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Jung-Han Suh

*Hanyang University, [sagile@naver.com](mailto:sagile@naver.com)*

Suk-Gwon Chang

*Hanyang University, [changsg@hanyang.ac.kr](mailto:changsg@hanyang.ac.kr)*

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# AN EMPIRICAL STUDY ON THE ENTERPRISE CLOUD SERVICE ADOPTION<sup>1</sup>

Jung-Han Suh, Business School, Hanyang University, Seoul, Korea, sagile@naver.com

Suk-Gwon Chang, Business School, Hanyang University, Seoul, Korea,  
changsg@hanyang.ac.kr

## Abstract

*Enterprise cloud service is a new IS paradigm which allows the storage of data, application software, and even operating platform over the Internet so that a corporation can use them at any time and at any place. It differs from the conventional information systems in that it doesn't require the companies to build up their own IS resource by allowing them to lease it over the Internet. With this innovative service offering, many companies have expressed much interest to adopt cloud services in practice. However, their apparent adoption behaviors appear to be quite inconsistent. This seemingly comes from the fact that cloud service is not a single product, but a set of different service provisioning options which have different incentives and risks to adopt. This paper configures what kind of service provisioning options are relevant to the true adoption intent of the enterprises and investigates how the intention to adopt differs among various service provisioning options. An integrated research model is set up with the concepts of IS maturity and outsourcing, and tested with the data collected from about two hundred SMEs. From the empirical study, it is found that perceived benefit and risk is differently affecting on the adoption intent, and the conceived conflict between high IS maturity level, especially with high IS infra asset, is negatively affecting on the adoption intent with some cloud service provisioning options.*

*Keywords: Enterprise cloud service, Cloud computing, Cloud service adoption*

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# 1 INTRODUCTION

The cloud service is a new paradigm of enterprise business computing. It has many attractive merits such as scalable storage, elastic computing power and a variety of service provisioning options from which an enterprise can choose to fit to her computing needs. Economically, it is quite beneficial to use cloud service especially when computing requirement fluctuates so frequently that an inefficient investment for over-capacitated computing facilities is unavoidable. Many enterprises have already recognized these benefits and flexibility, and have expressed much interest to adopt the cloud services in their daily IS operations like document management, e-mail and business communications. With this widespread interest, however, the adoption behaviour, especially for some major MIS functions, seems to be somewhat inconsistent among the interested enterprises. What are the sources of these inconsistencies and how do they differ in their adoption behaviour for the cloud services, as compared to that for the conventional information systems?

These are the key questions to be addressed in this paper. To answer these questions, this paper tries to figure out what factors affect on the intention to adopt the cloud services and how they differ among different cloud service provisioning options. The remainder of this paper is organized as follows: In the next section, a theoretical framework is constructed, along with some literature reviews. Theories on IS maturity and IT outsourcing are incorporated into an integrated adoption model for the cloud services. In Section 3, a generic research model is constructed, along with some typical cloud service provisioning options to test. A total of 16 hypotheses are derived, which are to be tested in an intensive empirical research. In Section 4, empirical results are analysed and discussed with different causal relationships for different service provisioning options. Finally, research findings are summarized and some future research issues are discussed in Section 5.

## 2 THEORETICAL BACKGROUND

There are a large number of studies on the IT adoption by the enterprises. The most frequently referred factors affecting on the IT adoption include organizational environment, organizational characteristics, and task context, where organizational characteristics specify firm size, product category, IS maturity and so on. Refer to Rai and Bajwa (1997), Ravichandra (2000) and Ko et al. (2008) for details. We may resort to the conventional IT adoption model, explaining the adoption behaviours of the cloud service. However, as noted earlier, cloud service is intrinsically different from the conventional IT service. First, cloud service is not a single product, but a package of IT service options which can be configured differently depending on the demanding enterprises' individual needs and system requirements. Second, the cloud service may be regarded as a partial IT outsourcing so that it is highly likely to share some common incentives with IT outsourcing.

From the literatures mentioned above, two lines of researches seem to be most relevant to the adoption behaviours of the cloud services. The first one is the IS maturity, which is probably related anyhow with the cloud service adoption in that the cloud service must be one of the most recent and most advanced IS service options. The second is the so-called risk-benefit assessment which is most frequently used in explaining the enterprises' decision on IT outsourcing. They are dealt with in detail in the following subsections.

### 2.1 IS (Information System) Maturity

The IS maturity was introduced first by Benbasat et al. (1980) and has been found to be positively related with IS adoption in various consecutive studies. Grover and Golar (1993), which examined the companies in the United States, showed that IS maturity serves as a key factor affecting on enterprises' adoption of mobile communication technology. Rai and Bajwa (1997) analysed the effect

of IS support and the size of IS department on the adoption decision of EIS (Executive Information System). Later, Ravichandran (2000) reconfigured those influencing factors into a generalized concept of organizational characteristics and explained the swiftness and intensity of adopting the TQM (Total Quality Management) using this concept. Two aspects of organizational characteristics were identified. Structural aspect measured IS department size, functional differentiation and structural complexity, while process aspect measured IS management support for quality. Most recently, IS maturity was identified by Ko et al. (2008) as a key variable of organizational characteristics to explain the perception, adoption and the implementation of the CRM (Customer Relation Management).

Meanwhile, IS maturity itself has been used as a measure to evaluate the informatization level of the enterprise. In line with this research purpose, Lim (2001) identified four dimensions of informatization level to evaluate the IS maturity of an enterprise. They are IT strategy, IT resource, IT use and IT performance. This was further extended by Leem (2008) to add IT human resource to become a complete set of constructs for IS maturity. Table 1 shows how each construct of IS maturity is defined and investigated by other related researches.

Construct	Description	Related researches
IT strategy	CEO's support for informatization and availability of concrete plan	Benbasat et al. (1980), Ravichandran (2000), Ko et al. (2008), Lim (2001), Yoon et al. (1998)
IT human resource	Personnel in charge of IT, level of education for IT personnel	Benbasat et al. (1980), Ravichandran (2000), Ko et al. (2008), Lim (2001), Yoon et al. (1998), Sung, et al. (1998), Ha and Jo (2003)
IT infra resource	IT Infrastructure, development level of information systems	Lim (2001), Leem (2008), Yoon et al. (1998), Sung et al. (1998), Kim (2002), Ha and Jo (2003)
IT use	Dependency on IT of the enterprise service	Benbasat et al. (1980), Lim (2001), Lee (2001), Ha and Jo (2003)
IT performance	Effect from informatization	Lim (2001), Seong et al. (1998), Lee (2001)

*Table 1: Variables of IS Maturity and Related Studies*

## 2.2 Risk-Benefit Assessment

The decision regarding IT outsourcing, usually made by top management, seems to be one of the most typical business decisions. Many factors affect on the decision, which are related with a subjective norm based on TRM (Theory of Reasoned Action) and social actions based on innovation diffusion theory. The decision alternatives are usually evaluated in terms of risk and benefit. This RBA (Risk-Benefit Assessment) model seems to be quite simple, but based on enormous number of theoretical researches. Depending on what perspectives are taken, different theories explain different aspects of risks and/or benefits. They include transaction cost economics, dependency theory, agency theory, resource dependency theory, resource-based view, institutional theory, and social exchange theory (Benlican 2011).

Construct	Description	Related researches
Performance risk	The risk that cloud service does not function appropriately and is not well performed.	Gewald et al. (2009), Kauffman et al. (2008), Benlian et al. (2011)
Economic risk	The risk that unexpected costs incur after the cloud service is adopted.	Antonuccu et al. (1998), Aubert et al. (1999), Earl (1996), Jurison (1995)
Security risk	The risk that important IT and data assets are not appropriately secured.	Antonuccu et al. (1998), Aubert et al. (1999), Jurison (1995), Grover et al. (1996)
Managerial risk	The risk that significant organizational conflicts occur because of the cloud service adoption.	Jurison (1995), Loh et al. (1995), Diromualdo et al. (1998)

*Table 2: Variables of Perceived Risk and Related Studies*

The cloud service is viewed as an extension of IT outsourcing in that the benefit can be partially traded off with the risk when the client company contracts with the cloud service provider. Related with IT outsourcing, a number of risk factors were identified by many previous studies, which are summarized in Table 2, along with the related studies.

As compared with the risks, the benefits from adopting the cloud service are more diverse, most of which are significantly different from those from IT outsourcing. Most frequently mentioned benefits include the economic cost savings, scalability and flexibility of the service, and location-free access to the information systems. The first two mainly come from the unique IS paradigm of the cloud service which provides the corporate customers with IS dimensioning options and enables them to pay the charge in a usage basis. Mobility is a unique, and at the same time, powerful feature of the cloud service. By adopting a cloud-based information system, the user can access to your corporate information system at any time, at any place, and sometimes at any device, as far as the Internet is accessed (Mell & Grance 2011; Vaquero 2009). The potential benefits from adopting the cloud service are summarized in Table 3.

Construct	Description	Related researches
Cost advantage	Cost savings expected when adopting the cloud service.	Kynetix (2009), Armbrust et al. (2009), Kremic (2006)
Strategic flexibility	Better response to sudden environmental changes	Kynetix (2009), Wu (2010), Whitten et al. (2010)
Focus on core competencies	Improved focus on core business by putting IS matters aside	Levina et al. (2003), Jayatilaka et al. (2003), Gonzalez et al. (2009), Benlian et al. (2011)
Access to resources	Improved and quick access to IT resources	Armbrust et al. (2009), Vaquero (2009), Mell et al. (2011)

*Table 3: Variables of Perceived Benefit and Related Studies*

Recently, Benlian et al. (2011) applied the RBA model to the cloud service. It considered the risk factors mentioned above and the opportunity expected when a company adopts the cloud service, and then related them with the intention to adopt the SaaS, which is one of the cloud service options. More recently, Lim et al. (2012) carried out a study which applied IT outsourcing theory to the cloud service adoption behaviour. This study specified the cloud service as a new IT paradigm and attempted to explain the adoption behaviour by grafting the Technology-Organization-Environment(TOE) framework with the outsourcing decision making model. More elaborated benefits were studied, which include scalability, cost saving, business agility, independence from system and location, and finally green computing. At the same time, elaborated risk factors additional management cost, dependence, government regulation, security, data confidentiality, privacy, availability, disperse system bug and degradation in transmission speed.

### 3 RESEARCH MODEL

Resorting to Benlian et al. (2011), a basic risk and benefit framework is configured to explain the intention to adopt the cloud service and then antecedent variables affecting on the aggregated perception on risk and benefit are added to the framework. To this research setting, a causal link from IS maturity to the intention to adopt the cloud service is further added, based on the discussions made in previous section. Another factor, the cloud service provisioning option, which is unique and probably most important, is added in this research. In our research model, this factor plays as a contingent variable, which implies that the cloud service adoption behaviour might appear to be different across different service provisioning options. Figure 1 summarizes and depicts our research model constructed for testing this conjecture empirically.

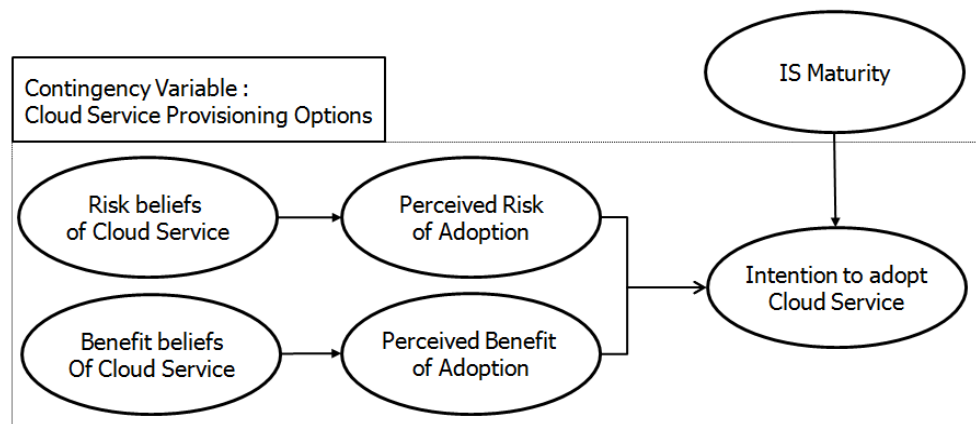


Figure 1: Research Model

### 3.1 Service Provisioning Options and Cloud Service Adoption

Before considering the adoption of the cloud service, most of the enterprises are equipped with their own incumbent information systems and have some operating experiences. Hence, the occasion to consider the cloud service happens when some apparent problems occurs like a sudden shortage of computing power due to some real-time processing overloads or outage of some computing and communication facilities. In this case, the enterprises may want to expand their server capacity by server virtualization with the help of the cloud service providers. In this case, there's no change in application layer services. We call this option "server extension," which means the server capacity is extended to the cloud.

Once the server extension prevails within the enterprise, there might appear some incentives to shut down the in-house information system, pursuing further cost reduction. Actually, heavy hardware upgrade investment and expensive maintenance costs turn out to be the target to reduce. In this case, the enterprise manages to outsource the IS infrastructures like electricity, computing servers, storages, and communication facilities. This option is often called "IaaS (Infrastructure as a Service)" and its practical meaning is "Total Infrastructure Outsourcing." This option is the same as the server extension in that they operate their own proprietary information systems which were developed by themselves.

As the end of lifetime of the incumbent information system approaches, many enterprises may consider building an entirely new next-generation information system. Two options may arise. The first option is to buy standardized application software over the Internet as a service. We call this option "SaaS (Software as a Service)." The second option is to build the enterprise's own information system on top of the platform provided by the cloud service provider. We call this option "PaaS (Platform as a Service)," which implies building a proprietary IS over the platform provided by the cloud service provider. Regarding the SaaS model, we might consider it at the whole enterprise level or within a limited application area. ERP over the Internet might belong to the first category, which we call "SaaS for All." The second category corresponds to the case where the adoption of SaaS is limited to some media applications like e-mail, document management, and teleconference. We call this second category "SaaS for Some." Table 4 summarizes these cloud service provisioning options.

	Extension to Cloud Service	Move to Cloud Service
Application	Option 3 ("SaaS for Some")	Option 4 ("SaaS for All")
Platform	n/a	Option 5 ("PaaS: IS over Platform")
Infrastructure	Option 1 ("Server Extension")	Option 2 ("IaaS: Total Infra Outsourcing")

Table 4: Provisioning Options of the Enterprise Cloud Service

If we combine these cloud service provisioning options with the research model depicted in Figure 1, we get the most important hypothesis as described below:

**Hypothesis 1:** The causal linkages from IS maturity, perceived risk, and perceived benefit to the intention to adopt the cloud service differ depending on what kind of service provisioning options are taken by the enterprises.

### 3.2 IS Maturity and Cloud Service Adoption

IS maturity has seemingly both positive side and negative side of impact on the adoption of new information systems by the enterprises. The positive aspect is focused on the possibility that the higher the IS maturity level, the better performed the information system newly adopted or developed. Furthermore, an enterprise with a higher level of IS maturity seem to be more robust to any regulatory and technical risk from outside the enterprise. Meanwhile, the negative aspect mainly comes from the cost side and the organizational issues. The main concern is from possible downsizing of skilled IT professionals especially when an expensive, thus probably less labor-intensive, information system is adopted (Antonuccu et al. 1998; Susarla et al. 2003).

Despite a handful of researches on IS maturity, its impact on the adoption of new information systems has shown to be somewhat inconsistent. The most plausible reason is that they happened to use different operational definitions of IS maturity, leading to different measures and further inconsistent empirical results. Note that we have already reviewed in Table 1 how the construct of IS maturity has been evolved during last ten years or so. Based on the literature review on the IS maturity, we define IS maturity as a comprehensive, multi-dimensional construct which could be measured in views of IT strategy, IT human resource, IT infra resource, IT use and IT performance, and derive some hypotheses on the impact of these constructs on the adoption of cloud service.

Regarding the impact of IT strategy, Ravichandarn (2000) and Ko et al. (2008) showed that corporate level interests on informatization and well-established IS plan are positively related with the new IS adoption and further IT outsourcing as well. Regarding the impact of IT human resource, Rai (1997) and Grover (1993) showed that well-organized IT department and favourable status of IS personnel have a positive effect on the adoption of new information system, while Benlian (2011) showed this is not the case for the IT outsourcing because of the increased relational risk across the organizational boundaries. Hypothesis 2 and 3 states how these two constructs are related with the adoption of cloud service.

**Hypothesis 2:** The IS maturity in view of IT strategy is positively related with the intention to adopt the cloud service.

**Hypothesis 3:** The IS maturity in view of IT human resource is positively related with the intention to adopt the cloud service.

Based on the outsourcing study by Susarla (2003), IS maturity in view of IT infra resource and IT use might be negatively related with the adoption of the cloud service provided that the interested user recognize cloud service as a kind of IT outsourcing. The reason mainly comes from an economic point of view that the investment to the existing IT infrastructure may not have been paid off enough. Regarding the IT performance, the higher the performance the more likely the existing information system is preferred. However, at the same time, expectation for even better performance with a new, seemingly advanced information system will arise. Based on this reasoning, we derive three respective hypotheses.

**Hypothesis 4:** The IS maturity in view of IT infra resource is negatively related with the intention to adopt the cloud service.

**Hypothesis 5:** The IS maturity in view of IT use is negatively related with the intention to adopt the cloud service.

**Hypothesis 6:** The IS maturity in view of IT performance is positively related with the intention to adopt the cloud service.

### **3.3 Risk/Benefit and Cloud Service Adoption**

It is quite important to figure out what kind of organizational changes may result after a new, innovative information system is deployed and used. The well-known innovation diffusion theory favours the positive side of new technology deployment, while innovation resistance model focuses on the negative side of it. The positive side is usually called “benefit” and the negative side is often assessed in view of “risk” (Seo 2004). As far as the cloud service is regarded as a kind of IT outsourcing, the risk and benefit aspects of IT outsourcing need to be tested for the cloud services as well (Loh et al. 1995).

**Hypothesis 7:** Organizational perceived risk is negatively related with the intention to adopt the cloud service.

**Hypothesis 8:** Organizational perceived benefit is positively related with the intention to adopt the cloud service.

According to a survey executed by The Open Group (2011), concern on security is found to be the most outstanding, and influencing factor on the cloud service adoption decision. Potential organizational conflict and performance degradation appeared to be the second and the third concern. These risk factors have been dealt with so frequently in IT outsourcing literature. Referring to them, we relate various risk factors derived in Section 2 to the aggregated risk measure, “perceived risk.”

**Hypothesis 9:** Performance risk is positively related with the overall perceived risk, when adopting the cloud service.

**Hypothesis 10:** Economic risk is positively related with the overall perceived risk, when adopting the cloud service.

**Hypothesis 11:** Security risk is positively related with the overall perceived risk, when adopting the cloud service.

**Hypothesis 12:** Managerial risk is positively related with the overall perceived risk, when adopting the cloud service.

As for the benefit from adopting the cloud service, we have identified four different aspects of benefit in Table 3. We extend Benlian et al. (2011)’s work on the adoption of SaaS to different cloud service provisioning options by relating those four benefit measures to the overall perceived benefit, and further to the intention to adopt the cloud service.

**Hypothesis 13:** Cost advantage is positively related with the overall perceived benefit, when adopting the cloud service.



**Hypothesis 14:** Strategic flexibility is positively related with the overall perceived benefit, when adopting the cloud service.

**Hypothesis 15:** Focus on core competencies is positively related with the overall perceived benefit, when adopting the cloud service.

**Hypothesis 16:** Access to resources is positively related with the overall perceived benefit, when adopting the cloud service.

It should be noted that Hypotheses 2 through 16 are to be tested with different cloud service provisioning options to verify the conjecture described by Hypothesis 1.

## 4 RESEARCH METHOD AND EMPIRICAL ANALYSIS

### 4.1 Research Setting and Data Collection

Questionnaires were collected from previous relevant studies for the individual constructs constituting risk and benefit. Also, IS maturity measure was prepared using the structured questionnaire developed for the annual informatization survey by Small & Medium Business Administration. The survey was conducted by a professional research institute and 20 trained investigators interviewed the CEOs or CIOs of small and medium businesses during one-month period. In order to explain the details of each cloud service provisioning options, a special illustrative card was devised for each option, along with supplementary articles.

A total of 204 companies from manufacturing, wholesale & retail, construction, transportation, broadcasting and information communications, and science and technology service industries were investigated. They are sampled carefully to be well-represented the small and medium enterprises in terms of the year founded, the number of employees, and also the sales.

Industry		Year Founded		Number of Employee		Sales(100M Won)	
Category	Percent	Category	Percent	Category	Percent	Category	Percent
Manufacturing	24.6	< 1980	10.8	< 10	44.3	< 10	22.7
Wholesale & Retail	17.2	1981-1990	13.3	11-50	28.1	10 – 70	24.1
Construction	12.3	1991-2000	37.9	51-90	9.4	> 70	34.9
Transportation	9.9	2001-2010	32.0	91-130	5.4	No Answer	17.7
Broadcasting and Information Communications	21.2	> 2011	4.9	>131	11.8		
Science and Technology Service	14.8	No Answer	1.0	No Answer	1.0		

*Table 5: Sample Characteristics.*

A factor analysis and reliability test were conducted in order to verify the convergence validity of 18 questionnaires including antecedent variables for risk factors of cloud service, 21 questionnaires including antecedent variables for benefit factors of cloud service and 3 questionnaires for intention to adopt the cloud service. Varimax Rotation was used to find principal components when applying factor analysis and the load value standard was set to be 0.5. For reliability analysis, the consistency of variables was evaluated based on Cronbach's Alpha value of 0.7 which is generally acceptable for the enterprise level of analysis. Factor analysis has been done separately six times for the hypothesis for the aggregated model and for the remaining five separated models with different service provisioning options.

## 4.2 Cloud Service

Hypotheses for the whole cloud service were verified by integrating the data for five different provisioning options. SPSS Version 18.0 was used for analysis and the result was obtained by regression analysis. As for the analysis, the regression model was applied for relating perceived risk, perceived benefit and IS maturity to the intentions to adopt the cloud service. And then, the same regression model was tested for the causal links from risk components to the aggregated perceived risk and also for the causal links from benefit components to the aggregated perceived benefit.

Among five sub-constructs of IS maturity, IT strategy, IT human resource, IT infra resource and IT performance turned out to be significantly related with the intention to adopt. But interestingly enough, it was found that IT infra resource is negatively related with the intention to adopt the cloud service. As expected, both perceived risk and perceived benefit are found to affect negatively and positively on the intention to adopt respectively. Regarding the causal links from the sub-constructs of risk and benefit to the perceived risk and benefit, all links were found to be statistically significant.

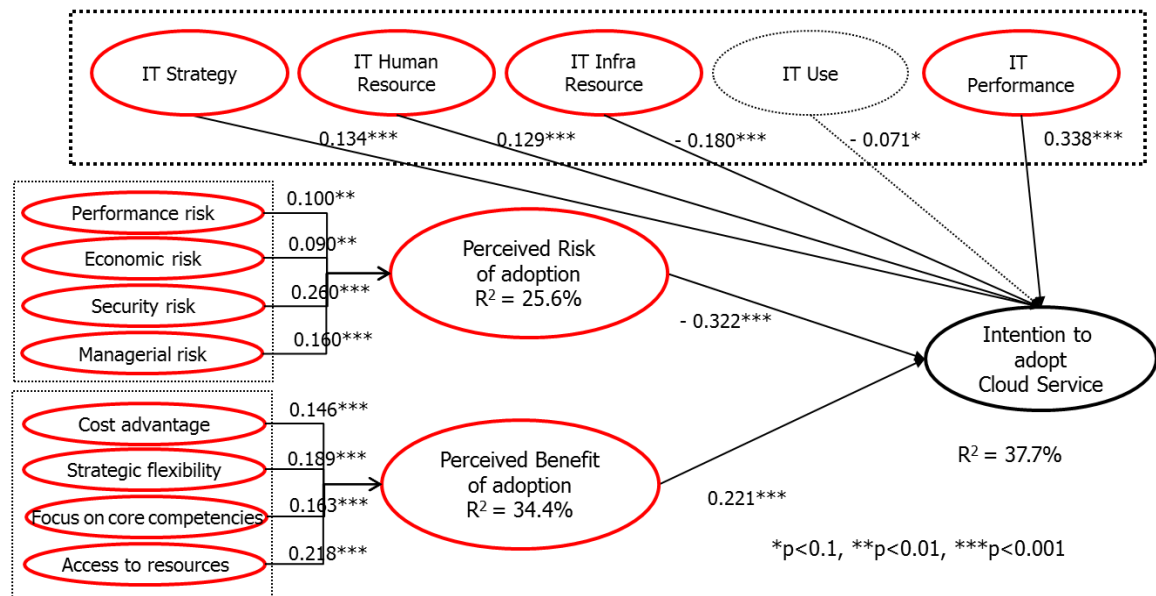


Figure 2: Result of Research Model (For the whole Cloud Service)

## 4.3 Option 1 (Server Extension)

With option 1, IT infra resource is negatively related with the intention to adopt, while IT human resource is not significant. But the Server Extension seems to have lower relation with existing IS infra than Total Infra Outsourcing. It takes only supplementary functions.

Unlike the results with other options, perceived benefit of adoption turned out to be more highly related with the intention to adopt than the perceived risk of adoption. The reason might be that the Server Extension is most populated among those five options. Therefore, the benefits generally known in adopting the cloud service are clearly understandable and the standard SLA (Service Level Agreement) for the service are contracted with many risk factors handled appropriately a priori. All risk and benefit components turned out to be significant. Especially the security risk and the managerial risk appeared to have a critical effect.

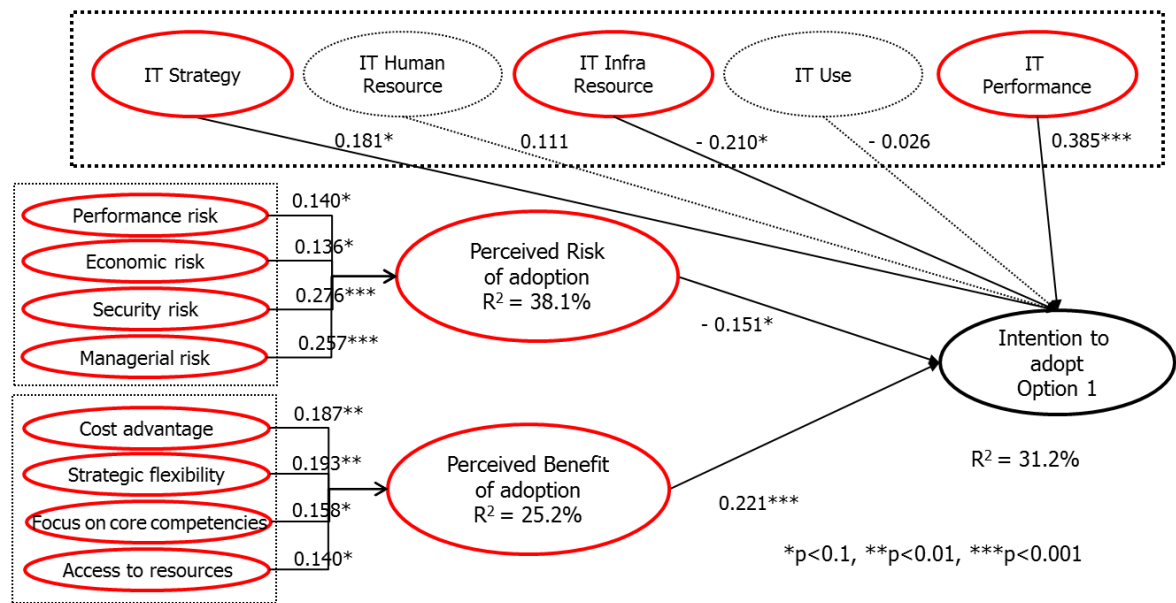


Figure 3: Result of Research Model (For Option 1)

#### 4.4 Option 2 (IaaS: Total Infra Outsourcing)

With option 2, IT Human resource, IT Infra Resource and IT performance turned out to be significantly related with the intention to adopt. Especially IT resource is negatively related with the intention to adopt as the hypothesis suggests.

Economic risk and security risk are found to effect on perceived risk of adoption while performance risk and managerial risk is not statistically significant. And strategic flexibility and access to resources turned out to have a critical effect on perceiving the benefit of adoption. So, it is interpreted that the advantage of coping with flexibility in strategy is apparently more important than definite economic benefits in option 2.

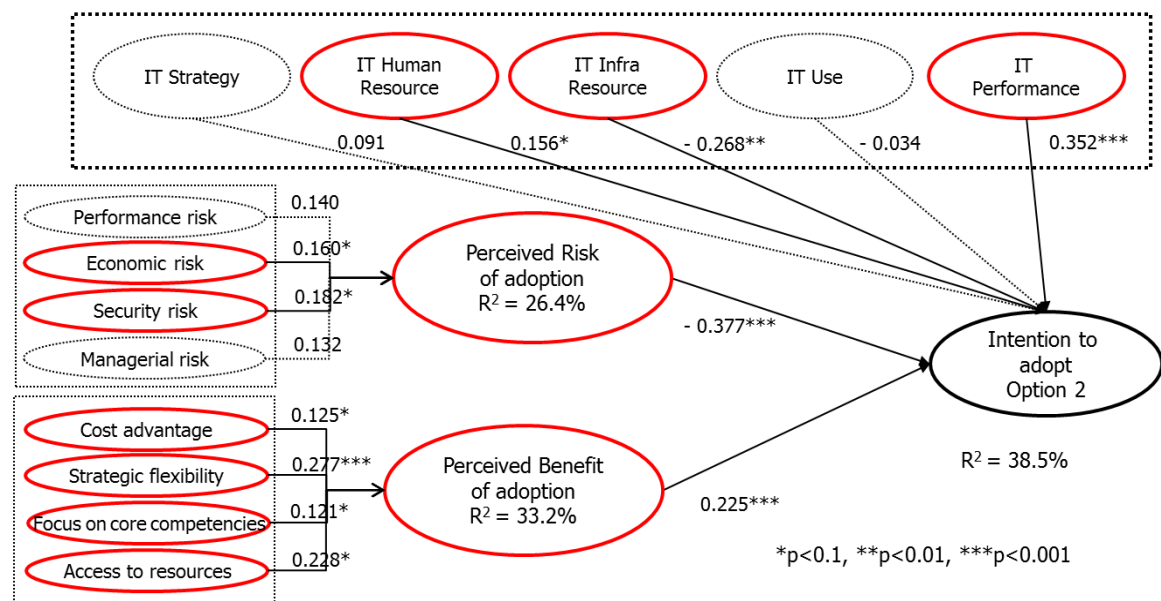


Figure 4: Result of Research Model (For Option 2)

#### 4.5 Option 3 (SaaS for Some)

With option 3, only IT performance turned out to be significantly related with the intention to adopt. The reason might be that partial adoption of cloud service has nothing to do with the existing infra and application.

The performance risk turned out to be the highest factor which affects the perceived risk of adoption. That is, the concern whether the quality and function of requested service would correctly operate or not is reflected on the decision to adopt the application of cloud service. On the other hand, the economic risk is not significant because the cost is not heavily considered with option 3. Access to resources was the most influencing factor on perceived benefit of adoption, while other sub-constructs of benefit also appeared significant.

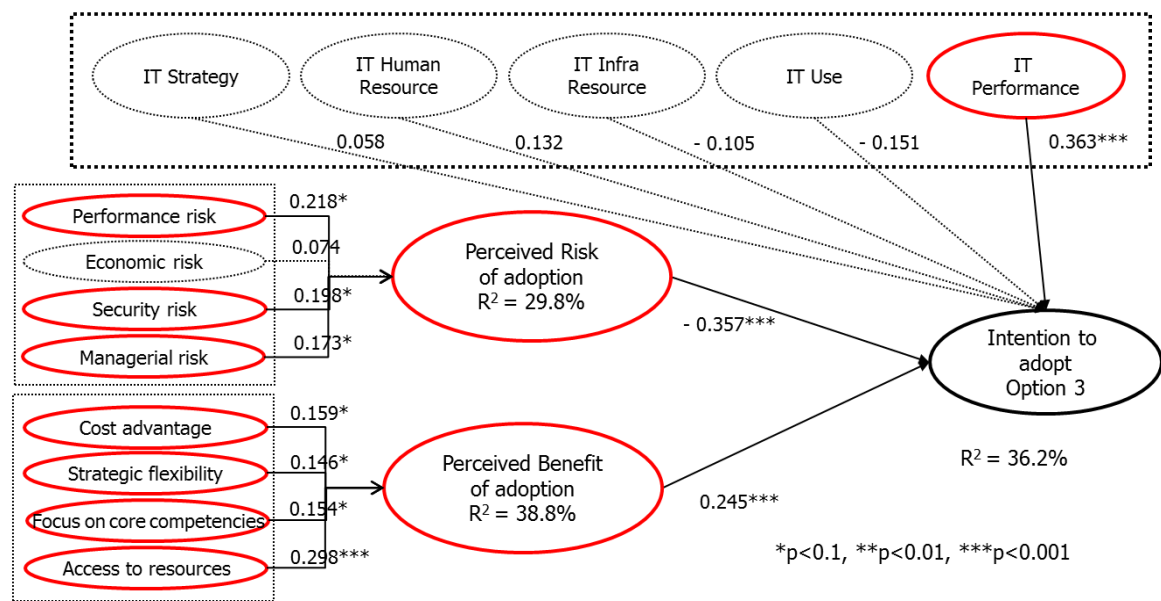


Figure 5: Result of Research Model (For Option 3)

#### 4.6 Option 4 (SaaS for All)

With the option of SaaS for All, IT infra resource turned out to be not significantly related with the intention to adopt. Perceived risk of adoption has the strongest effect on intention to adopt compared to other options. The reason might be that perceived risk is increased by moving precious information assets to outside cloud-based information system. It should be noted that the security risk has the highest impact on the perceived risk of adoption, as compared to the other sub-constructs of risk.

The strategic flexibility is not significant in its effect on perceived benefits of adoption. That is, they perceive the strategic flexibility as a most important benefit of adoption only when they adopt a partial extension option instead of total outsourcing with cloud services.

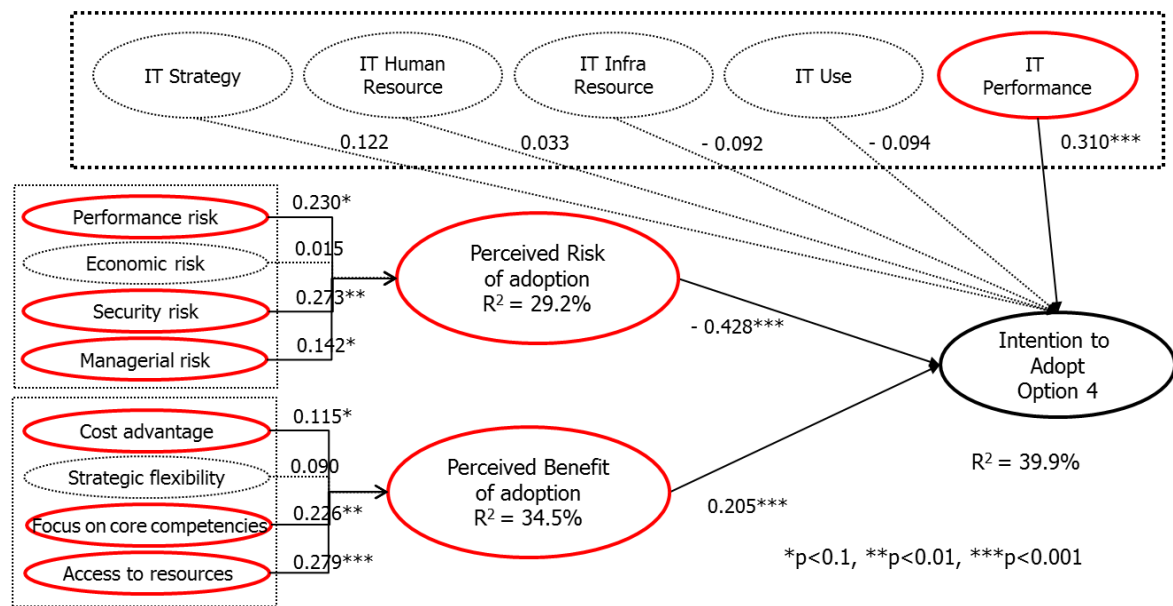


Figure 6: Result of Research Model (For Option 4)

#### 4.7 Option 5 (IS over Platform)

With option 5, IT infra resource turned out to be negatively related with the intention to adopt, while IT human resource appeared to have a positive effect on the intention to adopt. This could be explained that option 5 requires the IT human resource to develop the information system and conversion of existing infra resources.

The option 5 has not been yet so popular that perceived risks and benefits appeared to have the lowest effect on intention to adopt as compared to the other options of cloud service. Therefore, individual risk and benefit factors could not be perceived yet so strong. Thus, the security risk is the only most critical factor affecting on the perceived risk of adoption.

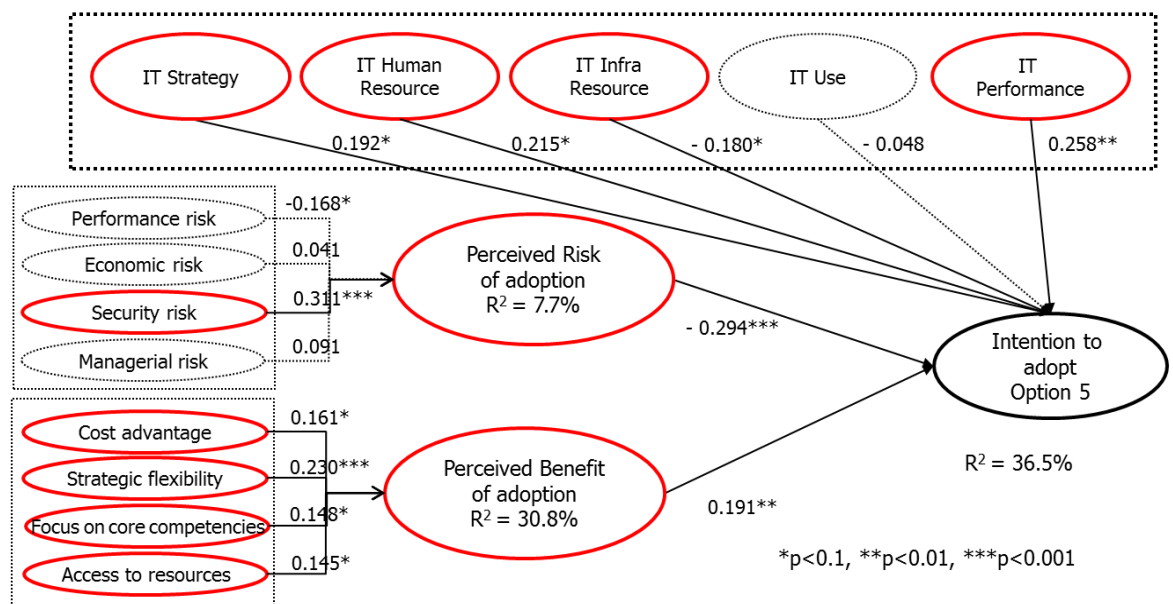


Figure 7: Verification Result of Research Model (For Option 5)

## 5 CONCLUSION

This study classified cloud service provisioning options available for small and medium business and presented research models and hypotheses reflecting the characteristics of cloud-based information system and IT outsourcing. In order to verify the conjectures, a survey was conducted and incentives to adopt the cloud service for each option was analysed. The proposed hypotheses were verified and various significant factors were identified with different causal relationships. The test results are shown in Table 6.

	Cloud Service	Option 1	Option 2	Option 3	Option 4	Option 5
H2	0.134***	0.181*	0.091	0.058	0.122	0.192*
H3	0.129***	0.111	0.156*	0.132	0.033	0.215*
H4	- 0.180***	- 0.210*	- 0.268**	-0.105	- 0.092	-0.180*
H5	- 0.071*	- 0.026	- 0.034	-0.151	- 0.094	- 0.048
H6	0.338***	0.385***	0.352***	0.363***	0.310***	0.258**
H7	- 0.322***	- 0.151*	- 0.377***	- 0.357***	- 0.428***	- 0.284***
H8	0.221***	0.207**	0.225***	0.245***	0.205**	0.191***
H9	0.100**	0.140*	0.14	0.218*	0.230*	- 0.168*
H10	0.090**	0.136*	0.160*	0.074	0.015	0.041
H11	0.260***	0.276***	0.182*	0.198*	0.273**	0.311***
H12	0.160***	0.257***	0.132	0.173*	0.142**	0.091
H13	0.146***	0.187**	0.125*	0.159*	0.115*	0.161*
H14	0.189***	0.193**	0.277***	0.146*	0.09	0.230***
H15	0.163***	0.153*	0.121*	0.154*	0.226**	0.148*
H16	0.218***	0.140*	0.228**	0.298***	0.279***	0.145*

. \*p<0.1, \*\*p<0.01, \*\*\*p<0.001

*Table 6: The Result of Research Models*

Though the findings investigated in this study are interesting enough, we might consider an extended model which incorporates some additional factors like outsourcing level and variability of infrastructure use. In addition to this, the research model itself can be applied to larger enterprises, and can be tested with non-profit organizations. All of these are the areas for further investigation in the future.

## References

- Antonuccu, Y.L. and Tucker, J.J. (1998). IT Outsourcing: Current Trends, Benefits and Risk. *Information Strategy: The Executive's Journal*, 14 (2), 16-26.
- Armbrust, M., Fox, A., Griffith, R., Joseph, A.D., Katz, R.H., Konwinski, A., Lee, G., Patterson, D., Rabkin, A., Stoica, I. and Zajarria, M. (2009). Above the Clouds: A Berkeley View of Cloud Computing. UC Berkeley Reliable Adaptive Distributed System Laboratory.
- Aubert, B.A., Dussault, S., Patry, M. and Rivard, S. (1999). Managing the Risk of IT Outsourcing. *System Sciences, Hawaii International Conference*.
- Benbasat, I., Dexter, A.S. and Mantha, R.W. (1980). Impact of Organizational Maturity on Information System Skill Needs. *MIS Quarterly*, 4 (1), 21-34.
- Benlian, A. and Hess, T. (2011). Opportunities and Risks of Software-as-a-Service: Findings from a Survey of IT Executives. *Decision Support Systems*, 52 (1), 232-246.
- Catteddu, D. and Hogben, G. (2009). Cloud Computing: Benefits, Risks and Recommendations for Information Security. *European Network and Information Security Agency(ENISA)*, 1-125.
- Diromualdo, A. and Gurbaxani, V. (1998). Strategic Intent for IT Outsourcing. *Sloan Management Review*, Summer, 67-80.
- Earl, M.J. (1996) The Risk of Outsourcing IT. *Sloan Management Review*, Spring, 26-32.

- Gewald, H. and Dibbern, J. (2009). Risks and Benefits of Business Process Outsourcing: a Study of Transaction services in the German Banking Industry. *Information and Management*, 46 (4), 249-257.
- Gonzalez, R., Gasco, J. and Llopis, J. (2006). Information Systems Outsourcing: a Literature Analysis. *Information Management*, 43 (7), 821-834.
- Grover, V. and Goslar, M.D. (1993). The Initiation, Adoption, and Implementation of Telecommunications Technologies in U.S Organizations. *Journal of Management Information Systems*, 10 (1), 141-163.
- Grover, V., Cheon, M.J. and Teng, J.T.C. (1996). The Effect of Service Quality and Partnership on the Outsourcing of Information Systems Functions. *Journal of Management Information Systems*, 12 (4), 89-116.
- Jayatilaka, B., Schwarz, A. and Hirschheim, R. (2003). Determinants of ASP choice: an Integrated Perspective. *European Journal of Information Systems*, 12 (3), 210-224.
- Jurison, J. (1995). The Role of Risk and Return in Informaion Technology Outsourcing Decisions. *Journal of Information Technology*, 10 (4), 239-247.
- Ha, D.Y. and Jo, Y.G. (1998). The Measurement for the Informatization Level for the Small & Medium Business and Factors for the Measurement. *The Asia Pacific journal of Small Business*, 20 (1), 3-28.
- Kauffman, R.J. and Sougstad, R. (2008). Risk Management of Contract Portfolios in IT Services: the Profit-at-Risk Approach. *Journal of Management Information Systems*, 25 (1), 17-48.
- Kim, B.G. (2002). Comparative Study on the Critical Success Factors of Information Systems of Small-and-Medium-sized Companies: Electronic Industry versus Textile industry. *Korea Association if Information System*, 11 (1), 151-173.
- Ko, E., Kim, S.H., Kim, M. and Woo, J.Y. (2008). Organizational Characteristics and the CRM Adoption Process. *Journal of Business Research*, 61 (1), 65-74.
- Kremic, T. (2006). Outsourcing Decision Support: A Survey of Benefits, Risks, and Decision Factors. *Supply Chain Management: An International Journal*, 11 (6), 467-482.
- Kynetix Technology Group, (2009). Cloud Computing: a Strategy Guide for Board Level Executive. Kynetix Management Guide.
- Lee, S.J. (2001). An Empirical Study on Critical Success Factors and User Performance of ERP Systems: Small and Medium Firms. *Asia Pacific Journal of Information Systems*, 11 (4), 155-173.
- Leem, C.S. (2008). Information Technology Maturity Stages and Enterprise Benchmarking: an Empirical Study. *Industrial Management & Data Systems*, 108 (8), 1200-1218.
- Levina, N. and Ross, J.W. (2003). From the Vendor's Perspective: Exploring the Value Proposition in Information Technology Outsourcing. *MIS Quarterly*, 27 (3), 331-364.
- Lim, S.K. (2001). A Framework to Evaluate the Informatization Level. *Information Systems Evaluation Management*, 144-153.
- Loh, L. and Venkatraman, N. (1995). An Empirical Study of Information Technology Outsourcing: Benefits, Risks, and Performance Implications. *Proceedings of International Conference on Information Systems*, 277-288.
- Mell, P. and Grance, T. The NIST Definition of Cloud Computing(Draft). NIST Special Publication, 800-145.
- Rai, A. and Bajwa, D.S. (1997). An Empirical Investigation into Factors Relating to the Adoption of Executive Information Systems: an Analysis of EIS for Collaboration and Decision Support. *Decision Sciences*, 23 (4), 939-974.
- Ravichandran, T. (2000). Swiftness and Intensity of Administrative Innovation Adoption: An Empirical Study of TQM in Information Systems. *Decision Sciences*, 31 (3), 691-724.
- Rim, S., Kong, D., Shim, S. and Han, Y. (2012). A Study on the Significant Factors Affecting the Adoption of Enterprise Cloud Computing. *Korea Society of IT Services*, 11 (1), 173-196.
- Rosen, G. (2010). The Business of Clouds. *ACM Crossroads*.
- So, S.H. (2004). An Empirical Study on the SCM System Adoption in the Korean Small and Medium-sized Enterprises: An Application of Technology Acceptance Model and Innovation Diffusion Theory. *Korean Industrial Economic Association*, 17 (4), 139-142.

- Sung, T.K., Seok, J.C., Joong, H.K. and Jae, K.K. (1998). Evaluation and Implementation Strategy Analysis on Information Infrastructure of Small and Medium Firms. *Asia Pacific Journal of Information Systems*, 8 (3), 75-100.
- Susarla, A., Barua, A. and Whinston, A.B. (2003). Understanding the Service Component of Application Service Provision: Empirical Analysis of Satisfaction with ASP services. *MIS Quarterly*, 27 (1), 91-123.
- The Open Group. (2011). The Open Group Cloud Computing Survey. <http://opengroup.org>.
- Vaquero, L.M., Rodero-Merino, L., Caceres, J. and Lindner, M. (2009). A Break in the Clouds: Towards a Cloud Definition. *Computer Communication Review*, 39 (1), 50-55.
- Whitten, D., Chakrabarty, S. and Wakefield, R. (2010). The Strategic Choice to Continue Outsourcing, Switch Vendors, or backsource: do Switching costs matter? *Information and Management*, 47 (3), 167-175.
- Wu, W. W. (2010). Mining Significant Factors Affecting the Adoption of SaaS Using the Rough Set Approach. *Journal of Systems and Software*, 84 (3), 435-441.
- Yoon, J.S., Han, K.S. and Han, J.M. (1998). An Empirical Study on the Key Management Issues and Critical Success Factors of Information Systems in Korean Small and Medium Firms, *Korean Academic Society of Business Administration*, 27 (3), 759-787.