250 respondents with 52.1 percent, the years' of experience (6-10 years), including 111 respondents with 23.1 percent. These results indicated that most of the respondents have considerable experience related to IT.

3.1.2.3. Study 2 Results

Study 2 findings, confirm that internet connectivity seen as strongly important with more than 80 percent when planning to adopt cloud computing, followed by speed of the Internet with 70 percent. Next, data backup with 65 percent, security with 53 percent, and cost with 50 percent. Integration seen as important with nearly 58 percent, reliability, security, cost all of these factors indicated as important with over 40 percent. Data storage location seen as slightly important with nearly 50 percent, provider dependability with 43 percent, and availability and reliability were closely to 40 percent. Where, data sovereignty seen as neutral with nearly 32 percent, transportability with 30 percent.

- *Internet connectivity*

This research confirmed the findings in the literature review that Internet connectivity is one of the significant factors that required to be consider when organizations planning to adopt cloud computing. Figure 1 illustrates that more than 80 percent of the research participants indicated that Internet connectivity is an important factor that need to be considered in cloud computing adoption process. Regional municipal governments were located in rural and regional locations and do not have the same level of access to Internet as councils in metropolitan area. Internet connectivity in rural and regional areas is limited and expensive.
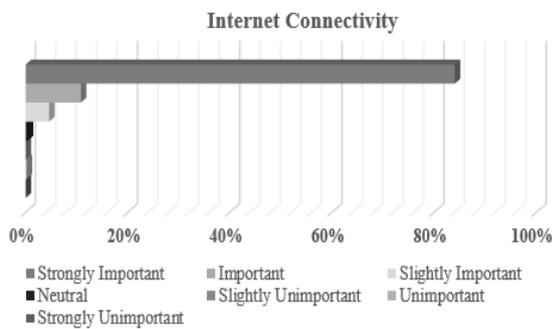
Fig. 1. Internet connectivity

Magele (2005), Internet connectivity was distinguished as the most fundamental issue to be tended to when discussing IT/IS selection. Internet connectivity was characterized as far as certain variables, for example, openness and accessibility that decide the capacity of the web to meet an agreeable level of administration. Any organization wanting cloud must guarantee dependable and stable Internet connectivity (Tweneboah-Koduah 2012).

- *Internet speed*

This research confirmed the findings in the literature review that Internet speed was one of the most significant factors that need to be consider for cloud computing adoption. Figure 2 illustrates that nearly 70 percent of the research participants indicated that Internet speed was an important factor that need to be considered when planning to adopt cloud computing without high speed of the internet the cloud computing was useless.
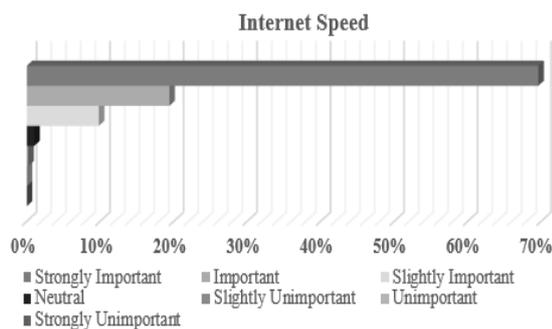
Fig. 2. Internet speed

Cloud computing requires fast broadband (Voorsluys et al. 2011).

- *Availability*

There appears to be a lack of studies that have been conducted to assess availability of cloud computing services. As shown in Figure 3, this research found that around 39 percent of the research participants indicated that availability was a slightly important factor when planning to adopt cloud computing. Where, about 35 percent of the research participants indicated that availability was important factor, nearly 18 percent of the research participants indicated that availability is a strongly important factor when planning to adopt cloud computing. Without the availability required, the advantages that cloud computing promises to provide will not eventuate.
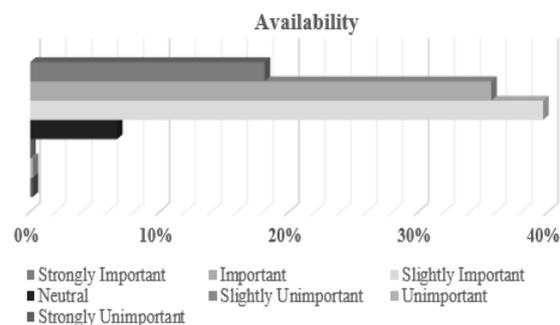

Fig. 3. Availability

Based on Ahuja and Mani (2012), availability alludes to the uptime of a framework, equipment and programming that all things considered give an administration amid its utilization. In fact, there are a few levels where availability can be accomplished. These levels incorporate application level, server farm level, and framework level (Ahuja & Mani 2012). All need that identified with the availability of the administration should be considered while selecting cloud service providers. It was critical to ensure that cloud service providers offer situations that are exceedingly adaptable and high in availability (Ahuja & Mani 2012).

- *Reliability*

There appears to be few studies that have been conducted to assess reliability of cloud computing services. As shown in Figure 4, this research found that around 42 percent of the research participants indicated that reliability was important factor when planning to adopt cloud computing. Thirty-six percent of the research participants indicated that reliability was a slightly important factor, nearly 17 percent of the research participants indicated that reliability was a strongly important factor when planning to adopt cloud computing. Without the availability required, the advantages that cloud computing promises to provide will not eventuate. Cloud computing would not be as effective if the dependability of the

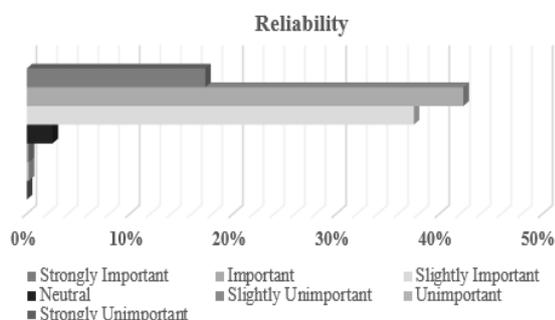connection for cloud computing was not proven and not as strong as it should be.

Fig. 4. Reliability

For business arrangements it is important to the point that cloud service suppliers must be reliable and available to bolster every minute of every day operations (Voorsluys et al. 2011). Distinctive components and prerequisites identified with unwavering quality must be considered while picking a cloud service supplier and the arranged terms must be made part of the service-level agreement (SLA) (Voorsluys et al. 2011).

- *Data storage location*

This research confirmed previous research findings that data storage location is one of the factors that needed to be considered when planning to adopt cloud computing. Figure 5 demonstrates that around 50 percent of the research participants indicated that data storage location was a slightly important factor in cloud computing adoption process. But, nearly 24 percent of the research participants indicated that this factor was important, 20 percent of the research participants indicated that this factor was a strongly important. Participants tend to store their data in-shore because it was just too expensive to ship it else with, and also for some security issues.
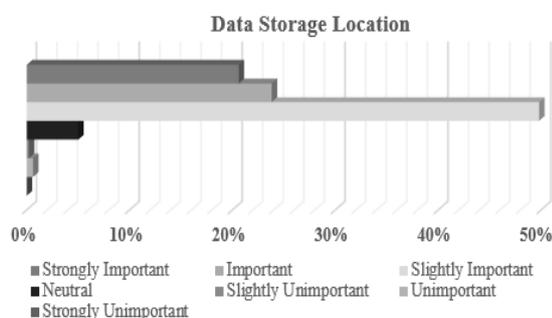

Fig. 5. Data storage location

Cloud computing turns out to be broadly utilized (Jaeger et al. 2008). This incorporate issue of protection, security, interchanges limit, and government observation (Delaney & Vara 2007; Ma 2007). There was an absence of approach identified with the capacity of information in cloud computing (Jaeger et al. 2008).

- *Security*

This research confirmed the findings in the literature that security is one of the significant factors that required to be consider when planning to adopt cloud computing. Figure 6 shows that nearly 53 percent of the research participants indicated that security was a strongly important factor that needs to be considered when planning to adopt cloud computing. Forty percent of the research participants indicated that security was important factor. There are external factors that may negatively affect the storage systems and unauthorized access of data. In some cases it may be advisable to store data within the country and not off-shore.
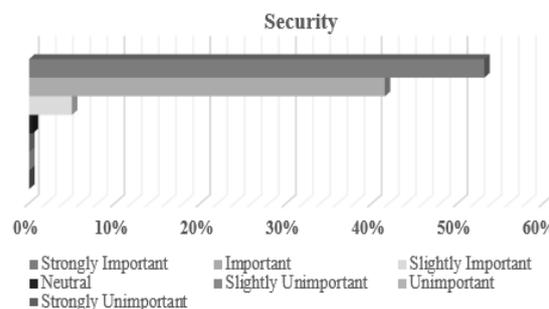

Fig. 6. Security

Governments need to guarantee the security for national information and guarantee accessibility of basic framework (Curran et al. 2011; Joshi et al. 2001; Duffany 2012; Gharehchopogh & Hashemi 2012). Around 63 percent of government CIO had security reservations when underwriting cloud computing. Security concern is a main deterrent to public adoption of cloud computing through Asia Pacific, America, and Europe (Herhalt & Cochrane 2012). Data security risks arising from cloud computing include: (1) data confidentiality because of the convergence of data on a typical cloud base. (2) Loss of control over data by organizations that utilizing cloud services; and (3) manageability of confirmation and transmission stages to information interference (Tweneboah-Koduah et al. 2014).

- *Data sovereignty*

There appears to be a dearth of studies that have been conducted to assess data sovereignty when planning to adopt cloud computing services. As shown in Figure 7, this research found that around 32 percent of the research participants indicated neutral related to data sovereignty, 20 percent that they indicated that data sovereignty was slightly unimportant factor. Where 17 percent indicated that this factor was a strongly important, 12 percent indicated that this factor was important when planning to adopt cloud computing, and that was to make ensure that their data, their rights, and their sovereignty are protected under government laws.
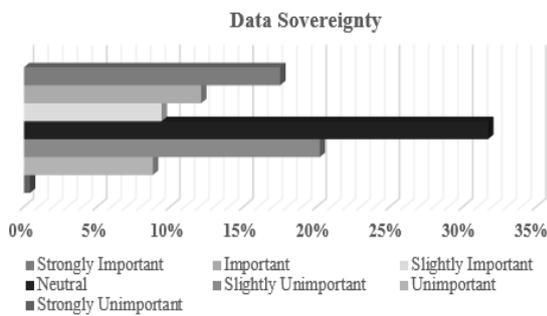

Fig. 7. Data sovereignty

The impact of data storage on national sovereignty effect arises from the fact that many organizations have their storage servers distributed over different countries, and out of reach of their jurisdiction (Tweneboah-Koduah et al. 2014). Whether cloud service providers are provided on or off-shore, an assurance was required by governments that their sovereignty would not be threatened by overriding effect of laws in the jurisdiction of cloud service providers application or data storage (Tweneboah-Koduah et al. 2014).

- *Cost*

This research also confirmed the findings in the literature review that cost was one of the most significant factors that need to be consider when organizations planning to adopt cloud computing services. Figure 8 shows that nearly 50 percent of the research participants indicated that cost was a strongly important factor that need to be considered when planning to adopt cloud computing. 41 percent of the research participants indicated that cost was important factor, and this was due to there were no figures that were available to justify cloud computing as a cost effective solution.
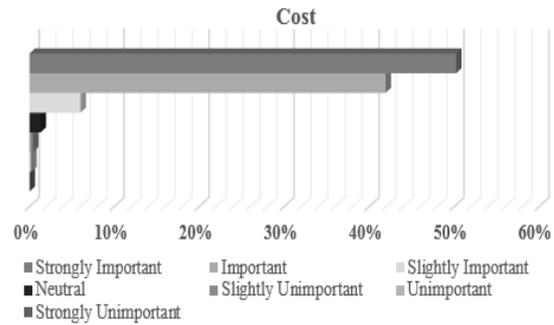

Fig. 8. Cost

Equipment such as hardware and related regulatory costs should be precisely evaluated by organizations to decide how they can remain financially suitable, and plausible (Forell et al. 2011; Li et al. 2009). Such monetary attainability can be surveyed by applying costing models (Dillon 2010; Ramgovind et al. 2010). The organizations that need to actualize cloud computing needs to contrast the expense of exchanging with the cloud rather than remaining focused equipment frameworks (Cardoso & Simões 2012; Greenberg et al. 2009). These costing ought to incorporate cost things identifying with exchanging the remote business perspectives to the cloud, expanding data transmission to build proficiency and guaranteeing practicality (Kim 2009; Assuncao et al. 2009; Kondo et al. 2009).

- *Integration*

Figure 9 illustrates that about 57 percent of the research participants indicated that integration was as important factor when organizations planning to adopt cloud computing. 22 percent indicated that this factor was a strongly important, and this was due to that integration to be a very important factor as the software and other systems would not perform appropriately if the organizations cannot integrate them precisely.
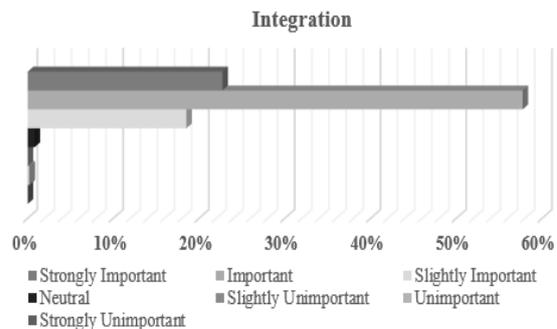

Fig. 9. Integration

Innovation lack of integration is reported to be a barrier (Tweneboah-Koduah et al. 2014; Tripathi & Parihar 2011); Organizations that need to consequently procurement services, manage virtual machine instances, and work with both cloud-based and endeavour based applications utilizing a solitary instrument set that can work crosswise over existing projects and numerous cloud service providers (Brohi & Bamiah 2011).

- *Data backup*

This research confirmed the findings in the literature review that data backup was one of the significant factors that need to be considered when organizations are planning to adopt cloud computing services. Figure 10 shows that 64 percent of the research participants indicated that data backup was a strongly important factor that need to be considered when planning to adopt cloud computing. 28 percent of the research participants indicated that data backup was important factor as well, and this was to make ensure that backup was available to them in case of unexpected and unforeseen issues.
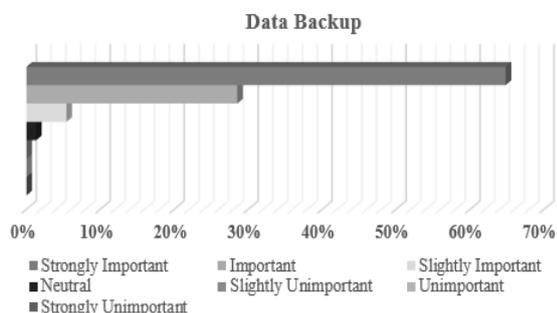
Data Backup

Fig. 10. Data backup

There was not surety of backup of data in cloud computing (Hemant et al. 2011). Recovery of data from cloud was critical for businesses in the case of failure. The cloud service providers may depend on consistent backups to uphold flexibility of their base. Since these backups may be done without the client's consent it could prompt genuine security issues and dangers. One of the top dangers recognized by Cloud Security Alliance (2010) was 'information misfortune or spillage' where records might be erased without a move down of the first substance. From a bigger connection, a record may be unlinked, or the data put away on an inconsistent media could be successfully devastated in the case of a key administration disappointment. It was the sole obligation of cloud service providers to secure data by always backing-up data to guarantee fast recovery.

- *Provider dependability*

There appears to be a lack of studies that have been conducted to assess provider dependability when organizations planning to adopt cloud computing. As shown in Figure 11, this research found that around 43 percent of the research participants indicated that provider dependability as a slightly important factor, 18 percent indicated that provider dependability as important and a strongly important factor when planning to adopt cloud computing. This was due that, there was a risk about the trust that was given to cloud service providers to control over an organization's data. This trust that was given to cloud service providers might result in loss of control over the data.
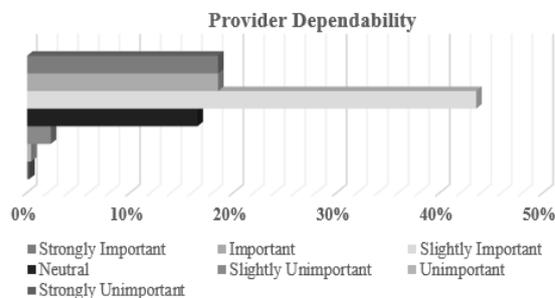
Provider Dependability

Fig. 11. Provider dependability

- *Employees' knowledge*

The finding that related to the employees' knowledge in this study was confirmed the finding that found in the literature review. Figure 12 illustrates that about 38 percent of the research participants indicated that employees' knowledge was an important factor when organizations planning to adopt cloud computing. Where 32 percent indicated that this factor was a slightly important in cloud adoption process. This was to make sure that the employee's knowledge or experience was comparable to known cloud computing environments.
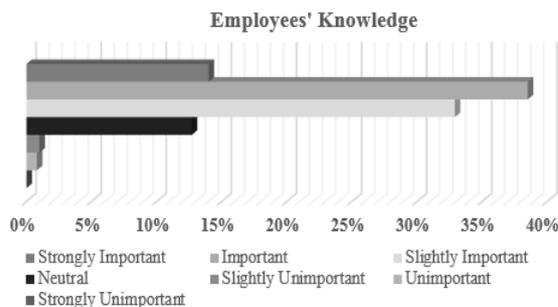
Employees' Knowledge

Fig. 12. Employees' knowledge

The employee's adoption behaviour can be influenced by the aggregated experience of utilizing

new developments (Roger 2003). In the case of cloud computing, , commonality with innovations, for example, virtualisation, cluster computing or utility computing can have an immediate impact upon employee observations in regards to cloud computing services. A few studies have observed related knowledge to be vital in innovation reception choices (Bandura 1977; Igbaria et al. 1995; Kuan & Chau 2001; Lippert & Forman 2005). Thus, related knowledge could be relied upon to assume a facilitative part in the reception choice.

- *Transportability*

The literature review, there appears to be a dearth of studies that have been conducted to assess transportability when organizations planning to adopt cloud computing. As shown in Figure 13, this research found that around 30 percent of the research participants indicated that transportability as neutral factor, 24 percent indicated that transportability as slightly unimportant factor when planning to adopt cloud computing. But, 16 percent of the research participants indicated that transportability as a strongly important factor, 13 percent indicated that this factor was important for the organizations when they plan to adopt cloud computing. This was to make sure that we have the flexibility to recover back our data, in case we decided to move from one cloud service provider to another one or decided to return the data back to our house.
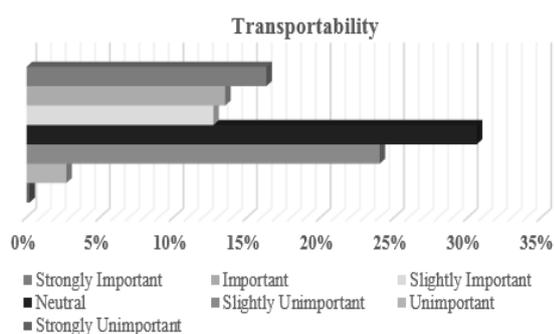

Fig. 13. Transportability

4. Contribution

This research contributes to the ICT technology adoption literature, by studying factors to be considered for cloud computing adoption in regional municipal governments. Looking at regional municipal government's adoption of new information system innovations can help enrich knowledge and understanding of the innovation adoption process in

this era of rapid development of new technologies. Regional municipal governments represent organizations that provide services to the local citizen and the businesses in most economies, and consequently represent an important market segment for software vendors and cloud service providers. Cloud service providers may need to improve their interaction with regional municipal governments who are involved in cloud computing, in an effort to create a healthy environment for cloud computing adoption, and to remove any vagueness surrounding this technology.

The process of adopting these technologies sometimes take time due to the fact that decision makers of the regional municipal governments are not aware about the factors to be considered when planning to adopt these technologies. To have a better understanding and awareness about the factors to be considered when planning to adopt these technologies play a vital role in decision-making processes. It has been explored as a part of this research that IT managers of these regional municipal governments related their late response to the adoption of cloud computing to the lack of better understanding to the factors to be considered in cloud computing adoption. Service providers should develop strategies to promote the factors to be considered for cloud computing adoption process.

Technology consultants and service providers should take necessary actions to mitigate the feelings of uncertainties associated with adoption of cloud computing. Factors such as internet connectivity, internet speed, availability, reliability, cost, security, data storage location, integration, backup, provider dependability, employee knowledge, and transportability are significant concerns when planning to adopt cloud computing in a business. The service provider should be capable of delivering secure and reliable environments in the most accessible, economical, and convincing way. This leads to a supportive environment for the business. Service providers should provide the technical support 24/7 to minimize the concerns of customers on data stored remotely away from their locations.

Other implications for government and policy makers, the growth and development of cloud computing may lead to evaluation of government policies and incentives encouraging the technology adoption in regional municipal governments. Through facilitating considerate of the aspects that affect the adoption and implementation of ICT technologies such as cloud computing. The research results can

underpin a comprehensive understanding of the factors to be considered when planning to adopt cloud computing.

Taking all the above into account, this research presents useful information for organizations, technology consultants and service providers, and governments. This research was viewed as being relevant to the current era of rapid developments of cloud computing technologies.

5. Limitations and Future Research

There has not been much research done on cloud computing in reference to Australia especially the regional municipal governments. Future research could build on this research by investigating the factors that required to be considered for cloud computing adoption in different sectors of the economy and industries. On a geographical dimension, this research was primarily limited to the regional municipal governments in Queensland.

6. Conclusion

Government organizations have begun searching for new alternatives for interfacing with different organizations and additionally nationals. Cloud computing can possibly fundamentally change the parts of IT divisions in business and government sectors as a result of its potential advantages.

In general, this research concentrated on factors to be considered when regional municipal governments planning to adopt cloud services. The main factors to be considered for cloud computing adoption process in Australian regional municipal governments were identified as Internet connectivity, Internet speed, availability, reliability, data storage location, security, data sovereignty, cost, integration, data backup, provider dependability, employees' knowledge, and transportability.

It was clear that this research adds some exact weight to bolster past discoveries. The majority of the research participants referred to the need for better Internet connectivity for more far reaching appropriation in their organizations, others brought up the requirement for better integration. But, other participants saw security issues and highlight the requirement for instructive consciousness of security and directions in different wards in which server farms are facilitated. Some indicated out the need to demonstrate that cloud computing was financially savvy. The discoveries of this research are helpful in giving a superior comprehension of how certain factors impact adoption which may in turn lead to more informed managerial decision making processes regarding adoption of cloud computing service systems.

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