Application of Value-based Adoption Model to Analyze SaaS Adoption Behavior in Korean B2B Cloud Market

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Abstract

The global recession circumstances, cloud computing has emerged as a new paradigm in the business ICT. This paper deals with Software as a Service (SaaS) adoption among cloud services in the Korean B2B cloud market. The Technology Acceptance Model (TAM) has been popularly utilized for examining how users come to accept a new technology, but this model has some limitation. In order to overcome these limitations of TAM, some models such as extended or modified TAMs and the Value-based Adoption Model (VAM) are developed. This paper aims at developing an exploratory model using VAM which explains company users’ SaaS adoption from the value maximization perspective. The proposed model tests and analyzes a number of hypotheses. The findings of this study can not only help company users to adopt SaaS, but also help SaaS providers to develop the new SaaS business models.

Keywords: B2B, SaaS, Value-based Adoption Model (VAM), Adoption Intention, Cloud Service

1. Introduction

The appearance of cloud computing represents a fundamental change of information technology (IT) as delivering on-demand resources such as Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) [1][2]. As a result of rapid growth of cloud services, the global and Korean major cloud service providers launched commercial B2B and B2C cloud services typed as public and private in the Korean cloud market.

The technology acceptance model (TAM) proposed by Davis in 1986 is a widely applied to explain user’s adoption behavior and usage of new information technology [3][4]. Based on the theory of reasoned action, TAM is a parsimonious model, asserting that all influences of external variables such as system design features on behavior are mediated by usefulness and ease of use [5]. But TAM has its limitations in explaining the adoption of new information and communication technology (ICT). TAM did not consider the consumer perspective, especially customers' value perspective. There are some researches which consumer behavior was value maximization. For example, the prospect theory [6] was suggested that the value function was adopted and defined over perceived gain or loss relative to a reference point. The principles of cost-benefit analyses are exemplified in the concept of value, which is broadly defined as the trade-off between total benefits received and total sacrifices [5, 6]. A value-based model would be able to capture the monetary sacrifice element and present adoption as a comparison of benefits and costs. The value-based adoption model (VAM) proposed by Kim et al. dealt with the influence between the perceived value and adoption intention [5]. They proposed and empirically tested a VAM of M-Internet by integrating the most relevant findings of the technology adoption and value literature. This combined framework represents an approach to understanding consumers’ adoption of mobile technology.

The objective of this study is to examine SaaS adoption intention using VAM in Korea. This study attempts to explore companies’ adoption behaviors toward the B2B SaaS that were recently deployed in the Korean market. In order to achieve the goal, we identified key influencing factors that affect the companies’ adoption behaviors, based on VAM. An explorative model is proposed and a number of hypotheses are tested and analyzed. The application results of VAM to analyze SaaS adoption behavior in Korean B2B cloud market should help in the theoretical understanding of the adoption behavior of Korean B2B cloud service in enterprise context. In practice, the findings of this study can not only help company users to adopt SaaS, but also help SaaS providers to develop the new SaaS business models.
The paper is structured as follows. In Section 2, research background of this study such as cloud computing and value-based model is presented. In Section 3, we propose our research model and hypotheses based on VAM. In addition, VAM application results and discussion of SaaS adoption behavior in Korea are also described. Section 4 concludes the study with a brief summary.

2. Research Background

2.1. Cloud Computing

There are some definitions of cloud computing. This paper presents a representative two definition of cloud computing such as NIST and wikipedia.

First of all, the NIST definition of cloud computing as follows [7]:

“Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”

Second, the wikipedia definition of cloud computing as follows [8]:

“Cloud computing relies on sharing of resources to achieve coherence and economies of scale similar to a utility over a network [7]. At the foundation of cloud computing is the broader concept of converged infrastructure and shared services. The cloud also focuses on maximizing the effectiveness of the shared resources. Cloud resources are usually not only shared by multiple users but as well as dynamically re-allocated as per demand. Cloud computing allows companies to avoid upfront infrastructure costs, and focus on projects that differentiate their businesses instead of infrastructure [9]. That is to say, cloud computing allows enterprises to get their applications up and running faster, with improved manageability and less maintenance, and enables IT to more rapidly adjust resources to meet fluctuating and unpredictable business demand [9][10][11].”

As mentioned above, cloud computing providers generally offer their services according to several fundamental models such as infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS) [7][8][12].

“In the most basic cloud-service model, providers of IaaS offer physical computers or virtual machines and other resources. IaaS-cloud providers supply these resources on-demand from their large pools installed in data centers. For wide-area connectivity, customers can use either the Internet or carrier clouds. In the PaaS model, cloud providers deliver a computing platform, typically including operating system, programming language execution environment, database, and web server. Application developers can develop and run their software solutions on a cloud platform without the cost and complexity of buying and managing the underlying hardware and software layers. With some PaaS offers, the underlying computer and storage resources scale automatically to match application demand so that the cloud user does not have to allocate resources manually. In the business model using software as a service (SaaS), users are provided access to application software and databases. Cloud providers manage the infrastructure and platforms that run the applications. SaaS is sometimes referred to as “on-demand software” and is usually priced on a pay-per-use basis. SaaS providers generally price applications using a subscription fee.

Cloud computing has some deployment models such as public, community and hybrid clouds. Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party and hosted internally or externally.[10] Public cloud is open for public use. Technically there is no difference between public and private cloud architecture, however, security consideration may be substantially different for services [13]. Community cloud shares infrastructure between several organizations from a specific community with common concerns whether managed internally or by a third-party and hosted internally or externally. Hybrid cloud is a composition of two or more clouds (private, community or public) that remain unique entities but are bound together, offering the benefits of multiple deployment models [10].”

2.2. Value-based adoption model (VAM)
Value-based adoption model (VAM) is to achieve parsimony by capturing a small number of factors that account for most of the variance in adoption intention, so that it would be easy and straightforward to predict new technology adoption [5].

The VAM presents in Figure 1. As shown in Figure 1, perceived value is affected by perceived benefits and perceived sacrifices. Perceived value affects adoption intention.

Perceived benefits are derived from the cognitive evaluation theory [14] which classifies motivations into extrinsic and intrinsic subsystems. Extrinsic motivation refers to the performance of an activity to achieve a specific goal while intrinsic motivation refers to the performance of an activity for no apparent reinforcement other than the process of performing the activity per se [15]. Both extrinsic and intrinsic factors have been found to influence perceived value and behavioral intention [16], and these findings also apply to information systems [5] [17].

Perceived sacrifices are both monetary and nonmonetary [18] [19]. Monetary spending includes the actual price of the product, and it is generally measured based on customers’ perceptions of the actual price paid. Non-monetary costs usually include time, effort and other unsatisfactory spending for the purchase and consumption of the product [5].

![Figure 1. The Basic Concept of Value-based Adoption Model (VAM) (Image)](image)

Generally customers try to achieve maximum utility or satisfaction, given their limited resource. Perceived value reflects this by comparing benefits with sacrifices and is therefore an indicator of adoption intention. Kim et al.’s study demonstrated that perceived value affects perceptual intention to use.

3. Application of VAM to Analyze SaaS Adoption Behavior

3.1. Research model and hypotheses

The VAM specifies the causal relationships between perceived benefits, perceived value and actual usage intention. The factors influencing companies’ adoption of cloud services can vary, depending on the IT, the target companies, and the context. The constructs of usefulness and economic feasibility of B2B SaaS were adapted for perceived benefits.

Usefulness is defined as the total value a user perceives from using a new technology [16]. The motivation-oriented perspective of TAM views perceived usefulness as outcome expectancy and a measure of extrinsic motivation [20]. We expect that usefulness has a positive effect on perceived value. Therefore we hypothesize H1. In addition, cloud service has economic benefits because cloud service allows companies to avoid upfront infrastructure costs. That is to say, cloud service allows enterprises to get their applications up and running faster, with improved manageability and less maintenance. We expect that economic feasibility has a positive effect on perceived value. Therefore we hypothesize H2.

The constructs of technicality and security were derived for perceived sacrifices. Cloud service is perceived as being technically excellent in the process of providing services. The technicality of cloud service is determined by users’ perceptions of ease of use, system reliability, connectivity and efficiency. The technicality is defined as “the degree to which a user believes that using a particular system would be free of physical and mental effort” [21]. As the characteristics of cloud service have not been fully modeled in existing information systems research, other elements of technicality have to be considered as the entire experience will contribute to customers’ evaluation of the technology. Technicality of cloud service is a combination of all the non-monetary costs. Therefore we hypothesize H3. The security of SaaS is the security of sensitive data and existing regulation on data privacy and
protection and technicality of SaaS is the limited ability to customize cloud service (SaaS) to meet customer needs. Security of cloud service is also a combination of all the non-monetary costs. Therefore we hypothesize H4.

According to the economic theory of utility, customers try to achieve maximum utility or satisfaction, given their resource limitations [5]. Perceived value reflects this by comparing benefits with sacrifices and is therefore an indicator of adoption intention. The relationship between perceived value and adoption intention has never been examined before, but there is strong empirical support that perceived value affects perceptual intention to use [22]. Therefore we hypothesize H5.

Therefore, we propose the following five hypotheses from VAM and Figure 2 shows the proposed VAM for SaaS adoption.

H1: Usefulness is positively related to perceived value.
H2: Economic feasibility is positively related to perceived value.
H3: Technicality is negatively related to perceived value.
H4: Security is negatively related to perceived value.
H5: Perceived value is positively related to adoption intention

Figure 2. The Proposed Value-based Adoption Model (VAM)

3.2. Reliability and validity

This study has adopted extant validated scales and experimental procedures wherever possible. All measurements have been further checked for reliability and validity.

The scales of all perceptual research variables show good reliability with Cronbach’s alphas greater than 0.7. We also conducted principal component factor analysis on the four independent variables and one dependent variable (perceived value) with VARIMAX rotation. A total of five factors with eigenvalue greater than 1.0 were identified. All items of the variables loaded on each distinct factor and explained 76.5% of the total variance. Most variables showed convergent validity with factor loadings above 0.6. When compared across factors, the items were loaded highest on their own factors. Therefore the results of the factor analysis indicate that the conditions of convergent and discriminate validity were satisfactorily met.

3.3. Testing and results

We collected data from Korean companies’ users of SaaS. We conducted a Pearson correlation analysis and the multiple regression analyses. We presented the testing and analyzing results briefly.

First, perceived value (p<0.001) is significantly related to adoption intention ($R^2=0.415$). Thus, H1 is accepted. Next, the four factors are found to be significantly related to perceived value ($R^2=0.385$): usefulness (p<0.05), economic feasibility (p<0.05), technicality (p<0.05), and security (p<0.001). Thus, H2, H3, H4 and H5 are all accepted. An additional test was conducted to examine the direct effects of
the five antecedents including perceived value on adoption intention. The result shows perceived value is significant at p<0.001 level.

4. Conclusions

This paper explored companies’ adoption intention toward the B2B cloud services focused on SaaS that were provided in the Korean B2B cloud market. In order to achieve the goals, we identified key influencing factors that affect the companies’ adoption intention based on VAM. The exploratory model based on VAM was proposed and a number of hypotheses were tested and analyzed. The VAM specifies the causal relationships between perceived benefits, perceived value and actual usage intention. The factors influencing companies’ adoption of cloud services can vary, depending on the IT, the target companies, and the context. The constructs of usefulness and economic feasibility of B2B SaaS were adapted for perceived benefits. The constructs of technicality and security were also derived for perceived sacrifices. In addition, perceived value is related to adoption intention of B2B SaaS. According to the results, the four factors were found to be significantly related to perceived value. In addition, five antecedents including perceived value had the direct effects on adoption intention of SaaS. The findings of this study can not only help company users to adopt SaaS, but also help SaaS providers to develop the new SaaS business models.

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6. References


