THE INFLUENCE OF CLOUD COMPUTING ON OUTSOURCING OF INFORMATION SYSTEMS BY SME

Eugenia Y. Huang, Department of Management Information Systems, College of Commerce, National Chengchi University, No.64, Sec. 2, Zhinan Rd., Taipei, R.O.C., 886-2- 29387348, huang.eugenia@gmail.com

Chi-Yau Chen, Department of Management Information Systems, College of Commerce, National Chengchi University, No.64, Sec. 2, Zhinan Rd., Taipei, R.O.C., 886-912566188, puppywind1219@gmail.com

Po-Yu Duan, Department of Management Information Systems, College of Commerce, National Chengchi University, No.64, Sec. 2, Zhinan Rd., Taipei, R.O.C., 886-963051158, maxduan@hotmail.com

ABSTRACT

Cloud computing is one of the major emerging issues in the field of information technology application in relation to business operation. This study proposed an evaluation model to support organizational decisions as to whether to outsource business information systems to cloud service. This study also examined what factors influence SME choice of outsourcing. Based on the evaluation equation, which was modified from extant studies by adding five categories of concern, security, stability, scalability, service, and support. We believe that they are key aspects that influence SME's judgment of the benefits of cloud computing approach as compared with the traditional datacenter.

INTRODUCTION

As technology advances, the computational power, and the categories of computers are also changing rapidly, from supercomputers to distributed computing and grid computing. Many organizations and individuals have realized that although hardware, software and techniques are important, using information technology efficiently is the most significant issue for businesses and society. The improvement and development of information systems must be guided by specific criteria that help to meet organizational needs. Cloud computing is an IT term that first appeared in 2007. It attempted to restructure the use of IT based on the concept of public utility in the same manner that improvements are made to resources like water or electricity. Advocates of cloud computing have claimed that cloud computing is the next generation of information technology. Several well-known corporations such as Google, Microsoft and Amazon are promoting this concept and urging their customers to purchase cloud computing power to decrease substantial investment in information technology and concentrate on core competitive abilities. Not only is cloud computing a compelling trend in technology enterprises but

countries such as Japan, China, and the U.S. have also built vast cloud computing centers. The presidents of these countries have promised that cloud computing will be among state development targets. Cloud computing has also changed traditional options for outsourcing. When companies discover that allowing other professional organizations to develop some of their IT processes can reduce cost and allow them to concentrate on their core abilities, such companies are likely to outsource IT processes. This action can be termed called “IT outsourcing”. Traditional information systems such as ERP (enterprise resource planning), SCM (supply chain management), and CRM (customer relationship management) are usually developed by system providers. Other small projects or programs may also be accomplished through outsourcing. Cloud computing has introduced three types of new and innovative services: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). With a variety of service types, outsourcing options have become more diverse as companies consider what kinds of processes, technologies, and infrastructure could or should be outsourced. The influence of these changes has been extremely significant. The appearance of cloud computing may not have changed the core competitive abilities of a company; however, elements which were kept in-house because outsourcing was previously not possible, such as large data storage, vast computing power and a development environment, can be obtained from cloud computing providers. However, some elements, such as research systems or importance profile, are not suitable for cloud outsourcing. Two different clouds can be built in cloud computing, “private cloud” and “public cloud”. Companies build private clouds for their own usage, while resources are shared on public clouds. For such reasons as avoiding security risks, most large companies are building their own private cloud to integrate their computing powers. Opportunities for cloud outsourcing seem likely to emerge in SMEs; SMEs can outsource business applications to cloud computing providers such as Google, Microsoft, and Amazon, which have built large public clouds to allow other businesses to purchase their computing power. This study aimed to discuss the following question: What elements of traditional information system outsourcing, in what kinds of situations, should be abandoned in favor of cloud computing? We also constructed a selection model to assist SMEs in selecting various ways to outsource information systems.

RESEARCH APPROACH

This paper discusses which reasons or factors cause managers to tend to choose outsourcing rather than in-house processes. We did not consider outsourcing of core processes or abilities, as companies should concentrate on these internally. This research focused on processes, which were not suitable for outsourcing in the past but can now be outsourced due to cloud computing. Click and Duening (2004) claimed that factors influencing choice of vendor include maintenance of quality, history of performance, fulfillment of service promise, processing capability and equipment, location, and technological ability [1]. Gathering characteristics of outsourcing and cloud computing, we referred to the equation developed by Berkeley University and modified it to match study characteristics [2]. The estimation equation

modified by this study had three additional variables: security, scalability, stability, service and support. Security means that customer data or processes are protected and not disclosed. Scalability means that customers can extend or reduce the extent of the resources they require according to their unique situation. Stability indicates that the platform and overall system are more stable. The Service factor indicates that the vendor can provide excellent service and is reputable. The Support factor indicates that the vendor has sufficient resources, such as personnel, technology, and hardware, to provide service to their customers. This research hopes that this equation can assist companies in identifying factors of influence on decision to outsource and selection of vendors. This study also developed a new selection model and simulated results to analyze the assumptions made by this study comparing in-house and outsourcing methods. The results were compared with present company action and situations.

$$\mathrm{UserHours}_{\mathrm{Public}} \times (\mathrm{Revenue} - \mathrm{Cost}_{\mathrm{Public}}) \times \prod_{\substack{i=1 \\ S_i \text{ is important}}}^{5} S_{i,\mathrm{Cloud}} \geq \mathrm{UserHours}_{\mathrm{In-House}} \times \left(\mathrm{Revenue} - \frac{\mathrm{Cost}_{\mathrm{In-House}}}{\mathrm{Utilization}}\right) \times \prod_{\substack{i=1 \\ S_i \text{ is important}}}^{5} S_{i,\mathrm{Datacenter}} \tag{1}$$

S_1 = Security, S_2 = Stability, S_3 = Scalability, S_4= Service, S_5= Support, $S_i \geq 1$

SIMULATION & FACTOR MODEL

Based on the selection equation, we assumed that cloud user hours and datacenter user hours are 1000 hours each. The revenue was assumed to be 1000 dollars, and we assumed the cost of datacenter is 500 dollars and compared the three kind of cloud cost: 400 dollars, 500 dollars and 600 dollars. The company got better performance when they spent more cost. We believed that the five factors of security, stability, scalability, service, and support in the equation would perform better when companies choose cloud computing outsourcing rather than in-house datacenters; therefore, we assumed higher cloud scores in Table1 as compared to datacenter scores. The results are presented in Figures1.

These figures show than when more factors are included, total cloud benefit exceeds that of in-house datacenters. When all factors of consideration are included, the benefit of outsourcing with cloud computing significantly exceeds that of using in-house datacenters. These results indicated that SMEs can gain more advantages from different angles by outsourcing information systems to cloud vendors. Based on the equation, this study developed a model to classify factors into equation variables, which

affect outsourcing decisions. Because this paper focuses on company outsourcing of information systems, we can determine factors related to cloud computing and outsourcing and classify them into these categories. For instance, the security variable: Confidentiality, integrity, authenticity, availability, and non-repudiation are critical indicators in the information technology domain. Company strategy determines how much investment in security is important to the company. The company development of control, organizational culture, and roles of security function and security management are also essential factors to estimation of vendor quality [3][4][5]. After investigating papers, theses, and relevant information on these issues, this study constructed a one-dimensional matrix model in Table2 [6][7][8][9].

Table1. Assumed values for each control variable in the equation

	Hours	**Revenue**	**Cost**	**R-C**	**S_1**	**S_2**	**S_3**	**S_4**	**S_5**
Cloud1	1000	1000	400	600	1.05	1.05	1.05	1.05	1.05
Cloud2	1000	1000	500	500	1.1	1.1	1.1	1.1	1.1
Cloud3	1000	1000	600	400	1.15	1.15	1.15	1.15	1.15
DataCenter	1000	1000	500	500	1	1	1	1	1

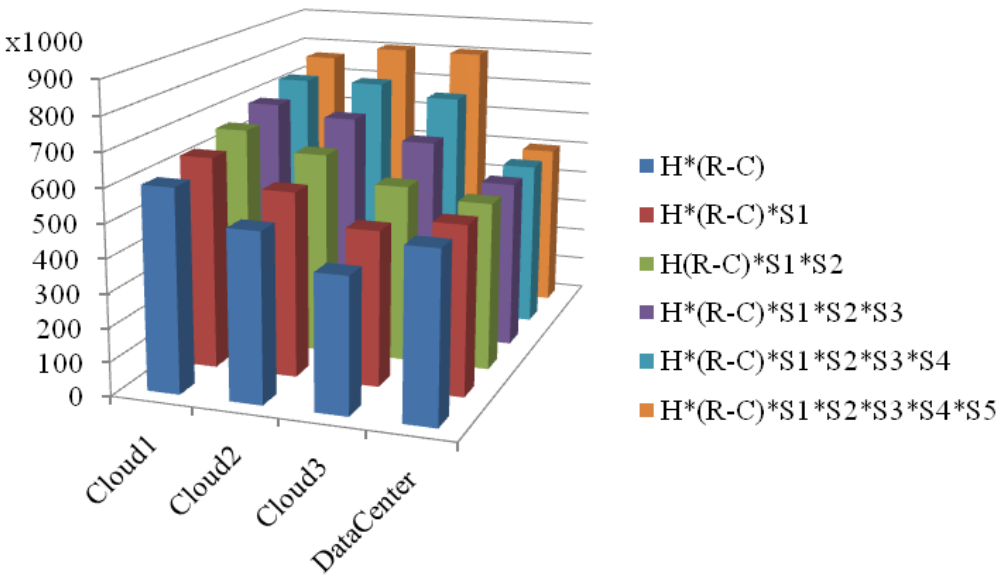

Figure1. Assumption including security, stability, scalability, service, and support

Table2. Factor model of outsourcing of information systems using cloud computing

Equation Variables	Factor	Equation Variables	Factor
Security	1.Confidentiality 2.Integrity 3.Authenticity 4.Availability 5.Non-repudiation 6.Information security investments	**Scalability**	1.Load Scalability 2.Functional Scalability 3.Space Complexity 4.Time Complexity 5.Load Balance
Stability	1.Limit load 2.Fault tolerant 3.Backup 4.Recovery 5.Input/output Control	**Service**	1.Credit 2.Adaptability 3.Quaility
		Support	1.Problem solving capability 2.Staff training 3.Internal policy 4.Technical capability 5.Resources

CONCLUSION

With the evaluation model proposed in this paper and the simulated result, it is easy to see that with only a small degree of gain in each category that is being considered, the cost-benefit consideration will favor the public cloud computing alternative. This is the major contribution of this paper, as it clearly demonstrates the dramatic combined effect of important categories of factors; this effect is hard to comprehend by considering each individual category respectively. To further understand SMEs' views of the degree of importance of each factor, we can conduct a Delphi study to aid elimination of relatively irrelevant factors from each category. Following the Delphi method, Analytic Hierarchy Process (AHP) can be applied to sort results by degree of importance and come up with the weighting for each factor. The final outcome could provide recommendations to cloud computing vendors regarding the factors of most concern. Some limitations exist in this research. First of all, this paper assumed the SME perspective; for large corporations, the proposed categories of factors in the evaluation model should be reexamined. As cloud-computing is relatively new and immature in the IT technology domain and on the IT service market, the characteristics of each factor is not static; instead, they evolve with time. We believe that some existing concerns of cloud computing will gradually be addressed by technological advancement.

REFERENCE

[1] Rick L. Click & Thomas N. Duening (2004), “Business Process Outsourcing – the Competitive Advantage”, John Wiley & Sons, Inc., U.S., p48, 99.

[2] Michael A., Armando F., Rean G., Anthony D. J., Randy K., Andy K., Gunho L., David P., Ariel R., Ion S., and Matei Z. (February, 2009), “Above the Clouds: A Berkeley View of Cloud Computing, Berkeley University”.

[3] Ma, Q., Schmidt, M., & Pearson, J.. (2009). An Integrated Framework for Information Security Management. Review of Business, 30(1), 58-69.

[4] Johnson, A.. (2009). Business and Security Executives Views of Information Security Investment Drivers: Results from a Delphi Study. Journal of Information Privacy & Security, 5(1), 3-27.

[5] Young, R.. (2009). Growth Perspective of Information Security. Journal of Information Privacy & Security, 5(4), 51-67.

[6] Lundquist, Carol, Frieder, Ophir, Holmes, David O, & Grossman, David. (1999). A parallel relational database management system approach to relevance feedback in information retrieval. Journal of the American Society for Information Science, 50(5), 413-426.

[7] Vasilios Darlagiannis, Andreas Mauthe, & Ralf Steinmetz. (2004). Overlay Design Mechanisms for Heterogeneous, Large-Scale, Dynamic P2P Systems. Journal of Network and Systems Management, 12(3), 371-396.

[8] S. M. Deen.(2005). An Engineering Approach to Cooperating Agents for Distributed Information Systems. Journal of Intelligent Information Systems, 25(1), 5-45.

[9] Norman Bobroff, & Lily Mummert. (2005). Design and Implementation of a Resource Manager in a Distributed Database System. Journal of Network and Systems Management, 13(2), 151-174.