Cost Modeling and Risk and Benefit Modeling Approach as a Tools For Decision Making in Adoption Cloud Computing as IT Strategic Business

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ABSTRACT

Cloud computing is an innovation that allows the use of IT as a utility based on-demand. Since cloud computing is a new technology, its led to a variety of risks that required an assessment model to assess the organization's readiness to adopt cloud computing. Moreover, by using cloud computing services means organizations or outsourcing involves a third party. Before adopting cloud computing technology, organizations need to consider some of the effects that arise as a result of cloud computing, namely in terms of costs, risks and benefits. To assist organizations to consider the migration of existing IT systems to the cloud, it can be used the cost approach valuation models and risk and benefit. This paper discusses two models of cost-based assessment of risk and benefit modeling and modeling that can be used as a tool to assist organizations in making decisions related to the migration of existing IT systems to the cloud.

Keywords : *cloud computing, assesment model, cost modeling, risk and benefit modeling*

1. INTRODUCTION

Cloud computing is a significant trend with the potential to increase agility and lower costs [1]. In general, the definition of cloud computing is the IT resources and services that is abstracted from the underlying infrastructure that provides an on-demand service and at-scale in a distributed environment [2]. Cloud computing causes changes the way and management of IT, promising improved cost efficiency, accelerate innovation, accelerate time-to-market and ability to enhance the user application on demand.

Cloud computing has attracted the attention of the organization because it can eliminate the need for the user to plan the IT needs for the organization to begin development on a modular basis and will only improve IT services as the need increases, so cloud computing is suitable to be applied to the small and medium enterprise (SME) [3]. The question that arises in the organization right now is not whether to use cloud computing but how they take advantage of cloud computing as a tool that supports business strategy [4][5][6][7]. This is due to cloud technology adopted have to aligned and support the organization's business strategy and can be integrated with existing legacy systems [4]. To realize that, organizations require an assessment model based on the model of cost and risk and benefit that can be used as tools to assess the impact of migrating existing IT systems to the cloud. This tool is expected to help organizations in making decisions related to IT systems migrate to the cloud.

2. PROBLEM OVERVIEW

Because cloud computing is at the peak of the Gartner hype cycle [8], organizations that want to do cloud computing arrangement will need to consider the increase in risk at this time. Therefore, before the organization decides to migrate existing systems to the cloud, there should be consideration of associated risks, benefits and costs as a result of the implementation of the cloud. What assessment model can be used as a tool used by organizations to see the impact that would arise due to the implementation of cloud computing? In addition to financial issues, socio-technical issues enterprise is also a consideration in determining the assessment models to measure the impact of IT systems migration to cloud computing.

3. LITERATURE REVIEW

Cloud computing promise a radical change in the provision of computing resources in organizations [5]. Cloud computing services provide computing services, data storage, software and services through the internet [9]. Cloud computing provides some interesting advantages for organizations such as no up-front the investments, lowering operating cost, highly scalable, easy access, and reduce business risk and reduce the cost of IT infrastructure maintenance [3].

Model of services provided by cloud computing are classified into three : Software as a Service (SaaS) , Platform as a Service (PaaS) , and Infrastructure as a Service (IaaS) [2]. For the next decade, cloud computing can be a foundation for growth for all types of businesses . Cloud computing will lead to the growth of a new ecosystem in the business world , because it will be more and more functions are moved to the cloud company . Ecosystem will allow companies to : (1) Partnering with each other easily through the cloud and (2) create and market a new business service . Or create a unique offering by incorporating third party services and functions that are in cloud . For example is Amazon . In an effort to drive traffic to its sales site , Amazon unlock their patent product catalog , so it can be used by other companies in different ways . In making its catalog , images , prices and other details are available for potential partners through the cloud , Amazon is finding new value in expanding its business to a third party sellers . The result : the level of the Amazon website traffic increases and provide more income created by the ecosystem . Utilizing cloud computing means to be prepared to significant changes in the organization [10]. Such changes may occur in the following functional areas :

1. Strategy , in the highest level , cloud computing can be a new perspective to look at other business considerations . As an executive team to identify business benefits projected by using cloud computing and began to articulate a strategy , and also determine who is responsible for overseeing and implementing strategies .

2. finance, cloud will eventually bring a change in every aspect of the functions of finance, accounting , and taxes . The most visible changes is in evaluating the total cost of IT ownership . Due to the cost of IT changed from fixed cost into a variable cost .

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3. Risk and governence , as in the previous technology of cloud computing has new risks for organizations . Especially issues related to security , in terms of moving data to a third-party organization for the storage , processing , or support . Concerns in terms of integration and ownership of the data needs to be addressed as a form of intellectual property protection and to maintain the information of employees, customers , and clients .

4. Technical , turning to cloud computing means a lot to consider technical issues . The organization will consider how the data is in the cloud will be integrated with existing systems or with other function is outsourced . Organizations must also think about how the cloud strategy affects the ability to fully control and monitor applications despite system or infrastructure are outside. Beyond the technical aspects , the organization will also assess the talent on its IT division to determine whether employees have the right skills to manage cloud-based infrastructure .

Cloud computing is finally bringing the business closer to a world where technology can plays as supporting role, not a barriers. But to make this happen, organizations must be aware of the risks and benefits associated with migration of existing IT systems to the cloud. Organizations need to assess their readiness to apply the cloud. Need to use a scoring model that can help a decision maker in an organization to consider moving existing IT systems to the cloud. Assessment model that can be used as a tool used to guide in making decisions related to IT system migration to the cloud is a cost and benefit modeling and risk modeling [11]. Cost modeling is valuation model that uses the approach of the financial side of the model that produces estimates of the cost of the use of cloud computing services. While risk and benefit assessment modeling is a model that describes the benefits and risks of using the cloud from the perspective of the enterprise and provides a starting point as the risk assessment.

3.1. COST MODELING

Model of Assessment by Cost Modeling approach is based on the way as well as management's perspective in assessing the performance of that implemented information technologies. To carry out the analysis with cost modeling approach, it is necessary to first identified positive and negative impacts that will be the consequences for the organization as a result of the adoption of the cloud, as well as the initial cost outlay for start-up costs, operating costs and maintenance costs. Khajeh-Hosseini et al and Ranti has developed an assessment tool based cost modeling approach [11][12].

3.2 RISK AND BENEFIT MODELING

Risk has a variety of meanings according to the context that is referenced or used viewpoint. HM Treasury defines risk as the uncertainty of the outcome, whether positive opportunity or threat of negative actions and events [13]. IT-related risk is is a quantitative measurement of the loss or damage caused by the threat,

vulnerability, or by an event (malicious or non-malicious) that affect the collection of IT assets owned by the organization. Khajeh-Hosseini et al [7] and the COSO ERM Framework and FMEA [13] has provided risk and benefit assessment model that can be used by organizations to assess the impact of the adoption of cloud computing in their IT strategy. The purpose of making risk and benefit assessment is a tool to inform decision-making related issue of customer relationships, public image, flexibility, business continuity and compliance [11].

4. RESEARCH METODHOLOGY

In making this paper, the authors used a qualitative approach is to conduct a literature study related to cloud computing models and assessment models that can be used to assess the cloud computing systems and searching of related literature what criteria should be considered by an organization's IT systems before migrating to the cloud. Then the authors looking for examples of the application of the valuation models and risk modeling approach to cost and benefit of modeling in the form of case studies. Then the analysis is based on data obtained from the case study and draw conclusions about how to model modeling and risk assessment and cost benefit modeling is used as a tool to assist decision-making related to the migration of IT systems to the cloud.

5. RESULT AND DISCUSSION

Several researchers have conducted case studies by implementing cost and benefit modeling and risk modeling as a tool that is used for decision-making related to consideration of adoption of IT systems to the cloud [8] [9] [5] [11]. In the case studies conducted on small enterprise named CiteSeer digital library and a search engine, successfully made some "elasticity pattern" with a model assessment of cost modeling to model the growth of system resource requirements based on historical data, with reference to the cost of the three cloud different providers. As a result, the company can identify the costs that will be incurred when adopting the cloud to existing systems. The result can be seen in Table 1.

TABLE 1.
Cost of different cloud providers using cost modeling [11]

Cost ($)	AWS US-East	FlexiScale	Rackspace
1st month	18,980	5.060	6.550
Monthly avg	1,916	5.151	6.732
total, 3 years	85,950	185,345	242.170
different with AWS		+2x	+3x

By using the risk and benefit modeling, technical director of CiteSeer can identify 7 important benefits and 13 important risks. Then the case study conducted on a large organization that is on a division reseacrh and development (R&D) at a media corporation in Europe [7]. With the cost modeling, requirements modeling cloud systems made using three different scenarios. Scenario (1) using the Amazon

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Web Services (AWS) is a non-elastic instance by allowing the system to work 24x7, (2) using a flexible AWS instance where on a weekday, the server session will work during the day and compute servers will work at night days. (3) the user can be turned on / off their instance without worrying who else is using the instance, then a small instance will work 8 hours per working day. The result can be seen in Table 2.

TABLE 2.
Cost of different deployment options on AWS-EU [11]

Cost ($)	non-elastic	elastic	elastic, small instance
1st month	67.350	65.430	75.620
Monthly avg	6.259	4.344	4.175
total, 3 years	286.415	217.470	221.385

By using the risk and benefit modeling, IT manager of R&D division and senior software engineer successfully express 8 benefits and 25 significant risks based on technical analysis. And 4 benefits and 15 risks based on organization analysis. Ranty and darmadji [12] conduct the case study which identifies the feasibility of cloud computing investment in a financial institution by combining generic IT/IS business value and economic value added (EVA). By using this method they successfully identified 39 relevant benefit and 6 categories of great benefit. So that management can draw the conclusion that the adoption of cloud computing can provide economic benefits for the company.

N.Yaumi and K. Surendro also makes model assessment of risk and benefit approach based on the COSO Enterprise Risk Management Framework (ERM) which is supported by a Failure Mode and Effects Analysis (FMEA) on the risk assessment component [13] which is implemented in the higher education organization. From this assessment models can be constructed a model of risk management related to the adoption of cloud computing. Where the risk management models can be used to identify, assess, and mitigate risks related to the implementation of cloud computing.

From the case studies that have been done, it is seen that the cost and benefit modeling and risk assessment models can give an overview of the costs and the benefits and risks associated with the adoption of cloud computing as the IT infrastructure of an organization. The results of the second assessment report of the model can be used as a tool to assist decision-making in considering the adoption of cloud computing. Cost modeling can give an idea of the costs that will be incurred due to the use of cloud computing organization as its IT strategy and risk and benefit modeling can provide an overview of the risks and benefits of the categories of organizational, legal, security, technical and financial. Because in business, the cost aspect as important aspects of customer relationships, public image, flexibility, business continuity and compliance. Both these valuation models need to be adapted to the strategic business IT alignment in order to set the IT strategy aligned with the business strategy of the organization.

6. CONCLUSION

Based on the data obtained by the author through several case studies that implement cost and benefit modeling and risk modeling in an organization, the authors conclude that, the cost and benefit modeling and risk modeling can be used as a reference for assessing whether an organization is ready to adopt cloud computing. Cost and risk and benefit can be used as criteria to determine the migration to cloud computing decisions. Thus allowing IT architects to model applications, data, and infrastructure needs in addition to the pattern of use of their computing resources. Besides cost and benefit modeling and risk modeling can also be used to create a risk management model that can identify, assess, and mitigate the risks of using cloud computing as an organization's IT strategy.

7. FUTURE DIRECTION

It is hoped that future research will further that combines cost and benefit modeling and risk modeling with strategic business alignment of IT models to ensure that the cloud-based IT strategy that has been designed in line with business objectives.

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