RESEARCH ABOUT FACTOR AFFECTING THE CONTINUOUS USE OF CLOUD STORAGE SERVICE

Chang Joong Jun, Yonsei University, 50 Yonsei-ro Seodaemun-gu Seoul Korea,
cjjun0831@gmail.com, 010-2692-3581
Jung Hoon Lee, Yonsei University, 50 Yonsei-ro Seodaemun-gu Seoul Korea,,
jhoonlee@yonsei.ac.kr, 010-2994-1154
Dong Young, Shin, Yonsei University, 50 Yonsei-ro Seodaemun-gu Seoul Korea,,
shin870420@hanmail.net, 010-8780-1987

ABSTRACT

Many service providers are investing on cloud storage service and competing fiercely for attracting users because it has the potential for the core infrastructure service of mobile and cloud service in the future. They should find out what motivate s the users to keep using the service. In this study, therefore, new variables that show user, system, and psychological switching cost factor are seek and combined with existing TAM and relationship with user's motivation is examined.

Key Words: Cloud Storage, TAM(Technology Acceptance Model), User factor, System Factor, Psychological switching cost factor

1. INTRODUCTION

1.1 Research background

It is becoming quite common for individuals to own more than one device as mobile devices including laptop computers, smartphones and mobile pads have become easily accessible in recent years. Advances in mobile-based information technology environment and changes in content consumption patterns called for cloud storage services with which users are able to have free access to information and send the latest version of selected content and device setting to other devices they have. It was not until 2011 that cloud storage service became popular. All around world, about 150 million people used the service in 2011 and 375 million in 2012, and, now, the number is expected to exceed 625 million in 2013. With the current pace, more than a billion people will be using it by 2016. As more diverse devices are available now, the service is providing more sophisticated services. For example, N-Screen service allows users to use the same content such as music, pictures, videos, and games on all of their devices. Due to the service, device producers can provide the same content for several devices without extra effort for each device. For this reason, they are making efforts for better cloud storage services to provide the integrated content system to users. Cloud storage systems will be a core element that makes it easier for service consumers to use services or content on more than one device at the same time. Therefore, the trend will be one of the important factors encouraging more use of cloud storage system. The main global IT companies like MS, Google, and Apple develop and provide new cloud storage services one after another to retain their current customers and expand their customer base, leading to an explosive increase of users.

1.2 Research purpose

Apple, a mobile device producer, allows each customer to use iCloud, a cloud storage and cloud computing service, with a storage capacity of up to 5GB and provides software development kit, a set of software development tools, for free to encourage people to develop apps without limitation. Developers are now able to make apps using cloud services with no financial burden. Apple is providing the free iCloud service, despite huge investment costs, because profits are expected to outweigh the costs. That is, Apple will be able to retain its customers when the company adds cloud features to iPhone apps since the users can't use data collected through the service on other devices that run on different operating systems. Some mobile phone carriers like SKT and KT provide their cloud storage services only to their mobile service users to retain and acquire users. Internet service providers including Google and Naver are tying it hard in order to take the initiative in the market and hold their service users. They use the same strategy as mobile phone carriers: providing a limitless storage service and user interface only to their service users. There is a reason why mobile device producers, mobile phone carriers and Internet service providers, are all aggressively making an investment: a mobile storage service could be most important in future mobile and cloud services. They are, thus, struggling to draw more service users to gain a competitive edge earlier.

Therefore, in order to acquire and retain the service users, the companies have to find ways to attract users and make them consistently use their services. Such an effort will help them hold a dominant position in an era of cloud and mobile services and service consumers will be able to enjoy more convenient and use ful service benefits. This research examines Technology Acceptance Model: TAM[1], an information systems theory that models how users come to accept and use IT new technologies, together with variables that show different factors such as user, system, and psychological shifting costs. Based on the examination, the research compares the result to user's beliefs to find the relation between them and identifies why users continue to use cloud storage services

.

2. THEOLOGIACAL BACKGROUND OF RESEARCH

2.1 Cloud Storage Service

As defined in Wikipedia, cloud computing is web-based software service that are delivered to computers or mobile phones over a network from programs in online utility data server. Cloud computing is mainly used in two ways these days: personal cloud and mobile cloud. With personal cloud, users who own several computing devices can use the latest version of content - pictures, videos, addresses, documents, games, or e-mails - whenever and wherever. Also, IT resources like software or data storage unit from mobile cloud can be used on mobile devices such as smart phones not personal computers. The most noticeable feature in personal cloud system is cloud storage. Cloud storage generally means, as defined in Wikipedia, a service providing users with storage pool where they save personal files or data units. Usually, common storage hosting companies run huge date centers and sell or lease storage services to those who need the service. Apple's iCloud, Google Drive and Dropbox are most famous cloud storage services. iCloud works as a hub through which users sends and receive PIM(personal Information Management) data residing in device features such as e-mail, address book, schedule,

book mark or memo. Document tool feature of Google Drive allows users to integrate different data and they can share it with other users. Through Dropbox, users can make an automatic extra copy of every stored file to keep it safe and all of those files are available on any other computers and smart phones. In a survey in which respondents were asked what features are needed for cloud storage services on Korean portal websites[2], they said the following conditions are most important; file security: document editing and saving: mass storage capacity: easy uploading and downloading: security and convenience: storage capacity and simple menu: ease of use : security. All of those belong to either of two categories; usefulness or security. Cloud storage service should be able to replace an external hard disk drive, a portable storage device, and provide environment where users can use the service regardless of time and space. Those functions are what the service itself was made for. That is, users want to use the service when they can enjoy numerous functions and mass storage capacity. Also, users consider security important because of fear that someone might have access to their files or data as cloud storage service is easily accessible to everyone. Contrary to usefulness, as users doubt about security and safety of files more and more, it will have a negative influence on users' intention to use. Researchers are working hard these days to find out how usefulness affects intention to use and research results show that usefulness plays a positive role on intention to use[3]. In other words, usefulness is the main factor that has an influence on potential users when they make a decision and actually start to use the service. In addition, researches on how usefulness and technology acceptance are related show that usefulness influences intention to use cloud storage service.

2.2 The Technology Acceptance Model (TAM)

There have been a number of studies about factors that have an influence on accepting high-tech products or advanced technologies like cloud storage service technologies as introduced above. Researches examining how users accept new information technologies are based on social psychology theories that talk about belief, attitude, behavioral intention, and behavior. As more studies were conducted in a social psychological aspect to identify causes of personal behavior, the application of studies expanded farther to a process of information technology acceptance. A notable theory is Technology Acceptance Model (TAM)[1]. Davis (1989) pointed out perceived usefulness and perceived ease of use as important factors influencing users' decision about using a new information technology. Perceived usefulness means the degree to which a person believes that using a particular information system would enhance his or her job performance. Perceived ease of use means the degree to which a person believes that using a particular information system would be free from effort. Davis (1989) hypothesized that perceived usefulness and perceived ease of use were major determinants of whether users will actually use or reject the information system. Attitude and behavioral intention were considered to be influenced by perceived usefulness and perceived ease of use, with behavioral intention having a direct influence on actual system use in turn. The TAM has been continuously studied, proved, and expanded by many scholars over the last two decades since Davis first proposed it in his doctoral thesis related to management information system (MIS). Researchers who study the TAM are refining the model to include other external variables in order to overcome the limitations the model has. Today, researches on technology acceptance are still ongoing and several additions to the TAM are being proposed for a better understanding of users' technology acceptance process. History of TAM research evolution and variable extension is summarized below. The TAM has gone through several levels of development for about 20 years and the process can be

summarized into five stages [4]

- •Model Introduction: Explaining technology acceptance process in terms of perceived usefulness and perceived ease of use
- •Model Verification: Testing the reliability of the scale items used to measure perceived ease of use and perceived usefulness in TAM
- •Model extension: Adding new beliefs or external variables to research in order to expand the TAM to different settings
- •Model Refinement: Refining the model by verifying perceived usefulness and correlation of social influence process and cognitive instrument process
- •Model Integration: Combining various kinds of theories such planned behavior theory or innovation diffusion theory and suggesting an integrated model

Venkatesh and Davis(2000) first brought extension to the original TAM model by adding the importance of subjective norm, suggested by Fishbein & Ajzen(1975), and proposed extended TAM(TAM2)[5]. In terms of explanatory power, it turned out TAM explains only about 40% of technology acceptance, whereas TAM2 reaches approximately 60%. Venkatesh and Davis explained perceived usefulness and intention to use in terms of social influence, voluntariness, image, job relevance and cognitive instrumental process.

2.3 Switching Costs in Cloud Storage Service

A variety of information technology services today – online shopping, Internet banking, Internet auction or mobile storage – have made information system researchers invest time and effort providing a theoretical framework to understand customers' decision to use new information technology services. Because relevant studies are chiefly concerned with customer evaluation, existing services have received little attention although their role is important when users choose a new service. Migration research in human geography offers a theoretical framework about migration, and, thus, the research will be still useful even though customers change the service channel they used to use. When people move to other areas, it is similar to a situation when customers move from a service channel to another. Lee(1966) said decision making in personal and social environments is influence by variables like personal expenses - interference from family, personal concern or moving cost, for example – while one's decision to move depends on personal and subjective evaluation of negative and positive factors[6]. If applied to channel shift of cloud storage service, variables can be dissatisfaction with the current cloud storage service channel (negative factor), perceived usefulness of mobile cloud storage service channels, and economic, psychological, and emotional costs caused by service switch, which all belong to switching costs. There are two kinds of shifting costs; Sustainable cost and initial costs[7]. Sustainable cost include loss performance costs, which occurs when you change service providers, and uncertainty costs, an anxious feeling that come from new services. Initial costs include pre-switching search evaluation costs for searching and evaluating new alternatives, post-switching search and evaluation costs needed to adjust to new alternatives, and setup costs necessary to become familiar with new services.

In the existing researches on shifting costs, initial costs included learning costs and other costs for service users with which they can search for and evaluate new alternatives. When a person accepts a system, however, there is no need for those costs since a new system is already provided. When customers accept a new system, they hope that they need the least amount of money necessary to get used to the new system. That means they will have difficulty getting

ready for a new system in terms of internal and external environments[8]. For example, when online customers change their online service provider, it will cost time and effort for them to build a new interface with a new service provider and learn new features of a new system. The psychological costs and other problems they face when they use new services will stop them from shifting to a new system[9]. When it comes to cloud storage service, however, it doesn't take much time for customers to learn how to use the service because they will be using the same window file system with a virtual drive added. Users can just download and install programs for the virtual drive to use in the same way they used the existing window system. Therefore, it won't cost much expense, including psychological burden, for users to adjust to a new environment and learn something new when they move to a new cloud storage service.

3. RESEARCH MODEL AND HYPOTHESIS

This study provides research models and hypotheses based on theoretical assumptions. There are many researches going on now about how functional attributes, of information technology products or services, affect intention to use regarding services. Researches on technology acceptance have been conducted with emphasis on user-centered psychological variables until recently. Now, researchers are also examining acceptance factors, including various attributes of information technology products, in order to complement and expand studies. In "A Study of the influential factors on Choice Intention for Tablet PC" [3], the author counted functional attributes of Tablet PC as one of the main external variables and concluded that functional attributes had a positive effect on parameters. That is, functional attributes of mobile devices like tablet PC are one of the reasons why users decide to use some device. The fact has great implications in that functional attributes from high technology give satisfaction to users of mobile devices and the users are similar although those functions are not a product itself. After applying the research results to cloud storage service, we can gain the following hypotheses.

Hypothesis 1. Functional attributes of cloud storage service will have a positive influence on perceived ease of use.

Hypothesis 2. Functional attributes of cloud storage service will have a positive influence on perceived usefulness.

Many researches are being conducted to find out what influence security, one of the important conditions of cloud storage service according to a survey about the service has on intention to use service[2]. A study of customers' purchase intention for Internet tour package proved the hypothesis that perceived risk has a negative effect on perceived usefulness[10]. In a research of consumer response to Internet shopping, Jarvenpaa(1997) said perceived risk related to personal privacy and credit card use had a negative effect on consumers' attitude toward online shopping[11]. According to Featherman(2003), those who find it convenient to use e-payment service, among the service users, tend to rate perceived rick low, and vice versa[12]. In addition, they are willing to keep using new e-commerce service. Security rick of Internet shopping malls influence perceived usefulness in a meaningful way but not on perceived ease of use according to Seo Changgyo(2001)[13]. Based on earlier studies, let us suppose that perceived security risk will influence perceived usefulness in cloud environment.

Hypothesis 3. Security risk in cloud storage service will have a negative influence on perceived usefulness.

Personal innovative attributes have been considered as a major variable in technology adoption. Early adopters, with technological knowledge and finances, are highly educated, well paid,

deeply interested in media, and eager for information. They have been reported to be opinion leaders who have an influence on many people[14]. When a person accepts innovation technologies, personal psychological tendencies as well as demographic factors play an important role in one's decision. It turned out that one's innovative tendencies, above all things, have a considerably meaningful influence.

Hypothesis 4. Personal innovative attribute will have a positive influence on perceived ease of use.

Hypothesis 5. Personal innovative attribute will have a positive influence on perceived usefulness.

Researches on the extended technology acceptance models have proved self-efficacy is an influential element in technology acceptance[15]. Igbaria(1995) demonstrated self-efficacy has direct and indirect influence on usefulness and ease of use for PC users[16]. Hasan(2006) confirmed that self-efficacy in information system acceptance affects technology acceptance in a direct way. A recent domestic research also verified that mobile self-efficacy has a positive effect on ease of use and usefulness.

Hypothesis 6. Self-efficacy will have a positive influence on perceived ease of use.

Hypothesis 7. Self-efficacy will have a positive influence on perceived usefulness.

As explained in the previous study, Sustainable cost, contrary to initial costs, occur as users come to enjoy more benefits from existing services and become more dependent on them when they keep using services regardless of initial service setting. Thus, if someone considers Sustainable cost must be high, it indicates that the person thinks the current service is providing such great benefits and he is anxious about a new system. If the person considers it low, on the other hand, that means the person thinks a new system will offer an equivalent level of benefits. In other words, Sustainable cost represents a sort of dependence on the existing system and a high Sustainable cost indicates that a new system is not likely to replace the established system[17]. Therefore, shifting costs are the same as sacrificing useful aspects of the earlier relationship when users turn to a new service provider, which is psychological loss[18]. An interrupted relationship with the previous system means increased uncertainty toward an unreliable service provider. Risk and uncertainty tend to increase more when it is hard to evaluate quality of alternatives[19]. The higher perceived Sustainable cost get, the more users want to remain in the current cloud storage service according to the earlier references. Those considerations with regard to cloud storage service lead us to the following hypothesis.

Hypothesis 8. Sustainable cost will have a positive influence on continuous intention to use the established cloud storage service.

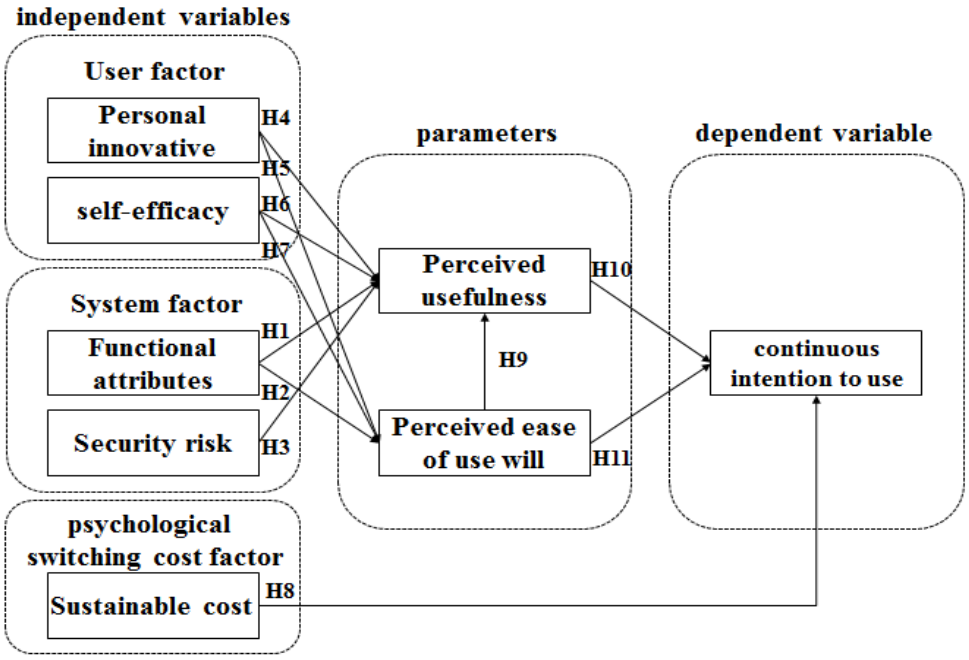
In addition to eight hypotheses above based on references, definitions of measurement variables – six independent variables, two parameters, and one dependent variable - are summarized as follows, along with three additional hypotheses proved in the traditional TAM.

Hypothesis 9. Perceived ease of use will have a positive influence on perceived usefulness.

Hypothesis 10. Perceived usefulness will have a positive influence on continuous intention to use the established cloud storage service.

Hypothesis 11. Perceived ease of use will have a positive influence on continuous intention to use the established cloud storage service. This technique collects and exchanges opinions through repeating survey on experts and develops the suggested opinions to predict the future: a method to repeatedly collect and exchange opinions from various experts, and develop the opinions to predict the future.

Figure 1. Research Model and Hypothesis



4. RESEARCH METHOD

4.1 Operational Definition of Variables

The research variables used in this study are from measurement tools that proved reliable and valid in previous studies. Table 1 includes operational definition of variables and academic sources. All variable was rated using 7-point Likert scale. In the table below, independent variables are divided into three types; user factor includes personal innovation characteristic, and self-efficacy: system factor includes functional attributes and security risk: psychological shifting factor include Sustainable cost and initial costs. Parameter is TAM-based ease of use and usefulness and dependent variable is intention to use.

Table 1. Operational Definition of Measurement Variables

Measurement Variable		Operational Definition	Reference
Indep-endent Varia-ble	personal innovation characteristic	A tendency to seek new technology use and accept the technology aggressively	Agarwal and Karahanna (2000), Son Seunghye (2011), Kwon Ojun (2010)
	Self-efficacy	Judgment and confidence about one's own ability to successfully handle mobile cloud storage and do other related activities	Bandura(1997), Higgins(1995), Kim Gyeonggyu (2009)
	Functional Attributes	A package of diverse functions that satisfy personal desire such as	Fang Wang(2007), Philip Koehler(2010),

		consumer satisfaction or expectation towards mobile cloud storage feature in smart devices - 1) Auto Sync 2) Backup & Restore 3) File Share 4) Storage Capacity 5) Service Quality	Moon Seongcheol (2012)
	Security Risk	Fear that someone might access or steal file or data	Lim(2006), Park Ginam (2003), Jang Eunyeong (2011)
	Sustainable cost	1. Loss Performance Costs that occur when users change service providers 2. Uncertainty Costs that occur when users fail to keep the previous relationship with service providers	Wathne et al.(2001), David Gefen(2002), Michael A Jones(2002),
Para-meter	Ease of Use	The degree to which a person believes that he can use cloud storage service without much effort	Davis(1989)
	Usefulness	The degree to which a person believes that using cloud storage service would be useful	Davis(1989)
Depen-dent Varia-ble	Intention to Use	Possibility that customers might want to keep using cloud storage service	Davis(1989), Agarwal&Karahanna (2000)

4.2 Data Collection Methods

This research will conduct an online survey of cloud storage service users to verify aforementioned hypotheses, asking them to respond to the survey if they are using more than one of the following services; KT Ucloud, SKT Tcloud, Daum Cloud, and Naver Ndrive of Korea and Apple iCloud, Google Drive, Dropbox, and SugarSync of foreign countries. Service users only will be surveyed because this study's main purpose is to analyze factors influential to existing service users' continuous service use. Those who are to polled may have difficulty answering whether they are using the service because cloud storage is an unfamiliar concept. To avoid such confusion, this research chose domestic and foreign representative services.

5. Conclusions

This research has implications for a cloud storage service sector. First, in a theoretical aspect, if it could be proved the TAM can be applied to the IT industry, the fastest growing field now, the TAM would be able to expand to services related to Personal Cloud like Desktop Cloud, a similar service. It will lead to lasting expansion and growth of cloud storage services in a situation where it is hard to find TAM-applied examples in Korea and abroad. Shifting costs have been barely used as independent variables when it comes to application of the TAM in Korea and abroad when identifying why new IT technologies are constantly used. However, Shifting costs,

psychological costs caused by service shifting, are expected to have a significant influence on belief variables including ease of use and usefulness. This will convey useful information to service providers; cloud storage service will be the most basic infrastructure in personal cloud services and constantly retain users.

Second, in a practical point of view, functional aspects must be playing an important role if the following hypothesis proves true; users keep using cloud storage services because of convenience and usefulness at work and at home. Also, it is expected that cloud storage services will have a huge influence on innovative users' beliefs, perceived ease of use and usefulness, while self-efficacy will have an effect on usefulness in a meaningful way but not on ease of use.. That is, users with a strong innovative inclination will use cloud storage services more actively regardless of personal perceived ability to use IT technologies. For individuals, after all, cloud storage services mean a new paradigm shift to use information technologies and ability, a functional aspect, is not important here. Therefore, drawing innovative users to cloud storage services or instilling innovative spirit to individuals will be greatly helpful for sustained growth of personal cloud services.

References

[1] Davis, F.D. "Perceived Usefulness, Perceived ease of use, user acceptance of Information Technology", MIS Quartely, 1989.

[2] Hong, Y. S. "Evaluation of the Usability of Local Web Portal Cloud Storage Service", Digital Design Studies, 2011.

[3] Moon, S. C. "Understanding Tablet PC Adoption : An Extension of the Technology Acceptance Model", Korea Press Bulletin, 2012.

[4] Yoo, J. H. "A Comprehensive Review of Technology Acceptance Model Researches", Entrue Journal of Information Technology, 2010.

[5] Venkatesh, V. & Davis, F.D. "A Model of the antecedents of perceived ease of use: Development and test", Decision Sciences, 1996.

[6] Lee, E. S. "A Theory of Migration", Demography, 1966.

[7] Kim, K. M. "Customers' Switching Mechanism toward Mobile Banking", Korea Corporation Management Association, 2008.

[8] David Gefen, "Customer Loyalty in E-Commerce", Journal of the Association for Information Systems, 2002.

[9] Hsien-Tung Tsai, "Determinants of e-repurchase intentions: An integrative model of quadruple retention drivers", 2007.

[10] Kim, T. M. "A Study for User`s Purchasing Intentions of Internet Travel Products", Korea Academic Society of Tourism Management, 2009.

[11] Jarvenpaa, "Individual Differences and Internet Shopping Attitudes and Intentions", 1997.

[12] Featherman, "Predicting e-services adoption: a perceived risk facets perspective", International Journal of Human-Computer Studies, 2003.

[13] Seo, C. K. "Factors Affecting the Participation of Korean Companies in e-Marketplaces", The Korea Society of Management Information System, 2001.

[14] Turnbull, W. & Meenaghan, A. "Diffusion of innovation and opinion leadership", Journal of Marketing, 2001.

[15] Agarwal, R. Sambamurthy, V. Stair, R. M. "The evolving relationship between general and specific computer self-efficacy-An empirical assessment", Information System Research, 2000.

[16] Igbaria, M. Iivari, J. “The effects of self-efficacy on computer usage”, Omega: International Journal of Management Science, 1995.
[17] Thomas A. Burnham, “Consumer Switching Costs: A Typology, Antecedents, and Consequences”, 2003.
[18] Wathne, et al. “Choice of supplier in embedded markets: relationship and marketing program effects”, Journal of Marketing, 2001.
[19] Zeithaml, V.A. “Problems and strategies in services marketing”, 1985.