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CLOUD COMPUTING IN THE PUBLIC SECTOR

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ABSTRACT

Cloud computing is the application of computer-based information systems by utilizing the internet. Cloud computing can be accessed from any tool from any location and origin of the connected network. Cloud computing also offers excellent service 24 hours a day and 7 days a week, consumers need only pay based on the resources they use. The main issues in cloud computing is security and privacy. The provider always offer more security and privacy, in addition to a variety of convenience and cost efficient in their products. Cloud computing has penetrated all areas of Government, including as E-government. Cloud computing is considered able to suppress corruption and improve government performance in serving the community. This study describes the benefits, barriers, and challenges the adoption of cloud computing for Government based on a wide range of literature. The study also various things that must be prepared to adoption this application.

Keywords: cloud computing, public sector, information system

1. Introduction

Excellent service from the public prosecution is one of the main driving factors of the public sector in utilizing computer-based information technology. Currently the development of computer-based technology from the latest is cloud computing. Cloud computing is "a means for enabling on-demand access to shared and scalable pools of computing resources with the goal of minimizing management effort or service provider interaction." (The National Institute of Standards and Technology/NIST in GAO, 2016; and Sofana, 2012). The Internet is regarded as a large cloud. Cloud computing for the public sector are usually called e-Government.

e-Government is applied in various forms. In Indonesia e-Gov apply in procurement services, taxation and licensing. In Canada used in 77 (seventy-seven)
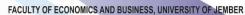
different types of service, in Singapore to apply for submission of questions, licensing and management of documents, while in Malaysia for electronic procurement, E-services and taxation (Hardjaloka, 2014). Cloud computing allows an agency to pay for only the IT services it uses. Purchasing it services through a provider enables agencies avoid to paying for all the assets (e.g., hardware, software, networks). According to The Office of Management and Budget (OMB), cloud computing is economical, flexible, and fast (GAO, 2016). Based on the research of Alshomrani and Qamar (2013) the benefits of cloud computing for the public sector are Availability and Accessibility, Cost savings, Efficiency, Flexibility, and Scalability. Sofana (2012:24) says cloud computing is considered more environmentally friendly, more cost effective and faster.

To take advantage of these benefits, Information and Communications Technology (ICT) investment in Indonesia's Government reaches Rp 14 trillion (US $ 1.2 billion) in 2013 and Rp 36 Trillion (US $ 2.8 Billion) in 2014 (Anggono, Ministry of communication and Information Technology of the Republic of Indonesia). The United States government plan to spend more than $ 2 billion on cloud computing services in fiscal year 2016 (GAO-Highlights, 2016 : 3) and the Australian Government spends approximately $ 6 billion in 2011-2012. (Australian Government Department of finance, 2014).

The adoption of cloud computing in Government is also facing some challenges and barriers. Effective challenges in e-government are classified into three groups that include social, economic and political barriers (Hashemi et al (2013). While according to Tsaravas & Themistocleous (2011) Barriers of E-Government Does classified into four groups that include Social, Technological, Organizational, and Policy and. Sen (2013) three critical challenges in cloud computing are regulatory, security and privacy issues.

The following research is trying to illustrate the benefits, challenges and barriers of cloud computing for government. Researchers want to find out what the benefits, barriers and challenges in the adoption of cloud computing in the public sector?

2. Literature Review

2.1 Cloud Computing

There is some notion of cloud computing from different articles or books, among them:

Cloud computing is internet based technology offers computing resources as a service to end users support various IT business process (Ramamoorthy, 2016). Cloud computing is the combined utilization of computer technology (computing) and cloud-based development (Jamil, 2016:4). Cloud computing is "a means for enabling on-demand access to shared and scalable pools of computing resources with the goal of minimizing management effort or service provider interaction." (The National Institute of Standards and Technology/NIST in GAO, 2016; and Sofana, 2012:9). Cloud computing is a model of computation, where activities of processing, storage, software, and other services are provided as a source of virtual integrated into one network. The network generally used is internet (Laudon, 2015:190).

Of the various opinions of the above can be said that cloud computing is a computer-based data storage processing for end users by leveraging the internet. According to Jamil (2016:8); Sofana (2011:11); Hashemi URet.eal (2013); Alshomrani and Qamar (2013); and Gen. (2011) Here are five characteristics cloud computing :

1. On demand self services means Using this feature when needed the customer can easily and automatically access to computing facilities like servers, net, storage and soon from any provider..

2. Ubiquitous/Broad network acces: It implies that the facilities are accessible on the net and they can be used following standard methods like laptops and mobile phones.

3. Location – Resource pooling: This features pools, customers needed different resources in the same place dynamically by the providers include the storage, memory, the bandwidth of the net and the virtual machines..

4. Rapid elasticity Using this feature, the user can always be updated and improved and accessible anytime for the users.

5. Measured services. All these features cover the coherence and appearance of the clouds.

Laudon (2015:194); Hashemi et al (2013); Bassi and Chaudhary (2015); Sen (2013); Alshomrani and Qamar (2013); Wyld (2010); and Kavitha (2014) does NIST development models include the aim and the identity of the cloud and the way they are settled.

1. Public cloud: it is for the public use and accessible for everyone, in which the resources, applications and web-services are provided over the internet and public organizations help to provide infrastructure.
2. The Private cloud: Private cloud is for the exclusive use and only for an organization, the Organization's members can just access the data, services and applications.
3. Community cloud: Infrastructure can be shared between one or some organizations with specific community. Its cost is cheaper than the public cloud but more than the private cloud
4. Hybrid cloud: Hybrid ones which are combination of two or more (public, private and community) clouds. It is in fact an environment which uses multiple cloud providers, internal and external suppliers.

The benefits of using cloud computing by Sofana (2012:24) cloud computing is considered more environmentally friendly because less electricity use so that less use of solar, meaning less pollution smoke. Cloud computing more cheaper because users pay only needed, faster because the internet support the faster and cheaper. Challenges in cloud computing is security, performance, availability, exitra.

Cloud computing applications from Iphone can help the effectiveness of corporate mobility, flexible, cost-effective, and efficient electricity (Laudon, 2015). The main issues in cloud computing is the data security and reliance on the cloud service provider and internet network. Cloud computing is an internet-based application, where there is a negative side of the utilization of the internet in job that is the threat of malicious software, hackers and computer crimes, internal threats from employees, legal, and health disorders.

3. Reseach Method

Research methods researchers use is descriptive qualitative research methods with the study of literature. This researcher collect data using documentation method. Types of data used in this research is secondary data in the form of the words, the images have been recorded without the intervention of researchers in the form of writing, record, sound, digital image, and which is contained in a document such as a previous research, books, journals and articles related to research (Daymon, 2008:344).

4. Result And Discussion

There are some benefits, challenges and barriers of E — the author of the Government auto summary of various studies. The following are some of the benefits and challenges for those who offer cloud computing-based services and applications:

Table 1
Benefits, Challenges, and Barriers of cloud computing

No.	Benefits	Challenges/Barriers
1	(Kavitha: 2014): 1. Cost saving 2. Mobile access 3. Scalability and Capacity 4. Resource Maximization 5. Collaboration 6. Customization	1. Security and Privacy 2. Lack of Standards 3. Continuously Evolving 4. Compliance Concern
2.	Muhammed et.al (2015) 1. virtually unlimited processing, new storage capabilities (Uwaje: 2012) 2. Kuyoro et al (2012) enables the measuring of used resources 3. Hinchcliffe (2009) payment just for only software used	1. Poor quality can hinder the prompt availability of data. 2. The Fear of hackers 3. Companies are not contented privacy. 4. Lack of technical skills 5. Lack of flexibility of the policy or legal framework 6. Lack of detailed information 7. ICT infrastructures and social needed to establish cloud computing data centre

		across the country.
		8. insecurity problem facing the nation will also hinder cloud technologies providers from investing in the country
3.	Alshomrani and Qamar (2013); 1. Availability and Accessibility 2. Cost saving 3. Efficiency 4. Flexibility 5. Scalability	1. Privacy 2. Lack of user control 3. System failure 4. Security 5. On demand self service 6. Data leakage
4.	Hashemi et.al (2013) 1. Rapid elasticity 2. Protection, Care and Technical Support 3. Cost and Efficiency 4. Auditing and Logging 5. Disaster Recovery 6. Reporting and intelligently 7. Systems Integration and Software LEGACY 8. Policies Management 9. Migrating to New Technologies 10. Green technology 11. Security	1. social, economic and political barriers
5	Dhumal (2015) 1. efficient delivery of services at door step 2. reducing corruption 3. Use four models of E-Gov a. Government to Government: increased the speed of work and performance of government b. Government to Citizen: provides 24 hours and 7 days services to the citizen and reduces the effort for citizens accessing the government services. c. Government-to-Business: increased transparency and speed of work d. d. Government-to-Employee model: pay employee's tax bills and other payments	1. Low technology literacy 2. Language Problem 3. Contradiction regarding Government services 4. Lack of Internet facility in Villages: 5. Population
6.	Tsaravas & Themistocleous (2011)	

1. efficient and cost-effective (Carter and Bélanger, 2005; Tokunbo, 2010) 2. reduced the corruption levels, enhanced transparency and increased revenue (Tokunbo, 2010). 3. improved satisfaction levels among citizens, reduced their rejection against public sector services and effaced personal interaction (Gilbert and Balestrini, 2004; Kumar et al., 2007). a. 4. more responsive governance can be achieved by citizens' involvement, leaving instant feedback on receiving services or government policies (Brooks and Ofosu-Agyekum, 2010).	1. Technological: hardware and soft ware, computer power, data storage, security, privacy 2. Organisational: issues, human resources, governance, the complexity of governmental processes 3. Policy: cost, security, data ownership, privacy 4. Social: lack of skills, data ownership, citizen trust, governance
7. Hardjaloka (2014) 1. Increase the effectiveness, efficiency, and reduce costs 2. Increase public participation 3. Improving transparent and reducing corruption 4. Improve services	1. Lack of local regulations governing the application of e-Gov 2. the existence of a tradition of sharing information and creating documentation not yet 3. reliable human resources and the community's ability in using technologi. 4. Limited Access Infrastructure

Source: the data processed

Based on some of the above research benefits e-Gov is a cost effective, flexible, disaster recovery and improve performance, quality of service and transparency of Government. While the major problem is security, human resources, law, economic, social, and technology. The element of confidentiality also into consideration because of the wealth of the country concerned and the important secrets that should not be known by people who are not interested (Wardani: 2013). In Indonesia to protect data security cloud computing is order by law PP number 82 year 2012 , Government mandating electronic service providers opens data center in Indonesia. (tekno.kompas.com: 2014). It will make easier for security of governance and communities data from other parties inside and outside the country.

(puspiptek.ristekdikti.go.id: 2016). With this rule will also encourage the growth of the cloud computing industry in Indonesia. (kominfo.go.id: 2011)

E-government in Indonesia beginning 2000s the laws in the field of e-Government is the instruction of the President (presidential instruction) number 3 year 2003 about the policies and Strategies of e-Government and Ministerial Regulation Ministry of Communication and Information Technology of the Republic of Indonesia number 28 year 2006 about the management of the domain name of the Government, and law number 11 year 2008 of the information and electronic transactions. (http://opensource.telkomspeedy.com/).

The Ministry of communications and Information in cooperation with various parties doing e-Government Ranking Indonesia (PeGI) to provide an overview of development, and the utilization of ICT in environmental governance, through the evaluation of the whole, balanced, and objective, and get a map of the condition of environmental governance in ICT utilization nationwide (kominfo.go.id, 2013). Dimensions examined the dimensions of planning, policy, institutional, infrastructure and applications. Based on the PeGI DKI Jakarta Province in year 2015 was ranked first, while for the Ministry/Agency assigned the Ministry of finance and for LPNK occupied the Central Bureau of statistics (BPS) (pegi.layanan.go.id)

e-Gov is the new system for the Organization of Government in Indonesia. Before adopting this system the Government was supposed to hold some of the feasibility study to evaluate the feasibility of the system. The feasibility study covering technical, economic, operational, human resources and legal/political. (O'Brien and Marrakech, 2014:155)

The feasibility of human resources include employees, managers, customers/users and suppliers. Human resources readiness before the application is applied to prevent resistance to the adoption of information and communication technology and the impact of further could create harmonious environment within a company or organization (Florestiyanto: 2012).

4. Conclusion

From some research it can be concluded that benefits the adoption of cloud computing is efficient and cost-effective, reduced the corruption levels, enhanced transparency, improve government performance and service quality, flexibility and Disaster Recovery. While the challenges and barriers to adoption of cloud computing is the Technology, social, economic, law and policy.

There are five things that should be hold by Government before adopting cloud computing are operational feasibility, economic, technical, legal and human resources/politics. This research is only wearing a secondary data source based on a variety of research and reading material, which did not use primary sources such as interviews and direct observation. For further research primary data is used in order to make research results more realistic and up to date.

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