

# ANTICIPATED BENEFITS OF CLOUD COMPUTING ADOPTION IN AUSTRALIAN REGIONAL MUNICIPAL GOVERNMENTS: AN EXPLORATORY STUDY

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## Abstract

*It is expected that computing services will increasingly be accessed as another utility a similar way to other services such as water, electricity, telephone or gas. Many organizations including government deliver their services through information and communication technology (ICT) tools including e-government. Cloud computing is a relatively new way of providing services over the internet. In this research in-depth interviews of Australian councils' IT managers were conducted with the aim of providing insights into the perceived benefits of cloud computing adoption. The research indicated that cloud computing is seen to offer the many benefits that are identified in the research literature; additional anticipated benefits emerged which related to reduced level of risk, remote access, reduce staff, and saving time.*

*Keywords: Cloud computing, anticipated benefits, adoption, e-government, local councils.*

# 1 INTRODUCTION

The implementation of information and communication technology (ICTs) strategies, such as electronic services, by organizations has allowed them to benefit both economically and competitively (DTI 2004; Pan & Jang 2008; Sultan 2010). Governments in particular are increasingly delivering their services electronically through electronic government systems (e-government) (Pyke 2009; Tuncay 2010). This simplifies the interaction between people and government organizations (Jansen 2005); and offers reliability, affordability and ease of maintenance (Janssen 2005; Smitha et al. 2012).

An efficient application of e-government is possible through cloud computing (Goscinski & Brock 2010; Tuncay 2010). It can save on the overall costs and is a novel method of providing services over the internet (Armbrush et al. 2010; Dillon et al. 2010; Leavitt 2009; Leimeister et al. 2010; Lyer & Henderson 2010; Salleh et al. 2012; Zhang et al. 2010). Several benefits are provided by cloud based e-government in the form of cost reductions, enhanced storage, security management, scalability and accountability (Hayes 2008; Mell & Grance 2009). Cloud computing may be the main way organization will manage information processing in the future (Grossman 2009; Marston et al. 2011; Melvin & Greer 2009; West 2011).

Research about the use of cloud computing in the public sector in general is limited (Janssen & John 2011). Some previous researchers have studied the benefits of cloud computing in a relation to the cost (Buyya et al. 2008; Buyya et al. 2009; Kondo et al. 2009), green technology (Baliga 2010; Marston et al. 2011; Tripathi & Parihar 2011; Zhang et al. 2010), infrastructure (Das et al. 2011; Lenart 2011; Marston et al. 2011). There is a lack of exploratory studies that provide an in-depth and holistic investigation of all the actual and anticipated benefits of adopting cloud computing (Low et al. 2011; Misra & Mondal 2011). That is, we could not find any studies that listed all benefits and explained why and how they are benefits.

Despite its potential benefits the adoption rate of cloud computing in regional municipal government sectors in Australia has been lower compared to urban areas (IT Industry Innovation Council 2011). The paucity of empirical studies about anticipated benefits of cloud computing adoption in Australian regional municipal governments has hindered understanding and thus strategy development to improve its adoption (IT Industry Innovation Council 2011). This situation has prompted regional municipal governments to request further research to guide their cloud adoption and implementation decisions (Department of Innovation Industry Science and Research 2011). The current gap in the literature has led us to the following research problem: What are the actual benefits of adopting cloud computing to Australian e-government organizations.

The paper is structured as follows: first, we provide an overview of cloud computing and e-government system based on the extant literature. Next we explain the methodology used to collect data for this research. This section involved in-depth interviews with IT managers in Australian local governments. Then we outline the findings and discussion of the research data. We conclude this paper with a research limitations and future research; and conclusion.

## 2 CLOUD AND E-GOVERNMENT SYSTEM

A broad and beneficial perspective into the computing world is provided by the various computing paradigms such as, cluster computing, grid computing and cloud computing (Armbrust et al. 2010; Buyya et al. 2009). Cloud computing involves computing resource services, software applications of distributed systems and data storage that provides a diversion from the usual paradigms (Armbrust et al. 2010). A new and evolving paradigm is provided by the cloud based e-government for the distributed computing of e-government applications that use services as the core for the flexible networks to integrate applications within and across government borders (Liang et al. 2011; Saeed et al. 2011; Zhang & Pi 2014).

Cloud computing poses certain technical, and social challenges for e-government systems. Technical challenges include interoperability issues between existing IT infrastructure and cloud computing

(Hofmann & Woods 2010; Kim 2009). Security issues relate to the protection of data from unauthorized access, and privacy (Ali & Soar 2014; Paquette et al. 2010; Subashini & Kavitha 2011). Trust issues related to the lack of customer trust and weak trust relationships (Tweney & Crane 2007; Pearson & Benameur 2010). Social challenges including a lack of technical knowledge by the government organizations and the client (Paquette et al. 2010).

By contrast, cloud computing offers several benefits to e-government (Ali et al. 2014; Smitha et al. 2012), some of these benefits are as:

*Protection, care and technical support.* The service providers of cloud computing provide access to applications and data services. The uniqueness of cloud system pertaining to e-government services is that the system is efficient enough to sort out problems particularly for government departments outside of urban areas where recruitment of IT staff is more difficult (Cellary & Strykowski 2006). Cloud service providers are accountable for upgrading software and providing technical assistance (Ali et al. 2014; Beaubouef 2011). Cloud technology, makes it easier to upgrade software applications, located in a single system (Cellary & Strykowski 2009; Marks & Lozano 2010; Rajkumar et al. 2011; Staten 2011). This further leads to minimize the total cost (Cellary & Strykowski 2009; Hashemi et al. 2013; Rastogi 2010; Tripathi & Parihar 2011).

*Disaster recovery.* A disaster recovery system is essential, a government can maintain a back-up of the server using a cloud system for the disaster recovery on a day-to-day basis and can store it off-site through implementing a third party storage service provider that holds the ability to store in a different location (Hashemi et al. 2013). Disaster recuperations schemes in cloud systems is a better choice compared to traditional disaster recuperation programmes because it can restore data in a more prompt and swift manner (Ali et al. 2015; Rajkumar et al. 2011; Singh 2010); and because this swift recovery reduces the cost of the operation (Staten 2011).

*Old technologies and migrating to new technologies.* Some of the functions of data centres for e-government include the ability to implement diverse versions of the software, programs and security packages (Aveek & Rahman 2011). But changing an out-dated technology to a highly sophisticated one has traditionally been a complicated task (Pokharel & Park 2009). By contrast, cloud computing does not require upgrading from one version to another because multiple versions of the software can be operated simultaneously. This system can therefore offer greater flexibility and efficiency for e-government (Aveek & Rahman 2011; Cellary & Strykowski 2009; Pokharel & Park 2009; Sharma et al. 2012).

*Policies management.* E-government applications need to be in compliance with governmental policies (Aveek & Rahman 2011; Pokharel & Park 2009). In order to increase efficiency in daily performance, these policies need to be implemented in unison with the infrastructure and data centres (Hashemi et al. 2013). Cloud architectures can assist with compliance with policy in data centres (Clemons & Chen 2011; Hashemi et al. 2013; Pokharel & Park 2009; Tripathi & Parihar 2011). Security-oriented policies can be installed in applications which can be designed and executed in the data centre (Clemons & Chen 2011; Tripathi & Parihar 2011).

*Promoting business development.* Benefits can be obtained from cloud computing in order to improve businesses by lowering the overall cost of investment in ICT infrastructure (Lenart 2011; Pokharel & Park 2009; Salleh et al. 2012). Cloud computing allows users to undertake computations, obtain software applications, and provide data access and storage to end-users without the need to know the physical location and configuration of the system that delivers the services (Bakshi & Hemachandran 2011). Many other benefits of cloud computing have been outlined in different studies such as; simplified cost and consumption model, faster provisioning of systems and applications, right size to address business changes, ease of integration, highly secure infrastructure, and compliant facilities and processes (Bakshi & Hemachandran 2011).

*Reduced IT infrastructure cost:* One of the major benefits that businesses are expecting from using cloud services is cost saving (Ali et al. 2014, 2015; Lenart 2011; Miller 2008; Salleh et al. 2012). This financial

benefit is expected mainly because of the usage-based pricing model. Start-up organizations can use cloud services to help them to decrease their capital expenses and hurdles to entry (Grossman & Gu 2009). Cloud computing provides almost direct access to shared computing resources and small and start-up businesses can launch new operations quickly with little to no upfront capital investment; this will assist with a faster time to market in many businesses (Lanman et al. 2011; Marston et al. 2011). Using software from the cloud will lead to a reasonable reduction in systems maintenance and updating requirements (West 2011). Clients will be able to reduce software updating and maintenance costs, by having most of the IT software, operations and functions undertaken by a third party.

*Ease of use and flexibility.* The interfaces of cloud applications use browser web based applications or windows based applications. Both interfaces tend to be intuitive and easy to use (Melvin & Greer 2009). Most cloud computing suppliers offer more flexible contract terms, which encourages firms to implement cloud services as needed to expand their businesses (Leavitt 2009). In addition to these significant characteristics of cloud computing, there is the portability and accessibility feature, as the Internet is considered the backbone of the utilization idea, through which computing services are provided for clients through an active Internet connection. On-demand access to any application can be at any time from any location, provided the client has network access (Lanman et al. 2011). This can assist small businesses, which have a wide market and broad horizontal company operations, such as regional or international, to decrease external costs and make them less location dependent. Unfortunately, perceived complexity hinders adoption and realisation of benefits.

### 3 DATA COLLECTION AND ANALYSIS

This research is exploratory in nature, seeking to provide a qualitative overview of the concepts relating to anticipated benefits of cloud computing adoption, and in consultation with Australian regional municipal governments. This research was intended to explore the significant anticipated benefits of the adoption of cloud computing. A series of in-depth interviews were conducted between May 13, 2014 and August 12, 2014. These obtained inputs from 21 participants at top management levels: IT Manager (7); IT Coordinator (4); Technical Director (2); Information Service Manager (2); IT Officer (1); IT Consultant (1); IT Network Manager (1); Chief Information Officer (1); Enterprise Architecture Manager (1); and Team Leader ICT Operation (1). These were selected on the assumption that they represent a key stakeholder group likely to be responsible for planning and adoption of cloud computing for regional municipal governments.

The sample reflects the geographical spread and size classifications of regional municipal governments throughout Queensland (Coastal – 29%; Resource – 14%; Indigenous – 10%; Rural/Remote – 29%; South East Queensland – 18%) (See Table 1).

Segments	Size classification					Total	%
	Extra small	Small	Medium	Large	Very large		
Coastal	0	1	2	2	1	6	29%
Resource	0	1	0	2	0	3	14%
Indigenous	0	2	0	0	0	2	10%
Rural/Remote	1	1	2	1	1	6	29%
South East Queensland	0	0	1	1	2	4	18%
Total						21	100%

Table 1. Size classification

To improve the reliability of this research Kirsch's (2004) model was followed; this model defines a set of procedures: Firstly, identify and select the research issues. Secondly, determine who to interview. Finally, how the interviews were to be conducted.

The interview protocol was developed based on the literature. This protocol was used to guide the interview process. 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 chat

(Gaskell 2000). Ethical clearance was obtained through University of Southern Queensland (USQ). Each interview was structured around four questions, with the interviewers asking probing questions based on responses. The questions required the participants to first describe their role IT/IS. Then, they were asked to describe their background, experience and knowledge in relation to cloud computing. The third section comprised a question about the length of time that they been involved with cloud computing projects and in what capacity. Next, they were asked to describe the impact of the adoption of cloud computing in regional municipal governments. Finally, they were asked to describe the significant anticipated benefits of the adoption of cloud computing in Australian regional municipal governments.

The interviews lasted between 30 and 50 minutes. The interview questions were designed as largely open questions to encourage the interviewees to provide answers that revealed their attitudes and perceptions relating to the research topic (Carson et al. 2001). Altogether, 24 interviews were carried out with IT managers of the chosen councils. The research reached the saturation level within the interview number 18, when the researcher notice that, there is 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 (refer to table 1). About 21 interviews were take a part in the analysis process, and the other 3 interviews excluded from the analysis process because it was discovered during the interview that these 3 IT managers did not coming from an IT background and did have not any experience or knowledge in relation to cloud computing.

The interviews data was analysed using manual content analysis method (Miles & Huberman 1984), and using Leximancer. Manual content analysis was undertaken as a first step in the analysis which included three concurrent flows of activities: data reduction, data display and conclusion drawing/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 organised assembly of information to permit the researcher to draw conclusions and taken actions (Miles & Huberman 1984). Once manual coding was completed, the data was then reanalysed using Leximancer to improve the reliability of the findings (Middleton et al. 2011; Smith & Humphreys 2006).

Leximancer is a data mining tool that can be used to analyse the content of collections of textual documents and to visually display the extracted information (Smith 2003). It uses ontological relativity and dynamics to assemble bits of information to structure and evaluate concepts (Cummings & Daellenbach 2009). Words are combined to form concepts (thematic analysis) and identify relationships (semantic analysis) between concepts. A 'concept map' displays the main concepts in the text data, depicting the relationships through visual summaries of concepts and their co-occurrences – similar to a mind map (Cummings & Daellenbach 2009). Combined use of both manual and software analytical approaches provided a robust basis for clearly delineating concepts, themes and aggregate dimensions (Middleton et al. 2011; Smith & Humphreys 2006).

## **4 FINDINGS AND DISCUSSION**

### **4.1 Anticipated Benefits of Cloud Computing Adoption**

The main important benefits as identified by the participants based on their knowledge and experience as IT managers is presented in Figure (1). Each of these benefits will be discussed next.

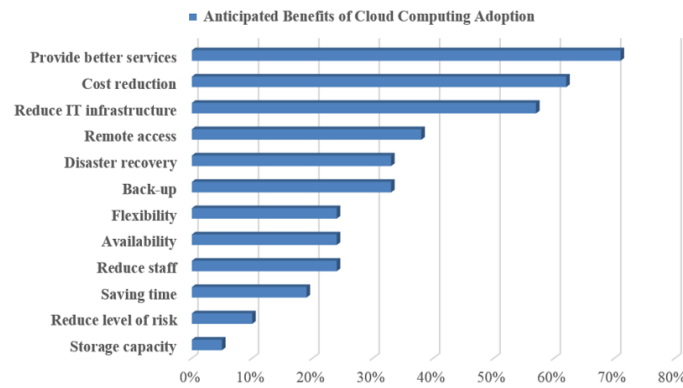


Figure 1. Anticipated benefits of cloud computing adoption

#### 4.1.1 Provide Better Services

Cloud computing and its benefits have attracted strong interest amongst various public sector organizations (Saeed et al. 2011). Through employing cloud computing, government organizations and various public authorities can focus more on their core objectives of their business, instead of contemplating on the IT resource provision and maintaining the IT tasks (Saeed et al. 2011). By enabling government organizations services online the organization can improve the quality of service in subject to be timelier, richer in content and with greater availability (Al-Khouri 2011; Goel et al. 2012; Hashemi et al. 2013; Rastogi 2010; Sharma et al. 2012).

This research found that providing better services to e-government stakeholders was the most cited benefit given by interviewees. Approximately 71 per cent (15/21) of the sample population perceived this benefit. Three main benefits were given: reduced risks for the organizations; having access to data anytime and anywhere; and better management of services. The first benefit of reduced risk referred to improved data protection for the clients upon transition to the cloud model. The following quotes illustrate this benefit: *“the benefits of cloud computing to the community directly is all about having a low risk with the data of the council and we are safe on the cloud base technology”* (C18-URS). Next participants pointed out that better service indicates that the staff and client may access their data and information anytime and anywhere: *“one of the greatest benefits of cloud computing is the ability to access your data from anywhere and generally speaking in different devices as well”* (C21-RTX). Finally, an overall enhanced service and management of data is promised and foreseen by the IT managers given that the benefits of the cloud model will be maximized by the organizations and providers: *“we get the benefit of regular maintenance and update so you do not have an aging solution, maintaining currency can be an issue for council with the upgrades. And we suffer the service solution that all happens in the background of the main equipment. So that might be a benefit with the intensive functionality connected them previously”* (C52-UFM).

#### 4.1.2 Cost Reduction

The interest in cloud computing derives from the anticipated benefits (LGAQ 2013), it offers low starting expenses (Saeed et al. 2011; Saini et al. 2011; Jain & Bhardwaj 2010; Miller 2008). This financial benefit is expected mainly because of the usage-based pricing model. Start-up organizations in particular can use to help them to decrease their capital expenses and any hurdles to entry (Grossman & Gu 2009). Cloud computing provides almost direct access to shared computing resources and small and start-up businesses can launch new operations quickly with little to no upfront capital investment; this will assist with a faster time to market in many businesses (Lanman et al. 2011; Marston et al. 2011). Using software from the cloud will lead to a reasonable reduction in systems maintenance and updating requirements (West 2011).

Interviewees cited cost reduction to the organizations as another benefit, especially once the cloud model has been perfected and maximized. Around 62 per cent (13/21) of the sample population stated this advantage. Participants stated that cost reductions on operations by using cloud computing is anticipated *“the major benefits to move to a cloud is, obviously, is going to be cost savings because you do not have*

to invest in big data centres, in any infrastructure, in the people to maintain that infrastructure or support the infrastructure and maintain the infrastructure, well like upgrading and depreciating” (C34-UFV). They believe that cloud computing will bring a reduced use of physical hardware system which will save a large portion of the financial resources for the organizations. Overall, participants had very similar views on how organizations will benefit by saving costs and managing their finances, which ensures productivity and sustainability in the long run “*I would afford that the anticipated benefits would have been cost reductions. Cost reduction on providing those services. It will be cost saving of everything, support, hardware, software, the title cost effective taking into consideration*” (C11-RAV).

#### 4.1.3 Reduce IT Infrastructure

There are several advantages and benefits in cloud computing and one of the prime advantages of this advanced computing system, particularly with regard to government organizations services in which cloud computing plays a significant role in minimizing the IT infrastructure (Das et al. 2011). In other word, there is no other IT financing is needed in case of infrastructure, programming and support resources advancement (Beaubouef 2011; Sperling 2010).

This research showed that the reduction in IT infrastructures by the organizations is one of the significant benefit of the adoption of cloud computing. This particular benefit is greatly connected to the reduced costs as discussed in the previous point “*the major benefits to move to a cloud is, obviously, is going to be cost savings because you do not have to invest in big data centres or in any infrastructure*” (C34-UFV). About 57 per cent (12/21) of the sample population believed that one advantage would be the decreased utilization of IT infrastructure: “*the best benefits of adopting cloud computing in the organization is reduce IT infrastructure*” (C72-URS). “*If there were proper communication, then lesser needs for local infrastructure. No expensive service, local signs or back-ups; everything be done from the cloud. That would be an advantage*” (C74-RTM).

#### 4.1.4 Remote Access

One new finding that was not covered in the literature concerned remote access. This research found that the ability for remote access was identified as new important benefit that emerged upon the adoption of cloud computing. Approximately 38 per cent (8/21) of the sample population identified remote access as anticipated benefit. The participants shared that by utilizing cloud computing, organizations will then have access to the remote and rural areas which can in turn into greater advantages especially having a larger audience reach “*if you got the ability and some of small areas have this it is one major link in connection to the Internet so if one take out and then loss the connectivity to the Internet, become single point failure, so you are not able to run your business*” (C61-URM). The participants noticed around the ability to move the requirement for supporting the backend infrastructure that is required of some systems out of the regional area and having that been able to be supported data centre in the major cities, where is the support maintenance around that staff is a part of agreement. There is less in local skills, where there is a shortage of those skills within regional and rural areas, for them to be able to support “*I guess one of the benefits is that to try and get the level of skilled IT workforce in remote and rural areas is significantly harder to get than in a capital city so I can see that there would be a benefit of cloud computing to leverage off those issues with getting those skilled workers to those regions*” (C28-URS).

#### 4.1.5 Disaster Recovery and Back-up

Disaster recovery provisions are essential for the endurance and long-term existence of many firms to make sure whether they hold the capability to survive at the proceedings caused by their IT infrastructure. Disaster recuperations schemes in cloud systems provide more choices when compared to traditional disaster recuperation programme in order to restore the data in a prompt and swift manner (Rajkumar et al. 2011). With regard to this recovery type, the overall cost can be reduced and consumes less time (Staten 2011). Government can maintain a back-up of the server through employing cloud system as an efficient back-up for the disaster recovery on a day-to-day basis and can store it off-site through implementing a third party storage service provider that holds the ability to store in a different location (Hashemi et al. 2013).

This research confirms that disaster recovery and back-up is emerged as an important benefits of the adoption of cloud computing. Approximately 33 per cent (7/21) of the sample population believed disaster recovery and back-up will be a positive effect of cloud computing. Based on their responses, disaster recovery and back-up entails to the ability of cloud computing to function despite the unexpected issues and problems that may arise along the way *“it would be beneficial for disaster recovery especially given the distance from any form of support especially if our roads and other mode of transport are being cut off for long periods of time especially with the flooding this way can be cut off for a fair while”* (C19-RTL). Having proper data back-up can provide a quick recovery in unexpected cases and times *“the ability of vendor to be able to look after the security side for things such as back-up from disaster recovery from rural and regional area. Back to the supplier, who would carry them out and as a part of the agreement, we need to make sure that they have proper disaster recovery mechanism in place as far as back-up and restore”* (C61-URM).

#### 4.1.6 Flexibility and Availability

Perceived complexity of the technology seriously hinders the increase in adoption rates and user satisfaction. Cloud computing, the operating interfaces of cloud applications look like browser web based applications or windows based applications. Both interfaces tend to be intuitive and easy to use (Melvin & Greer 2009). Most cloud computing suppliers offer more flexible contract terms, which encourages firms to implement cloud services as needed to expand their businesses (Leavitt 2009). In addition to these significant characteristics of cloud computing, there is the portability and accessibility feature, as the Internet is considered the backbone of the utilization idea, through which computing services are provided for clients through an active Internet connection. On-demand access to any application can be at any time from any location, provided the client has network access (Lanman et al. 2011). This can assist small businesses, which have a wide market and broad horizontal company operations, such as regional or international, to decrease external costs and make them less location dependent.

This research confirm that the concept of flexibility was emerged as an important benefits for the adoption of cloud computing. Approximately 24 per cent (5/21) of the sample population stated this benefit. Flexibility was touched in the first major benefit founded by the researcher where in the stakeholders are given the opportunity to access their data anytime and anywhere. The participants shared: *“one of the greatest benefits of any cloud computing is the ability to access your data from anywhere and generally speaking in different devices as well, so that you might be able to view something on a different device such as mobile phone and to be able to present, to perhaps you are away on at conferences or something like it, wanting to present something when you can access, you do not have to be logged in to the local server. You have got access anywhere and multiple people being able to share and work on the same documents for example. It gives you more flexibility in what you are doing”* (C21-RTX).

Another connected benefit to flexibility is the availability of data. This research confirmed that the concept of availability was emerged as an important benefits for the adoption of cloud computing. Approximately 24 per cent (5/21) of the sample population also stated this benefit. Similar to flexibility participants believe that the cloud model can provide an ease of use for the stakeholders once cloud computing has been adopted. The participants who indicated this benefit shared that: *“availability, it can be improved by having a probably architected and redundancy solutions and possibly speed too”* (C39-URM).

#### 4.1.7 Reduce Staff

According to study by West (2011) one of the most important benefits of the adoption of cloud computing is reduce IT infrastructure. As a result of reduce IT infrastructure most of the IT software, operations and functions done by a third party. There will be fewer in-house IT staff and lower costs. On the other hand, some studies found that cloud computing does not remove the necessity for IT branch staff, on the grounds that clients still oblige access to the Internet and application configuration. Cloud computing permits IT administrator to focus on core business functions. As with any ICT operation,



potential cloud computing adopters must be vigilant in testing their IT foundation and operations (Castellina 2011; Lenart 2011).

This research strongly confirm additional benefit of cloud computing would be staff reduction. Around 24 per cent (5/21) of the sample population anticipated this advantage. The participants who stated this shared that: *“the other benefits would be that you would not need certain specialized people internally as in, possibly, database administrators, possibly network administrators. That could possibly reduce some costly”* (C11-RAV). The employment of reduced staff which may bring other advantages such as an organized management, cost reductions, and more. The adoption of cloud computing indicates that a reduced use of specialized people to maintain the organization is needed since cloud computing will then do much of the work upon adoption and transfer of data and information *“the major benefits to move to a cloud is, obviously, is going to be cost savings because you do not have to invest in big data centres, infrastructure, and people to maintain that infrastructure or support the infrastructure and maintain the infrastructure, well like upgrading and depreciating”* (C34-UFV).

#### 4.1.8 Saving Time

Another new finding that was not covered in the literature was the saving of time. This research found that saving time is new important benefit that emerged upon the adoption of cloud computing. Approximately 19 per cent (4/21) of the sample population anticipated this benefit. They shared *“all the benefits come around being able to entering and use the software as a service and infrastructure as a service, that quick response bring the system quickly without spending much time or wait for service to arrive and installation of the processes”* (C61-URM). Time efficiency and management is also anticipated by the IT managers. With cloud computing all data and information is then stored in one or organized sets of location therefore time market will be a lot quicker and more effective *“the other big benefit is the time it takes to actually provision the servicing and get the actual system up and going. Because it is already set up in the cloud, you do not have to permit that in your own infrastructure, all you have to do really is put your data in there, you migrate your data in there and then train sort of chained management, so you actually do not have to do all the technology implementation side of it. So the time to market is a lot quicker”* (C34-UFV).

#### 4.1.9 Reduce the Level of Risk

Another new finding that was not covered in the literature was reduce the level of risk. This research found that reduce the level of risk is new important benefit that emerged upon the adoption of cloud computing. Approximately 10 per cent (2/21) of the sample population stated that cloud computing can indicate a reduced level of risk. This can take effect as heightened protection and security is also expected once the cloud model works effectively for the organization and the stakeholders *“basically, by moving stuff in the cloud, the biggest benefit by far is that there is reduced...or the risk is moved away from council in that we do not have to deal with the risk as such”* (C15-RAL).

#### 4.1.10 Storage Capacity

Capacity includes increased computing power, improved performance, unlimited storage capacity, increased data safety, and fewer maintenance issues (Miller 2008). Many organizations fully utilise less than half of their total ICT resource capacity (Leavitt 2009) and most computing suppliers try to focus on the idea of offering computing services to their clients where they can scale up their capacity on demand (Grossman & Gu 2009). Whenever the client needs additional computing resources such as storage space, the provider can simply increase the provision accordingly in order to handle the increased business needs.

This research confirm that the concept of storage capacity was emerged as an important benefits for the adoption of cloud computing. Only 5 per cent (1/21) of the sample population anticipated this benefit. Due the increase of the amount of the data, storage capacity become a problem of most of the organizations *“the amount of data that we generate now, storage is becoming a problem and cloud computing obviously can relieve that and relieve council of the financial burden to provide that”* (C25-RTM).

## 4.2 Comparative Analysis of Anticipated Benefits of Cloud Computing Adoption

As stated in the methodology, the interview data was reanalysed using Leximancer to enhance the reliability of the findings from the manual content analysis (Middleton et al. 2011; Smith & Humphreys 2006). The first step it focused on the wide range of business-related words used by the respondents and identified from the exploratory Leximancer analysis. The second step for analysing the data was to examine the thematic groupings. Leximancer uses a natural language processing algorithm, so the theme is titled by the concept with highest prominence in the thematic aggregation. In this analysis, Leximancer clustered the concepts into six themes (cloud, benefits, data, hardware, need, moment), each theme aggregating two or more concepts and represented by labelled circles as they have been illustrated in Figure (2). Figure (2) illustrates the IT managers' views of anticipated benefits of the adoption of cloud computing in regional municipal governments. This figure depicts the central theme within the map was 'cloud', and being strongly linked to the themes benefits, data, and hardware. The dominate theme cloud has strong associations with most other concepts on the map. Cloud is multifaceted in its use: relating to infrastructure, services, cost, systems, ability, rural regional, people, time, computing, and community. The concepts community, computing, benefits, cost, service, and infrastructure are shown to be frequently occurring and strongly connected to the theme cloud. Other themes illustrated but not connected to the theme 'cloud' include 'need' and 'moment'. The centrality of this theme provides a starting point for the research analysis.

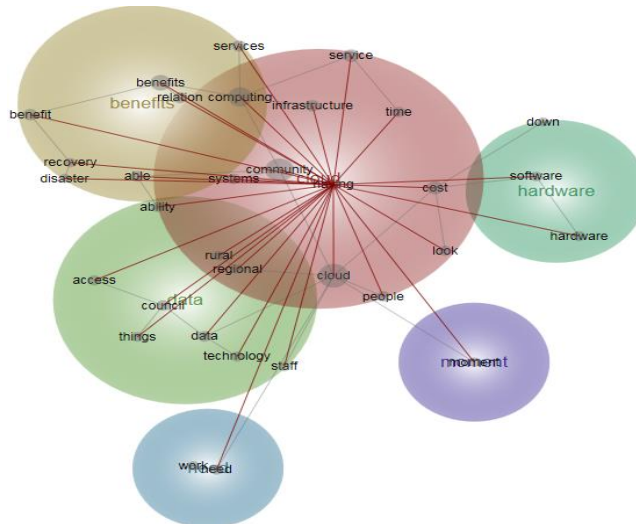


Figure 2. Benefits key concepts map

Each concept from the previously discussed concept map has been depicted in a bar chart as shown in Figure (3). It was demonstrated by the IT managers that the top six ranking concepts were community, computing, benefits, cost, service, and infrastructure.

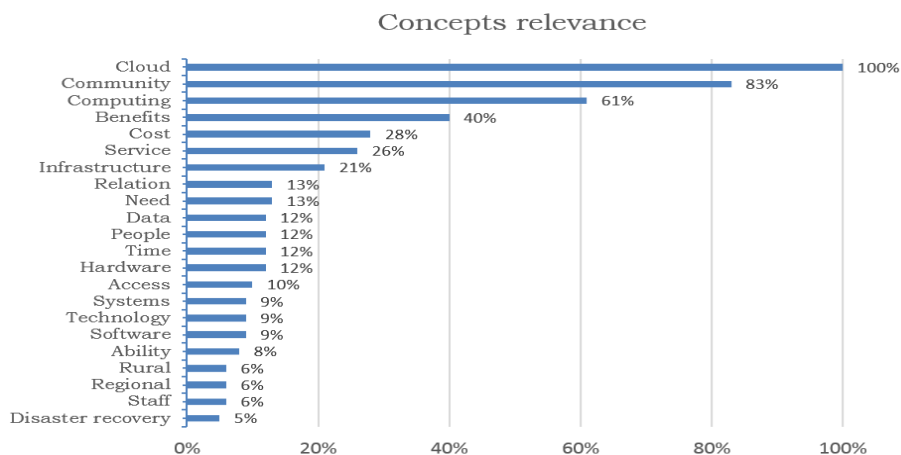


Figure 3. Concepts relevance

Because this research concentrated to find out the anticipated benefits of the adoption of cloud computing in the regional and municipal governments, the theme ‘benefits’ which contains the concept ‘benefit’ links strongly to the findings within the manual content analysis that suggested that IT managers saw cloud computing as having anticipated benefits on their organizations (See Figure 4).

The concept ‘benefit’ and it’s linkages on the concept map, through the analysis, have been illustrated through Figure (4). This concept is linked to all other concepts on the map. These linkages are to be expected with ‘benefit’ being the top ranking concept. The strongest linkages shown in Figure (4) are: (a) between *benefit* and *service*, (b) between *benefit* and *cost*, (c) between *benefit* and *disaster recovery*, (d) between *benefit* and *time*, (e) between *benefit* and *infrastructure*. These strengths are expected due to the focus of the research study and the qualitative questions asked, which were related to the anticipated benefits of cloud computing adoption.

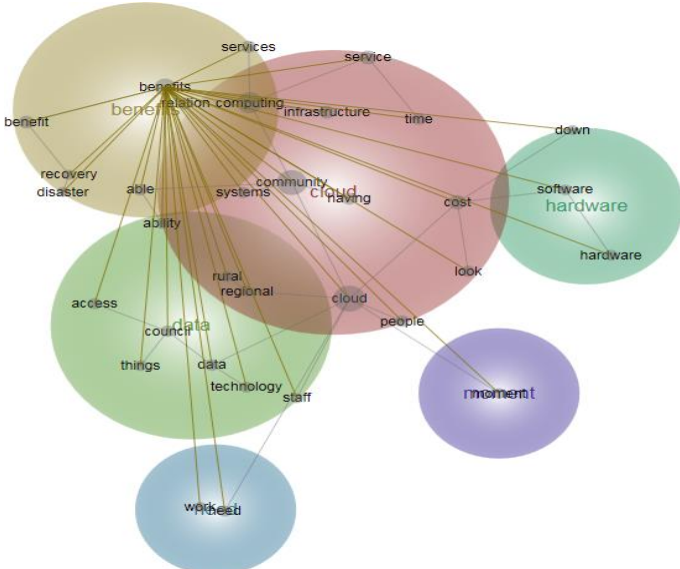


Figure 4: Benefits and related linkages

When discussing the concept ‘benefit’ the IT managers were referring to the benefits of cost, infrastructure, services, disaster recovery, ability, staff, time, rural regional, hardware, systems, software, and councils. In relation to the mentioned concepts Table (2) illustrate the representative quotes of each concept.

Leximancer-derived concepts	Representative quotes	Themes
Cost	“The major benefits to move to a cloud is going to be cost savings because you do not have to invest in big data centres, in any infrastructure, in the people to maintain that infrastructure or support the infrastructure”	Cloud
Infrastructure	“I supposed the primary one it would be the reduction in the requirement for local infrastructure”	Infrastructure
Services	“The ability to access services online. It would be one of the great benefits to the community”	Benefits
Disaster recovery	“It would be beneficial for disaster recovery especially given the distance from any form of support especially if our roads and other mode of transport are being cut off for long periods of time especially with the flooding this way can be cut off for a fair while”	Benefits
Ability	“One of the greatest benefits of any cloud computing is the ability to access your data from anywhere and generally speaking in different devices as well”	Data
Staff	“The other benefits would be that you would not need certain specialized people internally as in, possibly, database administrators, possibly network administrators. That could possibly reduce some costly”	Data

Time	“Whereas operating the expenditure is probably more accessible at times. The other big benefit too is the time it takes to actually provision the servicing and get the actual system up and going”	Cloud
Rural areas	“One of the benefits is that to try and get the level of skilled IT workforce in remote and rural areas is significantly harder to get than in a capital city. We can see that there would be a benefit of cloud computing to leverage off those issues with getting those skilled workers to those regions”	Data
Hardware	“We are no longer responsible to maintain or to pay for support into the hardware. But for software, there are still a lot of requirements”	Hardware
Systems	“According to the benefits of cloud computing generally, small businesses have been able to utilize some of the features and functions around there. The small businesses can use online accounting systems such as; office 365, mail services, rather than having to run their own local mail service”	Cloud
Software	“All the benefits come around being able to entering and use the software as a service and infrastructure as a service, that quick response bring the system quickly without spending much time or wait for service to arrive and insulation of the processes”	Hardware
Council	“They can focus on the business of running a rural council rather than focus on the business of trying to run computer systems in a rural council”	Data

*Table 2: Anticipated benefits concepts and themes*

Through the analysis of the data it is clear that in the discussion of benefits a number of aspects are addressed by IT managers. These aspects include benefits of cost, infrastructure, services, disaster recovery, ability, staff, time, rural, regional, hardware, systems, software, and councils. After having a comparison between the results from Leximancer and the manual analysis, it was found by the researchers that both the methods gave the same result in a relation to the anticipated benefits of the adoption of cloud computing in regional municipal governments.

Currently, industries such as financial services and healthcare are more likely to adopt cloud computing model as compared to manufacturing companies (Castellina 2011). Despite its' low adoption rate, but the interest for cloud computing especially the cloud computing as service model is gaining ground and has grown steadily amongst the small and medium size organizations (Lenart 2011; Saeed et al. 2011). Cloud computing is a revolutionary change ideal for innovative organizations, especially for new start-up that could not afford expensive IT systems. The significant difference between cloud computing and the other previous technology platforms that have tried to commoditize computing is users accessing services through the cloud from cloud computing provider only for the components relevant to their business, and it could be bought on a pay-and-go basis. As compared to large enterprises, small and medium enterprises (SME) normally operate in limited IT budgets. In light of that, cloud computing appears as an attractive option to SME in solving the problems of high investments in IT infrastructures and IT resources.

Cloud computing adoption is likely to prove commercially viable for many rural SMEs due to its flexibility and pay-as-you-go cost structure, particularly in the current climate of economic difficulties. Cloud computing adoption, empower rural SMEs to move large parts of their business IT from their premises into the cloud, offering them efficient, flexible and scalable processing power and functionality on a per use cost basis. Besides that, cloud based services reduce on premise costs in terms of software up gradation and licensing costs. In general, rural SMEs benefit the most from cloud computing due to the lower start-up costs. It appears that the use of cloud computing has positive consequences both financially and operationally to rural SMEs.

Large organizations can still benefit from utilizing some of the core technological components of the cloud computing. There are significant cost savings that can be realized by virtualizing end user computing, server storage, and network operations, so large organization can learn from the best practices to achieve significantly higher server utilization rates and lower total cost of ownership.

## 5 LIMITATIONS AND FUTURE RESEARCH

This research expands our knowledge about the anticipated benefits of the adoption of cloud computing in Australian regional municipal governments. This research may be considered as an important contribution in the pursuit of fulfilling the knowledge about anticipated benefits of the adoption of cloud computing. There has not been much research done on cloud computing in reference to Australia and much more can be discovered. Future research could build on this research by examining benefits of cloud computing adoption in different sectors and industries. On a geographical dimension, this research was primarily limited to the regional municipal governments in Queensland. It may not be appropriate to generalise to the whole population of the regional municipal governments in Australia. For this reason, further empirical investigations in different regional municipal governments are needed.

## 6 CONCLUSION

Cloud computing is a latest technological paradigm in IT world, related to the delivery of computing as a service. It has been proven that the application of cloud computing carries important benefits such as scalability and cost reduction. Moreover, it also holds the advantages of maintenance, installation cost saving, time saving and pay-as-you-go framework. Cloud computing as an exciting development is a significant alternative today's local government sector. Employees and external users have the opportunity to quickly and economically access various application platforms and resources through the web pages on-demand. This automatically reduces the cost of organizational expenses and offers more powerful functional capabilities.

This research focuses on the anticipated benefits of cloud computing adoption in Australian regional municipal government environment. Since there is limited literature related to Australian regional municipal governments and cloud computing. The research employed in-depth interviews of Australian councils IT managers to investigate the anticipated benefits that related to cloud computing adoption. The findings derived from this research have shown that cloud computing adoption in government organizations resulted in significant cost reductions, improved service delivery and reduced IT infrastructure. Furthermore, time-effective and convenient services were delivered to the public. From the points of benefits provided by cloud computing, there is a great result for local councils IT staff to take them away the responsibility of the maintenance burden in the councils. Adopting cloud network redundancy eliminates disaster recovery risks and its high costs. There can always be new tools and applications to improve IT features. These results validate the normative literature. In addition to this, since the core of Australian local government council's initiatives includes information exchange, processing and service delivery, cloud computing seems to be an effective means of the next generation systems integration.

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