Computers in Human Behavior 52 (2015) 219–232

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

User continuance intention to use cloud storage service

Heng-Li Yang *, Shiang-Lin Lin

Department of Management Information Systems, National Cheng-Chi University, No. 64, Sec. 2, Chihnan Road, Wenshan District, Taipei 11605, Taiwan

ARTICLE INFO

Article history:
Available online 17 June 2015

Keywords:
Cloud storage service
Task-technology Fit
Technology acceptance model
Privacy risk

ABSTRACT

Cloud computing is a huge and important change in the field of network application in recent years to provide users with a completely different IT service and delivery mode. Among various cloud services, cloud storage is a service most closely related to web users' need because it involves the storage of users' all important data and backup files. In this study, a sample survey was conducted in Taiwan, and key factors influencing individual users' adoption of the cloud storage service were analyzed and discussed based on Task-Technology Fit theory. The research results indicate that "cloud storage service", "unstructured task", "cloud storage self-efficacy" and "opinion of reference groups" all have significant positive influences on the "perceived usefulness", which further has influence on users' continuance intention to use the cloud storage service. The findings also support that the privacy protection risk and the lack of privacy-policy risk in the cloud storage service produce negative moderating effects on the perceived usefulness and the continuance intention.

1. Introduction

While the network technology quickly develops, information technology (IT) companies encounter many difficulties and challenges, forcing them to change their IT infrastructure and operation modes (Yu & Tao, 2009). After the change of the mainframe computer to the client/server network in the 1980s, cloud computing is another huge and important change in the field of network application in recent years to provide users with a completely different IT service and delivery modes (Park & Ryoo, 2013). The cloud computing is the user in an Internet-accessible environment can quickly share or access network resources (e.g., remote servers, storage spaces and network service applications) and interact with service providers through some easy operating interfaces and management modes. IT companies have provided effective and efficient infrastructure deployment, with which users can make use of various cloud services directly via networks (Kim, 2009; Marston, Li, Bandyopadhyay, Zhang, & Ghalsasi, 2011) without the need of purchasing expensive software or hardware.

Cloud computing provides users with a new business service mode, which assure the storage of important data in a network storage space (Yang & Jia, 2012). Traditionally, most users might use their computers or mobile devices to edit documents, play audio/video files and share data with others, and all these files must be stored in the users' own hardware devices. By storing files in this manner, the users could not access or share the files in an urgent condition. Further, since many of the users' data change frequently, inconsistency of data might occur when editing these data on different computer devices (Wang, Wang, Ren, Cao, & Lou, 2012). In addition, data backup would be also a very important issue to many users (Zhang, Feng, & Qin, 2013). Nowadays, it is possible to mitigate the above problems by using cloud storage service (CSS).

In 2012, the survey conducted by Gartner Group indicated that about 19% of organizations are using the cloud for production computing, while 20% are using cloud storage services.[1] It means there is a pretty good potential market for the cloud storage. About the application of cloud storage service, Techtarget pointed out in their cloud pulse survey in 2013 that most popular applications of cloud storage include data backup (56%), file sharing (51%) and disaster recovery (36%).[2] Pursuing these new business opportunities, many IT firms have provided cloud storage services, such as Amazon S3, Google Drive, SkyDrive and Dropbox.

However, information technological products are characterized in their high replacement rates and short service life circles (Moore & Benbasat, 1991). Whenever a new product is introduced into the market, it is necessary for the users to perceive the usefulness of the product in their daily task performance (DeLone & McLean, 1992, 2003). In addition, consumers are also concerned about risk

* Corresponding author.
E-mail addresses: yanh@nccu.edu.tw (H.-L. Yang), shiang0623@gmail.com (S.-L. Lin).

[1] Gartner Group, http://www.gartner.com/newsroom/id/2220715, 2014.
[2] TechTarget, http://www.computerweekly.com/resources/Storage, 2014.

http://dx.doi.org/10.1016/j.chb.2015.05.057
0747-5632/

of using products (Cox & Rich, 1964). Furthermore, being a type of network application service, cloud storage would carry more perceived risk than other physical products (Biswas & Biswas, 2004). TwinStrata carried out a survey about cloud storage adoption in 2014, and asked participators about their objection to using cloud storage. More than 62% of the respondents selected privacy security and loss of control as the biggest barriers and concerns for adoption cloud storage (62%).[3] InformationWeek also conducted an online questionnaire in 2014, and the survey result revealed more than 86% of the respondents had worries about the private security problem, and 52% of the respondents suspected the reliability and availability of using cloud storage.[4] These survey results implied privacy protection mechanism and policy are very important factors to users in determining whether to use the cloud storage service. Currently, most users still tend to doubt the privacy protection in the cloud environment; they think there must be some risk in using the CSS and hesitate to store important or confidential data in the cloud space. The above concerns would largely limit the benefits and advantages of cloud service that were expected to achieve and become the challenge to IT providers.

On the academic side, cloud computing has been getting increasing attention and represents nowadays one of most important research topics in computing science (Stantchev, Colomo-Palacios, Soto-Acosta, & Misra, 2014). However, most of the researches emphasized on the theoretical discussion (Marston et al., 2011) or technological development (Tsai & Hung, 2014), while few of them are directed to the factors that are considered by users before they decide to use the CSS. In addition, most of the relevant studies having been conducted in recent years are aimed mainly at the analysis of the advantages/disadvantages and the benefits of business-level cloud computing technology (Ghormley, 2012), while few of the related literature are directed to the study of individual users' intention of using the cloud services (Obeidat & Turgay, 2013). Therefore, the major purpose of this study is to identify the key factors influencing individual users' adoption of the CSS.

2. Literature and hypotheses

Regarding how the IT helps individuals in their daily life and contributes to individuals' good performance in their tasks, the core of two theories, namely, Technology Acceptance Model (TAM) and Task-Technology Fit (TTF) are important in understanding why individuals use one technology in carrying out their tasks (Klopping & McKinney, 2004; Yen, Wu, Cheng, & Huang, 2010). Based on the context and properties of CSS, we adopt two theories as the basis of the research model. We consider "*Unstructured Task*" as the "task" variable, and consider "*Cloud Storage Service Support*" as the "technology" variable in TTF. Further, since CSS is a high-technology service, it becomes important to consider "*Cloud Service Self-efficacy*", the "individual" variable in TTF. Based on the TTF theory, it is expected that CSS can help an individual in completing a task or job in his/her daily life. Moreover, in the existing society, word-of-mouth and risk consideration would also be important to user's decision on adopting or continuing to use the CSS. Therefore, we also add two other variables, "*Opinion of Reference Groups*" and "*Privacy Risk*", as the factors that would influence a user's intention to use the CSS. The following paragraphs explain how our hypotheses are inferred.

TTF proposed by Goodhue & Thompson in 1995 interprets the mutual dependency among task, technology and individuals. Goodhue (1995) defined the task characteristic as all activities carried out by individuals in turning inputs into outputs, and deemed the technology characteristics as tools used by individuals in carrying out their tasks. Mathieson and Keil (1998) mentioned that when the IT is able to support a user in his/her task, the user's perceived usefulness of IT would increase, which in turn increases the intention to use IT. Dishaw and Strong (1999) conducted an investigation on the program analysts in three enterprises for their software maintenance task; and also found that the services that can be provided by the software and the task being undertaken by the user have significant positive correlation with perceived usefulness. Seddon (1997) and Rai, Lang, and Welker (2002) pointed out that when the information or help provided by a system to users is able to increase the users' task performance, the users' perceived usefulness of the system will be significantly positively influenced. Yen et al. (2010) also pointed out that there are increasing daily tasks conducted through mobile devices and wireless technology, and the usefulness coming along with the technology characteristics of IT can be perceived by the users. However, when the IT fails to provide services to the user or fails to support the user's task, the user will doubt and lose trust in the extent to which the task performance can be upgraded with the help of IT (Jarupathirun & Zahedi, 2007; Larsen, Sørebø, & Sørebø, 2009; Lee, Cheng, & Cheng, 2007).

Further, many other studies on perceived usefulness also mentioned that the services provided by IT and the daily tasks undertaken by users will also directly influence the task performance brought by IT and the users' perceived usefulness of IT, which in turn influences the individuals' usage intention and behavior (Goodhue, 1998; Pagani, 2006), especially when the characteristic of work/task is unstructured. Unstructured tasks are ill-defined, ambiguous, non-routine task which lack for completely specified goals for the problem, lead to a greater number of undefined alternatives, and do not have established procedures for the worker to follow (Harris & Brightman, 1985; Abdolmohammadi & Wright, 1987; Jonassen, 1997). When an individual encounters this kind of works/tasks, he or she may normally be asked to handle and execute the tasks through teamwork (Langan-Fox, Wirth, Code, Langfield-Smith, & Wirth, 2001). Moreover, some unexpected conditions, such as unscheduled meetings, casual requests from boss or client and the like, tend to occur during work and necessitate the individual worker to access important data at any time and any place in response to such unexpected conditions (Nievelstein, Van Gog, Van Dijck, & Boshuizen, 2013). Via Internet, CSS can provide users many powerful functions that are quite different from the conventional ways of using data, such as online editing, data synchronization and sharing, automatic file backup, and so on (Spillner, Müller, & Schill, 2013). With the support from these powerful functions, the individual worker would perceive that CSS is able to effectively support and upgrade his or her performance in handling the unstructured work/task, and accordingly has the continuance intention to use CSS. Based on the above discussion and viewpoints, we put forward the first H1 hypothesis and the second hypothesis H2.

H1. The cloud storage service support has significant positive influence on users' perceived usefulness of cloud storage service.

H2. The unstructured task has significant positive influence on users' perceived usefulness of cloud storage service.

The concept of self-efficacy defined in Bandura's social cognitive theory (SCT) has important influence on human behavior (Bandura, 1977). Self-efficacy is the extent or strength of one's belief in one's own ability to complete a task (Bandura, 1982). Meanwhile, computer self-efficacy has been identified as a key determinant of computer-related ability and use of computers (Hasan, 2003).

[3] Twinstrata, http://www.twinstrata.com/snapshot-cloud-storage-adoption/, 2014.
[4] Information Week, http://reports.informationweek.com/abstract/24/12015/Storage-Server/Research:-2014-State-of-Storage, 2014.

Compeau and Higgins (1995) adopted multiple factors to predict situations of computer use and found computer self-efficacy is the most important variable in predicting situations of computer use behavior. An individual with higher perceived computer self-efficacy might have accumulated more experiences, feel less difficulty in learning new knowledge, and perceive more benefits in using computer (Bandura & Schunk, 1981; Hill, Smith, & Mann, 1987). Therefore, higher computer self-efficacy leads to higher perceived ease of use and perceived usefulness of the IT, which in turn increases the user's continuance intention to use the IT (Igbaria & Iivari, 1995). Gravill, Compeau, and Marcolin (2006) also pointed out that higher computer self-efficacy leads to stronger intention to use computer technology, better learning effect and problem-solving ability, as well as largely increased perceived ease of use and usefulness of computer. In recent years, cloud service is one of the most important trends in technological innovation. However, CSS is a newly emerging technological service in the field of cloud service, and it involves various different computing devices. In order to perceive the brought benefits, the user first needs to learn more about the functions and the technology thereof has higher self-efficacy of the cloud service (Ratten, 2013). Therefore, cloud storage self-efficacy (CSE) is more sophisticated than computer self-efficacy. A user is considered having self-efficacy in using CSS when the user determines through self-judgment that he or she has demand for CSS and has the ability to effectively use it or handle any service failure or interruption if any. Therefore, based on the above discussion and viewpoints, we further propose the third hypothesis H3.

H3. Cloud storage self-efficacy has significant positive influence on user's perceived usefulness of cloud storage service.

Richins (1983) considered word-of-mouth (WOM) propagation as a propagating behavior through interpersonal oral communication, in which persons discuss and exchange their experiences to thereby acquire more information and knowledge about some specific product/service and in turn affect other consumers' cognition of the product/service (Lee, 2014). Sheth (1971) pointed out that suggestion or recommendation through WOM does not have any commercial motivation and is thus considered by users to be more trustworthy than advertisement. Therefore, WOM propagation is considered a voluntary, reliable and trustworthy information resource and has powerful influence and effect on consumers' attitudes and intention of use toward a product/service. It is also found that online WOM or electronic WOM (eWOM) has significant positive influence on user's perceived usefulness (Herr, Kardes, & Kim, 1991). Park and Lessig (1977) also indicated that user behavior and user cognition are affected not only by user's internal mental mechanism and mental power, but also by external information, such as WOM and recommendation from family members or friends. CSS is a new service and strange to many individuals. When facing this fresh novel service, users tend to change their cognition and viewpoints on it when they receive positive opinions or recommendations from external groups or even product-favorable statements made by some professionals of related field, and think the service is useful and helpful to them. Trenz and Huntgeburth (2014) also pointed out that a user, who is considering whether to use a cloud service, will first listen to other reference users opinions and experiences in using the cloud service, in order to have a clear idea about the merits and benefits of the cloud service before deciding to use it. Based on the above discussion and viewpoints, we further propose the fourth hypothesis H4.

H4. Opinions of reference groups have significant positive influence on user's perceived usefulness of cloud storage service.

In 1980, Oliver proposed Expectation Confirmation Theory (ECT) which explained post-purchase or post-adoption satisfaction as a function of expectations, perceived performance, and disconfirmation of beliefs. ECT is widely used in studying the consumer behavior to realize users' repurchase and continuance intention (Bhattacherjee, 2001a; Hsu, Chang, Chu, & Lee, 2014), and the predictive ability of this theory has been demonstrated over a wide range of service continuance contexts (Patterson, Johnson, & Spreng, 1997). According to the ECT, Bhattacherjee (2001b) put forward an expectation–confirmation model, in which continuance intention is used to predict and explain users' behavior of continual use of an information system, and pointed out that users' expectation on the system they have used or the extent to which the system can upgrade or help in users' work performance would affect the users' continuance intention to use the system. Furthermore, Joo and Sang (2013) and Park, Kim, Shon, and Shim (2013) investigated factors that have influence on the adoption of smart phones by users and indicated that users have continuance intention to use smart phones when they perceive the usefulness of smart phones in helping them accomplish their daily task. In other words, if users found the novel IT is useful in conducting their daily task, they would use the IT continually (Igbaria & Tan, 1997). Moreover, Park and Kim (2014) indicated that using mobile cloud services could improve users' job performance, and thus perceived usefulness would have positive effects on intention to use mobile cloud services. When users feel CSS can well help them increase reliability and to reduce potential threats of data loss and therefore enhances the work performance, they will have higher continuance intention to use the CSS. Therefore, based on the above discussion and viewpoints, we further propose in this study the fifth hypothesis H5.

H5. User's perceived usefulness of cloud storage service has significant positive influence on users' continuance intention.

In the 1960s, the concept of private risk perception became a very important topic. Dowling and Staelin (1994) pointed out that when a user perceives a high risk level during a decision-making process, he might give up the use intention in order to reduce the risk in using the product/service. Perceived risk is considered as a main determinant of public opposition to novel technology (Chen, Lin, & Cheng, 2013), and has negative influence on users' intention to use products/services (Cheng, Lam, & Yeung, 2006; Featherman & Pavlou, 2003; Lee, 2009; Luarn & Lin, 2005). Many researchers (e.g. Cheng & Lai, 2012; Jaeger, Lin, & Grimes, 2008; McCreary, 2008; Shin, 2013; Takabi, Joshi, & Ahn, 2010) have indicated that issues such as security and privacy are among the topmost concerns in organizations' cloud adoption decisions.

CSS allows users to store personal files in a space on a network. However, if the cloud service providers fail to provide a good mechanism of privacy protection, the personal files stored in the network space are actually exposed to the privacy risk (Liu, Wang, & Wu, 2012; Wei et al., 2014; Yeo, Phang, Lee, & Lim, 2014). Meanwhile, CSS users might be also worried about that CSS providers or some vicious users could illegally analyze their interest and hobbies through the CSS access records (Svantesson & Clarke, 2010). Users' continuance intention to use CSS will be largely reduced if the personal data stored in the cloud storage is subject to the risk of being illegally used in commercial activities while the users' are completely kept in ignorance of the case.

Besides, King and Raja (2012) claimed that it would be essential for the cloud computing industry to earn consumers' trust by ensuring adequate privacy and security for sensitive consumer data, and it would be also a critical challenge for government enforcement of proper data protection laws. Therefore, the CSS providers are obliged to establish a complete privacy policy and

allow users to clearly understand how their personal private information will be collected, used, and disclosed, so as to increase the users' reliance on the CSS and continuance intention to use the service (Svantesson & Clarke, 2010). Svantesson and Clarke (2010) analyzed Google Docs' Privacy Policy and related documents, and then claimed that the legitimate privacy rights of users are seriously undermined because a user can gain only a very limited understanding of how her/his personal information may be used by Google and of where the data might reside. So, Kshetri (2013) suggested that cloud users' decision to switch vendors is likely to be determined by the existing vendor's data-handling policy or their ability to access and delete data with the vendor.

Hence, the increasing perceived risk, such as weak privacy protection mechanism risk and lacking proper privacy policy risk would affect the users' continuance intention to use the CSS. Based on the above discussions, we further propose in this study the sixth hypothesis H6 and the seventh hypothesis H7.

H6. The relationship between the perceived usefulness of cloud storage service and the continuance intention to use cloud storage service will be affected by privacy protection risk.

H7. The relationship between the perceived usefulness of cloud storage service and the continuance intention to use cloud storage service will be affected by lack of privacy-policy risk.

Based on the above hypotheses H1–H7, this study proposes a research model as shown in Fig. 1.

3. Measurement development

The variables of the above model were defined and their measurement items were developed. In this study, we define "*cloud storage service support*" (CSS) as the extent to which user convenience and service promptness can be provided to a user by various functional characteristics of the cloud storage service. Modifying the measurement questions proposed by Goodhue and Thompson (1995), we developed 12 measurement questions for the cloud storage service support. The "*unstructured task*" is defined as the extent to which a non-routine daily work/task can be accomplished without clear process and solution. Goodhue and Thompson (1995) proposed two dimensions of task characteristics, namely, non-routineness (lack of analyzable search behavior) and interdependence (with other organizational units). Gebauer (2008) further modeled a business task based on its level of difficulty, as characterized by non-routineness, interdependence and time-criticality. CSS can provide flexible support to tasks at anytime and any-place. Therefore, we emphasize the flexible characteristics, and model tasks as three sub-constructs: not clearly standardized, mutual dependency, and flexibility. Referring to Goodhue and Thompson (1995) and Gebauer (2008), we developed 14 measurement questions for unstructured task.

Compeau and Higgins (1995) defined the *computer self-efficacy* as individuals' beliefs about their abilities to effectively manipulate computer or related technological skills through accumulation of personal experiences. By computer self-efficacy, it does not just mean a user's ability of manipulating a computer but rather means the user's perceived ability to control when applying technological skills to a specific task. Therefore, in this study, considering the situation of the cloud storage service, we define the "*cloud service self-efficacy*" (CSF) as the extent to which the user is familiar with the cloud storage service and the extent to which the user can control the work/task through the cloud storage service. We developed 10 measurement questions for cloud service self-efficacy based on the computer self-efficacy measurement questions proposed by Murphy, Coover, and Owen (1989).

Park and Lessig (1977) defined the *reference group* as any group or person who has influence on an individual's viewpoint of value, idea or behavior intention. A user's decision of adopting the cloud storage service is usually made according to the service information and service evaluation provided by external groups, including the recommendation and endorsement by experts in information technology or professionals in cloud services, and netizens' evaluation and word of mouth found in virtual communities or information-related online forums. Particularly, recommendation by friends and family members has considerably big influence on most users' adoption of the cloud storage service. Therefore, in this study, we define the "*opinion of reference groups*" as the extent to which a user is influenced by the endorsement, opinion and evaluation made by experts, netizens or family members/friends about cloud storage service. We developed 11 measurement questions for opinion of reference groups through modifying and adjusting the measurement questions proposed by Park and Lessig (1977).

According to Davis (1989), Moon and Kim (2001) and Hernández, Jiménez, and Martín (2008), *perceived usefulness* is the extent to which a user subjectively believes the use of some technological skills or services will benefit or upgrade work/task performance in the future. Chang (2008) in his study of information agent's website, defined the perceived usefulness as the extent to which a user subjectively believes an agent's website can help the user in realizing his or her target. Also, Bhattacherjee (2001b) mentioned in his study that the user's continuance intention to use information technology indicates the extent to which the user is willing to use information technology again or continuously. In this study, based on the above descriptions, we define the "*perceived usefulness*" as the extent to which a user subjectively believes the adoption of the cloud storage service is helpful in accomplishing his or her daily work/task; and define the "*continuance intention*" as the extent to which a current cloud storage service user will continue to use the cloud storage service. We took the measurement questions proposed by the above-mentioned scholars as a reference to develop 9 measurement questions for perceived usefulness and 5 measurement questions for continuance intention.

To study the privacy issues of CSS, we discussed with a number of persons in different online forums and social network sites, such as cloud board of PTT (the largest Bulletin Board System in Taiwan) and Facebook. These users had experiences in using several famous CSSs, for example, Google Drive, SkyDrive, ASUS Webstorage, Dropbox, iCloud, etc. From the results of discussions, it can be concluded that the privacy issues that are most concerned by CSS users are "the private data was stolen", "data illegally used by service providers", "privacy data will be analyzed inappropriately" and so on. In view of this condition, this study identified two significant risk sources, namely, "*privacy protection risk*" and "*lack of privacy-policy risk*". The first, "*privacy protection risk*", is defined as the extent to which the user perceives the risk caused by the cloud storage service provider's incomplete protection of the user's privacy-related information, The second, "*lack of privacy-policy risk*", is defined as the extent to which the user perceives the risk caused by the cloud storage service provider's negligence in establishing and implementing proper privacy protection policy. Referring to the opinions feedback by users, we developed 9 measurement questions for "privacy protection risk" and 3 measurement questions for "lack of privacy-policy risk".

4. Sample survey

4.1. Pretesting

Based on the above measurements, this study conducted online questionnaire survey to test the research hypotheses. The

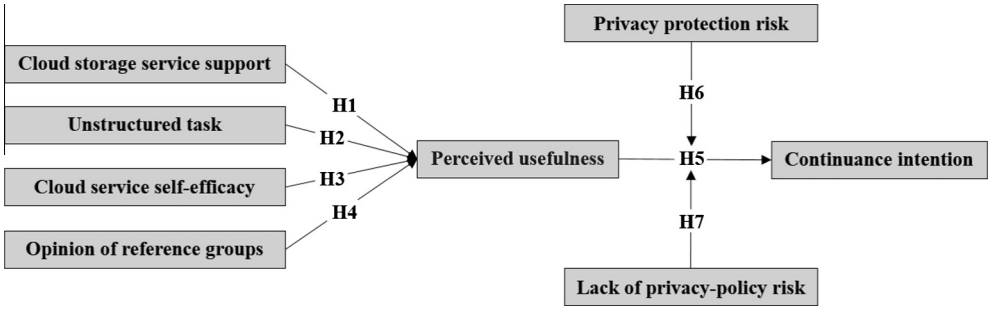

Fig. 1. Research model.

questionnaire participants are targeted to users in Taiwan who are currently using the cloud storage service. A pretest was first conducted and total 75 questionnaires were received. We conducted preliminary tests to examine the reliability and validity of the questionnaire. Some items with vague wording were rephrased; three items (one of unstructured task, one of CSS support, and one of continuance intention) with low item-to-total correlations were also deleted. The final questionnaire used in this study is shown in Appendix A.

4.2. Final survey

The final questionnaire was posted online for two months from the end of September 2013 to the end of November 2013. Several online survey platforms were selected for posting the questionnaire hyperlinks, including PTT and other cloud-storage-service-related online forums, discussion boards (e.g. Mobile01) and social network sites (e.g. Facebook and Google Plus). Users with cloud storage experience were invited to participate in this survey. Finally, total 336 questionnaires were collected from the formal questionnaire administration. Some returned questionnaires were incomplete and deemed as invalid; total 294 effective questionnaires were obtained. We also interacted with some users online to better understand the exact ideas of the mass of users.

Table 1
Demographic of respondents.

Profiles	Sample composition	Frequency	Ratio (%)
Gender	Male	157	53.4
	Female	137	46.6
Age	Below 20	14	4.80
	21–25	139	47.3
	26–30	84	28.6
	31–40	53	18.0
	41–50	4	1.4
Education	Elementary school	3	1.0
	Junior high school	1	0.3
	Senior high/ Vocational school	9	3.1
	University & Junior college	197	67.0
	Graduate school and above	84	28.6
Job	Service Industry	78	26.5
	Mfg. Industry	48	16.3
	Cultural & Creative Industry	2	0.70
	Financial sector	6	2.00
	Electronic & Information Industry	32	10.9
	Health care Industry	10	3.40
	Shipping Industry	3	1.00
	Cultural & Educational sector	21	7.10
	Mass media sector	2	0.70
	Student	84	28.6
	Others	8	2.80

5. Data analysis

5.1. Descriptive statistics analysis

The detailed demographic information of 294 effective respondents in the formal survey is shown as Table 1.

In addition, the users' experiences in using the cloud storage service were queried. As shown in Table 2, most users had more than one years' experience in using the cloud storage service (62%), which means most of the participants had a certain degree of cloud service knowledge. The results also indicates that most users used the cloud storage service via smart phones and desktop computers to backup files, carry data conveniently and share information. It also indicates that the types of files stored in the cloud storage space by the users were mainly general documents and photos. Finally, from the survey results, it is found that the most popular cloud storage service providers were Google Drive and Dropbox.

The questionnaire items of the constructs in the model were measured on a seven-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (7). As shown in Table 3, all variables are significantly higher than the median 3.5.

5.2. Measurement model

The method of partial least squares (PLS) was applied to test research model because the model includes moderating variables. First, questionnaire reliability and validity analyses are conducted to evaluate the measurement model, and then examined research hypotheses in our structural model. According to Kerlinger (1966), the reliability test is able to measure the reliability, consistency and stability of a measurement tool (i.e. the questionnaire). The Likert scale normally uses Cronbach's α value as an evaluation means for the reliability. Generally, the questions under each dimension should have an overall reliability greater than 0.6 (Hair, Black, Babin, & Anderson, 2009). As shown in Table 4, the Cronbach's α values of all dimensions and sub-dimensions are greater than 0.7, which are higher than the acceptable criterion, and all of the composite reliability (CR) also fulfilled the recommended level 0.7 (Hair et al., 2009), indicating a strong reliability for the questionnaire scale used in this study.

With respect to the validity, we conducted convergent validity test and discriminant validity test. Convergent validity indicates whether multiple questions developed for a certain construct will converge into the same one factor. The convergent validity is normally measured using average variance extracted (AVE) and factor analysis. According to Fornell and Larcker (1981), the AVE should be greater than 0.5 to ensure that the questionnaire scale has acceptable convergent validity. Besides, in light of Hair, Tatham, Anderson, and Black (1998), the indicator factor loadings should exceed 0.5, a commonly accepted level of significance. As shown in Table 4, the AVE for each dimension is greater than 0.5 and all indicator factor loadings are exceed 0.5, indicating a good

Table 2
Users' experiences in using cloud storage service.

Variable	Sample composition	Frequency	Ratio (%)
Duration of using cloud storage service	Less than 1 month	8	2.7
	1–6 months	38	12.9
	7–12 months	66	22.4
	1–2 years	81	27.6
	More than 2 years	101	34.4
Total cloud storage space owned	2G–15G	147	50.0
	16G–25G	36	12.2
	26G–50G	50	17.0
	51G–100G	34	11.6
	101G–250G	6	2.0
	More than 250G	21	7.2
Device most frequently used for cloud storage	Smartphone	176	59.9
	Tablet PC	56	19.0
	Notebook PC	102	34.7
	Desktop PC	140	47.6
Purpose of using cloud storage service	File backup	217	73.8
	Need in work	104	35.4
	Convenient data carrying	153	52.0
	Convenient file-sharing	2	0.7
	Information sharing	145	49.3
Type of file most frequently stored in the cloud storage	General documents	225	76.5
	Important documents	110	37.4
	Audio or video files	124	42.2
	Software	61	20.7
	Photos	183	62.2
Cloud service being currently adopted	Dropbox	179	60.9
	Google Drive	193	65.6
	Sky Drive	38	12.9
	iCloud	47	16.0
	Asus WebStorage	19	6.5
	Others	5	1.7

convergent validity for the questionnaire used in this study. In addition, the confirmatory factor analysis (CFA) yielded three sub-dimensions for "unstructured task", three sub-dimensions for "opinion of reference groups", and two sub-dimensions for "privacy risk", respectively. The items of the sub-dimensions provided by factor analysis are consistent with our sub-constructs of the questionnaire.

Discriminant validity refers to the degree to which the questions developed for a certain construct can be discriminated from questions developed for another construct. According to Fornell and Larcker (1981) and Hair et al. (2009), the square root of the AVE of a construct should be greater than correlation coefficients between the construct and another construct. As shown in Table 5, the square root of the AVE of each construct is greater than correlation coefficients between the construct and any of other constructs shown in the same row and the same column, indicating the constructs used in this study satisfy the discriminant validity of measurement model.

Common method variance (CMV) is one of the measurement errors, and it is a potential problem in behavioral research (Podsakoff & Organ, 1986). Common method variance leads to fictitious relationships between measurements, and may cause incorrect result of the research (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Craighead, Ketchen, Dunn, and Hult (2011) suggested that Harman's one-factor test is an effective approach for common method variance, and the threat of common method variance is considered to be high if the test accounts for more than 50% of variance (Harman, 1976). In this study, Harman's one-factor test indicates that the total explained variance is 30.3%, less than 50%, thus the common method variance is not significant. As another test, Korsgaard and Roberson (1995) claimed that if common method variance is significantly influential for the relationship among the variables, the one-factor confirmatory factor analysis would fit the data well. In this study, a confirmatory factor analysis was also performed, by modeling all items as the indicators of a single factor, and the results showed a poor fitness. Thus, the common method variance should not be a significant problem.

5.3. Structural model

After all the constructs in the measurement model were found to satisfy the specific threshold in the reliability and validity tests, this study further applied PLS to examine the research hypotheses in the structural model, and the results are shown in Fig. 2.

The study results indicate the cloud storage service support has significant positive influence on users' perceived usefulness (H1: $\beta = 0.208$, $t = 3.723$), and the unstructured task has significant positive influence on users' perceived usefulness (H2: $\beta = 0.227$, $t = 3.759$). Furthermore, the study results also indicate the cloud service self-efficacy has significant positive influence on users' perceived usefulness (H3: $\beta = 0.323$, $t = 6.555$).

Moreover, in this study, since the two largest parts of the questionnaire participants are students who are more easily influenced by friends, and people working in the service industry who very often meet different customer segments, it would be very natural the surrounding groups' experiences and suggestions of the cloud storage service would become a major source of reference information for these users. Accordingly, the opinion of reference groups has significant positive influence on users' perceived usefulness of cloud storage service (H4: $\beta = 0.273$, $t = 4.976$). Finally, when the users find the cloud storage service helpful in their daily work/task, their continuance intention to use the cloud storage service will also increase (H5: $\beta = 0.273$, $t = 4.976$).

However, many studies and marketing researches indicated that the users' deepest concern about the products/services is individual privacy. The findings of this study support that the privacy protection and the privacy policy provided by the cloud storage service providers have moderating effect on the users' continuance intention to use the cloud storage service. Based on our empirical results, the relationship between the perceived usefulness of the cloud storage service and the continuance intention to use the

Table 3
Descriptive statistic of variables.

Construct	CSS	UST	CSE	GO	POU	CI	Pro	Pol
Mean	5.572*	4.683*	5.668*	5.368*	5.528*	5.522*	4.984*	4.446*

Note: CSS: Cloud storage service support; UST: Unstructured task; CSE: Cloud service self-efficacy; GO: Opinion of reference groups; POU: Perceived usefulness; CI: Continuance intention; Pro: Privacy protection risk; Pol: Lack of privacy-policy risk.
* Indicates significant at $p < 0.001$, Mean is compared to median 3.5, $N = 294$.

Table 4
Reliability and validity analyses.

Dimension	Sub-dimension	Factor loadings		Cronbach's α	CR	AVE
Cloud storage service support (CSS)	–	CSS1	0.800	0.906	0.922	0.521
		CSS2	0.775			
		CSS3	0.568			
		CSS4	0.778			
		CSS5	0.748			
		CSS6	0.748			
		CSS7	0.754			
		CSS8	0.624			
		CSS9	0.674			
		CSS10	0.790			
		CSS11	0.643			
Unstructured task (UST)	Flexibility (Fle)	UST1	0.880	0.755	0.864	0.685
		UST2	0.842			
		UST3	0.633			
	Degree of being unclearly standardized (Nr)	UST4	0.744	0.862	0.900	0.644
		UST5	0.770			
		UST6	0.804			
		UST7	0.785			
		UST8	0.708			
	Mutual dependency (Id)	UST9	0.739	0.871	0.907	0.665
		UST10	0.677			
		UST11	0.867			
		UST12	0.820			
		UST13	0.603			
Cloud service self-efficacy (CSE)	–	CSE1	0.824	0.921	0.934	0.591
		CSE2	0.814			
		CSE3	0.832			
		CSE4	0.802			
		CSE5	0.814			
		CSE6	0.808			
		CSE7	0.830			
		CSE8	0.650			
		CSE9	0.605			
		CSE10	0.662			
Opinion of reference groups (GO)	Recommendation by expert (Eo)	EO1	0.849	0.896	0.935	0.828
		EO2	0.813			
		EO3	0.866			
	Use Experiences of network communities (No)	NO1	0.715	0.921	0.944	0.809
		NO2	0.785			
		NO3	0.817			
		NO4	0.818			
	Opinion of friends and family members (Fo)	FO1	0.857	0.931	0.951	0.829
		FO2	0.860			
		FO3	0.891			
		FO4	0.803			
Perceived usefulness (POU)	–	POU1	0.857	0.926	0.939	0.633
		POU2	0.783			
		POU3	0.853			
		POU4	0.809			
		POU5	0.648			
		POU6	0.880			
		POU7	0.720			
		POU8	0.789			
		POU9	0.797			
Continuance intention (CI)	–	CI1	0.808	0.779	0.826	0.503
		CI2	0.693			
		CI3	0.712			
		CI4	0.701			
		CI5	0.728			
Privacy risk (PR)	Privacy protection risk (Pro)	PR1	0.917	0.975	0.983	0.952
		PR2	0.924			
		PR3	0.916			
		PR4	0.897			
		PR5	0.898			
		PR7	0.882			
		PR8	0.886			
		PR9	0.861			
		PR10	0.882			
	Lack of privacy-policy risk (Pol)	PR6	0.918	0.972	0.976	0.817
		PR11	0.882			
		PR12	0.887			

Table 5
AVE Values and Correlation Coefficients.

	CSS	Fle	Nr	Id	CSE	Eo	No	Fo	POU	CI	Pol	Pro
CSS	**0.722**											
Fle	0.381	**0.828**										
Nr	0.222	0.562	**0.802**									
Id	0.426	0.605	0.490	**0.815**								
CSE	0.689	0.369	0.283	0.311	**0.769**							
Eo	0.418	0.272	0.196	0.310	0.327	**0.910**						
No	0.542	0.271	0.220	0.293	0.484	0.658	**0.899**					
Fo	0.450	0.211	0.156	0.312	0.418	0.446	0.649	**0.910**				
POU	0.681	0.567	0.305	0.480	0.681	0.470	0.596	0.523	**0.796**			
CI	0.467	0.333	0.122	0.253	0.543	0.242	0.388	0.327	0.531	**0.709**		
Pol	−0.203	−0.132	−0.143	−0.059	−0.308	−0.202	−0.249	−0.172	−0.277	−0.194	**0.904**	
Pro	0.154	0.044	0.088	0.056	0.109	0.062	0.233	0.308	0.128	0.118	−0.262	**0.976**

Note: The values in bold type shown along the diagonal are respectively a square root of the AVE of a specific construct, while all other values are correlation coefficients between two constructs, respectively.

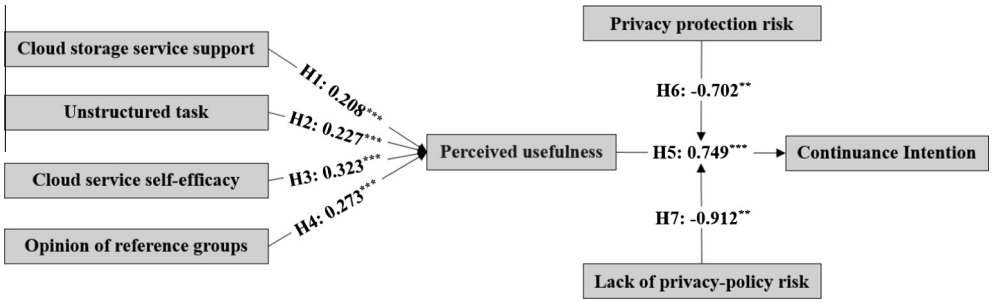

Fig. 2. Results of structural model analysis.

cloud storage service will be significantly weakened by two moderator variables, namely, privacy protection risk and lack of privacy-policy risk (H6: $\beta = -0.702$, $t = 2.719$; H7: $\beta = -0.912$, $t = 3.263$). As shown in Table 6, when the two moderator variables of risk are taken into consideration, the entire explanatory power of the model is upgraded, which indicates the two moderator variables have a certain degree of influence on the entire model.

6. Conclusions and future research

Cloud computing is a big change in the field of application in recent years and it provides users with a completely new business service mode. Among various cloud services, cloud storage is a service most closely related to web users' need because it involves the storage of users' all important data and backup files. Cloud storage service can provide users many powerful functions. With the support from these functions, the individual worker would perceive that the service could effectively upgrade his/her performance in handling the daily unstructured works/tasks, and accordingly has the continuance intention to use this service. Nevertheless, being a type of network service, cloud storage service involves even personal privacy and data security, and this is why it carries more users' perceived risk than other physical products.

The research results indicate that cloud storage service support, unstructured task, cloud service self-efficacy and opinion of reference groups are found to be the dominant antecedents of expected perceived usefulness of cloud storage service. Further, users' continuance intention to cloud storage services was influenced positively by users' perceived usefulness. However, the impacts of perceived usefulness on continuance intention were negatively moderated by cloud storage service's privacy protection risk and lack of privacy-policy risk.

Table 6
Main effect and interaction effect.

Hypothesis		Path	Path coefficient (*t*-value)	R^2
H6	Main effect model	• Perceived usefulness → Continuance intention	0.736(26.905)***	0.571
		• Privacy protection risk → Continuance intention	0.097(1.421)	
	Interaction effect model	• Perceived usefulness → Continuance intention	0.885(7.306)***	0.584
		• Privacy protection risk → Continuance intention	0.366(3.005)**	
		• Perceived usefulness ∗ Privacy protection risk → Continuance Intention	−0.702(2.719)**	
H7	Main effect model	• Perceived usefulness → Continuance intention	0.712(22.750)***	0.584
		• Lack of privacy-policy risk → Continuance Intention	0.143(1.989)*	
	Interaction effect model	• Perceived usefulness → Continuance intention	0.893(9.677)***	0.594
		• Lack of privacy-policy risk → Continuance intention	0.396(3.784)***	
		• Perceived usefulness ∗ Lack of privacy-policy risk → Continuance intention	−0.912(3.263)**	

* Denotes the significant level of 0.05.
** Denotes the significant level of 0.01.
*** Denotes the significant level of 0.001.

6.1. Implications for academia

This study makes the following contributions to academia. First, this study integrates TTF with TAM as the theoretical basis to propose a research model to understand the determinants of users' continuance intention to use cloud storage service. As theorized by TAM, the perceived usefulness significantly influence users' continuance intention to utilize cloud storage service. The findings confirmed that TAM could provide some explanatory power in the use of cloud storage service. However, another theory TTF is also needed to explain why users would perceive usefulness. The proposed integrated model has successfully explained why an individual uses the cloud storage service in carrying out their works/tasks. The key promotion factors are cloud storage service support, unstructured task, cloud service self-efficacy and opinion of reference groups.

Second, although many studies have used TAM model combined with TTF model to predict intention of continued usage of information systems, wireless technology, online auctions (e.g., Chang, 2008; Yen et al., 2010), this study might be one of earlier studies to understand the determinants of continuance intention when individuals are using cloud storage service.

Finally, many previous researches (e.g., Martins, Oliveira, & Popovič, 2014) regarded the perceived risk as an independent variable to discuss its direct effect on continuance intention. In this study, we divided perceived risk into privacy protection risk and the lack of privacy-policy risk as two moderator variables, and found their negative moderating effects on the perceived usefulness and the continuance intention in the context of cloud storage service. It would have implications for future research topics on new emergent information services.

6.2. Implications for practice

This study also has several practical implications for cloud storage service providers by drawing attention to specific factors that either facilitate or hinder service adoption among individual users.

First, the TTF can significantly explain users' intention to use cloud storage service. This finding indicates an important fact, that is, users will have higher continuance intention to use the cloud storage service if the service functions were specially designed to support the unstructured works/tasks the users are dealing with. For example, the user might have to access some important data at different places any time, or share or exchange information with co-workers or friends in real time, or face some work that does not have an established or standard operating procedure for everyone to follow. In these situations, such individuals would expect to use cloud storage service to accomplish their tasks. Therefore, the cloud storage service providers should provide the proper functions on handling the unexpected conditions of daily works/tasks, such as online data editing, data synchronization, data sharing, and allow cross operating-system platforms and devices. Furthermore, cooperating with their enterprise members, cloud storage providers may provide some customized functions, e.g., copyright protection or access right control. Through these functions, users would perceive the usefulness of the cloud storage service, and further continue using this service in the future.

Second, cloud service self-efficacy was observed to be one of the strongest catalysts to increase users' perceived usefulness on continuance intention to use cloud storage service. The cloud self-efficacy affects not only users' perceptions of his/her ability to apply the cloud storage service to deal with their works/tasks but also his/her intentions toward future use this service. In other words, if a user has more knowledge and cognition about the cloud storage service to effectively control the use, the time needed to learn to use the cloud storage service can be largely shortened, and the benefit that can be brought to him/her by the cloud storage service would be maximized. Hence, the cloud storage service providers should provide clear guideline or navigation mechanism to guide user how to operate the service more smoothly, and on-line helps if needed, which would allow users to have more confidence in the cloud storage service, thus, enhancing the users' self-efficacy when using cloud storage service.

Third, this study found that most users utilize cloud storage services through smart phone (59.9%) and, regarding the purpose, in addition to file backup, many users access files of audio/video (42.2%) or pictures (62.2%). Such types of access are usually vulnerable, unstable, and costly. In order to facilitate the usefulness, the cloud storage service providers may cooperate with the telecommunication operators to allow the file access more quickly, and reduce waiting time through the method of distributing file transfer or buffering mechanisms. In addition, the cloud storage service providers are suggested to cooperate with mobile device vendors or other App service providers to develop online editing software and input methods specifically for mobile devices in order to allow urgent documentation processing at any time and places.

Finally, this study suggests perceived privacy protection risk and lack of privacy-policy risk as two major hindrances on users' continuance intention to use the cloud storage services. This is partially because users can have only a very limited understanding of how her/his privacy data or information may be used by cloud storage service providers and of where these data or information might reside. Furthermore, many users have been worrying that their private or important data stored in the cloud space would be stolen or used without authorization by unknown persons and be improperly used by the cloud storage service providers, for example, analyze the users' interests or interpersonal relationship, or be illegally sold to other profit-seeking organizations. When the users feel higher privacy risk accompanying the cloud storage service, they tend to have lowered continuance intention to use the service. Therefore, the cloud storage service providers must be able to provide more comprehensive protection mechanisms and other emergency measures (on-line personal assistance if needed) to protect the users' private files, photos and other personal information stored in the cloud space so that users can use the service without worrying about data and information security. For example, whenever any strange device attempts to access files in a cloud space, the service provider might notify the owner of the cloud storage space via a SMS or e-mail. Moreover, encryption mechanism might also be freely provided to encrypt the secret files stored in the cloud space. Further, the cloud storage service providers should also declare strict and proper privacy protection policy to avoid adverse influence on their goodwill by any possible dispute between the users and the service providers during the use of the cloud storage service. By doing so, it would be helpful in enhancing the users' continuance intention to use the cloud storage service.

6.3. Limitations and future research

Despite the meaningful findings of this study, it bears several limitations that future researches should further address. First, the empirical data for this study were mainly collected from young group (80.7% of the participants are under 30 years old). It implies that the generalization of all users could be restricted. Future study may incorporate sample from different age groups of users in order to generalize our findings. Second, this study did not investigate different needs of users from different industries. Future research may further explore whether the different occupations of users have different expectations and needs for cloud storage services. Furthermore, future research may also consider more factors, such as user satisfaction, service quality, and tangible/intangible costs to analyze the influence on the usage of cloud storage services in depth. Third, this study was aimed to discuss the continuance

intention to use the cloud storage at the individual level. Future research may conduct similar study at the organizational level, and further discuss the possible conflict between the organizational intention and individual intention. Finally, cloud storage is only one of diverse cloud services. In the future, researchers may explore usage of other cloud services, such as cloud office, and cloud bank.

Acknowledgements

The authors would like to thank the National Science Council Taiwan, for financially supporting this research under contract NSC 101-2410-H-004-015-MY3. The authors also appreciate the useful comments and opinions of the reviewers.

Appendix A.

A.1. Measurement items

Unstructured task

Measurement item (13 items)	Sub-dimension
(1) My work/task often needs to access data at different places	Flexibility in work/task
(2) My work/task often needs to access data any time	
(3) Usually, there is more than one way to accomplish my work/task	
(1) I am frequently assigned to do work/task that I have never met before	Degree to which the work/task is not clearly standardized
(2) I often need to handle unexpected conditions in my work/task	
(3) Usually, my work/task does not have a set of standard procedures for me to follow	
(4) The content of my work/task is usually vague and not clearly defined	
(5) When I do my work/task, there is usually no precedent for reference	
(1) My work/task usually can be done only with the help of my colleagues or classmates	Mutual dependency of work/task
(2) My daily work/task often needs file-sharing with my colleagues or classmates	
(3) I often need to work with my colleagues or classmates to edit a file and maintain the data consistency of the file	
(4) When handling my daily work/task, I often need to exchange data at hand with my colleagues or classmates	
(5) To my daily work/task, the integration and synchronization of file data at different areas and between different devices is highly necessary	

Cloud storage service support

Measurement item (11 items)
(1) The cloud storage service allows me to do online data browsing and editing through Internet
(2) The cloud storage service provides me with the function of automatic file backup and allows me to restore my data to an earlier version when it is necessary
(3) The cloud storage service provides me with good data synchronization function
(4) With the folder-sharing function provided by the cloud storage service, I can share data with specific colleagues, family members and friends
(5) When I need to share files or folders with others, the cloud storage service is able to provide me with the URL (Uniform Resource Locator), enabling me to conveniently send the files or folders to be shared
(6) The cloud storage service provides me with good user operation interface
(7) I felt that the cloud storage service has good connection quality
(8) I felt that the cloud storage service has good file upload and download speed
(9) The cloud storage service allows cross operating system platforms (Windows, Mac, and Android)
(10) The cloud storage service allows me to access data through Internet at any place and any time
(11) The cloud storage service allows me to access data through Internet on different devices, such as desktop computers and mobile devices

Cloud storage self-efficacy

Measurement item (10 items)
(1) I have the ability to access data from the cloud storage space
(2) I have the ability to operate various functions provided by the cloud storage service, such as open, add, and delete file, on a PC or a mobile device
(3) I have the ability to edit and synchronize my files stored in the cloud storage space
(4) I have the ability to share my data stored in the cloud storage space with others via the cloud storage service
(5) I have the ability to organize and manage the files stored in the cloud storage space
(6) I have the ability to sign in or sign out the cloud storage service user interface through Internet
(7) I know how to maintain data consistency between different computers or mobile devices
(8) I have confidence in understanding the common terminology and glossary used in the cloud storage service
(9) When a data synchronization failure or a server connection failure occurs in the cloud storage service, I am able to do preliminary troubleshooting to locate the possible causes and then contact with a professional in this field to help me solve the problem
(10) When I need help in the course of using the cloud storage service, I have the ability to find the answers from the user guide

Opinion of reference groups

Measurement item (11 items)	Sub-dimension
(1) The cloud service experts' recommendation and opinions on the cloud storage service have persuasive influence on my decision of whether to use the service	Expert's recommendation
(2) The cloud service experts' recommendation and endorsement of the cloud storage service cause me to use the service	
(3) Generally speaking, the experts' recommendation and opinions on cloud storage services are an important basis on which I make my decision of using the service	
(1) The positive evaluations of the cloud storage service as found in internet communities or forums make me fully confident in using the service	Experiences offered by network communities
(2) The positive evaluations of the cloud storage service as found in internet communities or forums cause me to use the service	
(3) I will refer to the experiences of using cloud storage service posted in internet communities or forums	
(4) Generally speaking, the evaluations of the cloud storage service as found in internet communities or forums are important bases on which I make my decision of using the service	
(1) Friends' and family members' positive evaluations of the cloud storage service make me fully confident in using the service	Opinion of friends and family members
(2) Friends' and family members' positive evaluations of the cloud storage service cause me to use the service	
(3) I will refer to friends' and family members' experiences of using cloud storage service	
(4) Generally speaking, friends' and family members' evaluations of the cloud storage service are important bases on which I make my decision of using the service	

Perceived usefulness

Measurement question (9 items)
(1) Using the cloud storage service effectively increases my work performance
(2) Using the cloud storage service effectively improves my life and my file management quality, i.e. data consistency can be maintained between different devices and important data backup can be automatically done
(3) Using the cloud storage service allows me to conveniently and quickly browse online and edit the files I stored in the cloud space, enabling me to timely deliver the data needed by the work/task
(4) Using the cloud storage service allows me to access the file data in my cloud disk through different devices, such as mobile devices, notebook computers and desktop computers, at any place and in any time, enabling me to conveniently and quickly get the data that is urgently needed in my work/task
(5) Using the cloud storage service allows me to more conveniently share files and exchange information with people around my life
(6) Using the cloud storage service helps me to quickly integrate all the up-to-date data in my partners' work/task and complete the cooperative work successfully
(7) When some file data important to my work/task is unexpectedly damaged, such as being wrongly deleted or not openable, the cloud storage service can help me restore the data to a previously stored version, so that the loss in the work/task caused by such data damage can be minimized
(8) When my file data has to be modified frequently, the cloud storage service helps me restore the data to different storing time points, allowing me to cope with the frequent change of data in the course of performing my work/task
(9) Generally speaking, the cloud storage service is helpful in my daily work/task

Measurement items (*continued*)

Continuance intention

Measurement item (5 items)
(1) I will continue to use the cloud storage service in the future
(2) I plan to stop using the cloud storage service. (reverse wording question)
(3) I have no intention to continue using the cloud storage service if it is not absolutely necessary. (r reverse wording question)
(4) My need for the cloud storage service will constantly increase in the future
(5) In the future, I still need to use the cloud storage service to support my work/task

Privacy risk

Measurement item (12 items)	Sub-dimension
(1) I am worried that a system manager is able to see and access my privacy data stored in the cloud space, such as my photos, calendar, chat history, and directory	Privacy Protection Risk (9 items)
(2) I am worried that the cloud storage service provider will sell my privacy data stored in my cloud disk, such as my	

(*continued on next page*)

Measurement items (*continued*)

Measurement item (12 items)	Sub-dimension
income records, residing address, schedules, and work type, to some profit-seeking business organizations, such as banks, direct-selling companies and credit companies	
(3) I am worried that the cloud storage service provider will use my privacy data stored, such as my income records, residing address, schedules, and work type, to analyze my interest and hobbies and further try to sell products or send a large quantity of junk mails to me	
(4) I am worried that the cloud storage service provider will, for the purpose of seeking profits, analyze my history of using the cloud storage service or my accessing records, such as my sign-in address, my sign-in device, the types of data I accessed, and the time I access data	
(5) I am worried that the cloud storage service provider will illegally cooperate with some operating system providers, such as Microsoft, Google, and Apple, and any other third parties to integrate and analyze my privacy data, so as to further control other personal information about me, such as my interest, hobbies and the like	
(6) I am worried that, when I use the cloud storage service via a mobile device, my private data, such as photos and video films, and other private records, such as short messages, directory, chat history, calendar, and account book, will be accidentally uploaded to the cloud space and be viciously stolen by others due to any improper operating and function of the mobile device	
(7) I am worried about the leakage of my privacy-related data stored in the cloud disk, such as my ID card number, bank account password, directory, chat history, and business income records, if my cloud storage space account password were stolen	
(8) I am worrying that the invasion of the cloud storage service provider's cloud server by a hacker will result in leakage of my personal private data stored in the cloud disk	
(9) I am worried that my personal photos stored in the cloud disk will be stolen and illegally utilized, tampered with or spread by hackers and vicious users to cause damage and loss to my reputation	
(1) I am worried that the privacy policy provided by the cloud storage service does not include an indemnification clause to protect me against loss due to stolen personal private data, such that I could not be reasonably indemnified when my personal information is stolen	Lack of Privacy-policy Risk (3 items)
(2) I am worried that the privacy policy provided by the cloud storage service does not include the service provider's emergency measures for stolen personal private data, e.g., immediately cutting off the connection of any unknown source to the user's files, sending a notice to the user via an email or giving the user a notice on the service provider's official website in an eye-catching manner, and actively contacting with the user to provide all necessary assistance to the user	
(3) The cloud storage service provider's privacy policy has stated how my personal private information will be collected (e.g. from my sign-in IP and address), used (e.g. to provide improved services and send recommendatory advertisements), and disclosed (e.g. to allow a third party's application to access my personal information) as the provider wishes (reverse wording question)	

References

Abdolmohammadi, M., & Wirght, A. (1987). An examination of the effects of experience and task complexity on audit judgments. *The Accounting Review, 62*(1), 1–13.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 122–147.

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology, 41*(3), 586–598.

Bhattacherjee, A. (2001a). An empirical analysis of the antecedents of electronic commerce. *Decision Support Systems, 32*(2), 201–214.

Bhattacherjee, A. (2001b). Understanding information systems continuance: An expectation–confirmation model. *MIS Quarterly, 25*(3), 351–370.

Biswas, D., & Biswas, A. (2004). The diagnostic role of signals in the context of perceived risks in online shopping: Do signals matter more on the web. *Journal of Interactive Marketing, 18*(3), 30–45.

Chang, H. H. (2008). Intelligent agent's technology characteristics applied to online auctions' task: A combined model of TTF and TAM. *Technovation, 28*(9), 564–577.

Chen, M. F., Lin, Y. P., & Cheng, T. J. (2013). Public attitudes toward nanotechnology applications in Taiwan. *Technovation, 33*(2–3), 88–96.

Cheng, F. C., & Lai, W. H. (2012). The impact of cloud computing technology on legal infrastructure within internet – focusing on the protection of information privacy. *Procedia Engineering, 29*, 241–251.

Cheng, T. C., Lam, Y. C., & Yeung, C. L. (2006). Adoption of internet banking: An empirical study in Hong Kong. *Decision Support Systems, 42*(3), 1558–1572.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly, 19*(2), 189–211.

Cox, D. F., & Rich, S. V. (1964). Perceived risk and consumer decision making: The case of telephone shopping. *Journal of Marketing Research, 1*(4), 32–39.

Craighead, C. W., Ketchen, D. J., Dunn, K. S., & Hult, G. G. (2011). Addressing common method variance: Guidelines for survey research on information technology, operations, and supply chain management. *Engineering Management, IEEE Transactions on, 58*(3), 578–588.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–339.

DeLone, W. H., & McLean, E. R. (1992). Information system success: The quest for the dependent variable. *Information Systems Research, 3*(1), 60–95.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information system success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9–30.

Dishaw, M. T., & Strong, D. M. (1999). Extending the technology acceptance model with task technology constructs. *Information & Management, 36*(1), 9–21.

Dowling, G. R., & Staelin, R. (1994). A model of perceived risk and intended risk-handling activity. *Journal of Consumer Research, 21*(1), 119–134.

Featherman, M., & Pavlou, P. (2003). Predicting e-services adoption: A perceived risk facets perspective. *International Journal of Human–Computer Studies, 59*(4), 451–474.
Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable and measurement error. *Journal of Management Research, 18*, 39–50.
Gebauer, J. (2008). User requirements of mobile technology: A summary of research results. *Information, Knowledge, Systems Management, 7*(1), 101–119.
Ghormley, Y. (2012). Cloud computer management from the small business perspective. *International Journal of Management & Information Systems, 16*(4), 349–356.
Goodhue, D. L. (1995). Understanding user evaluations of information systems. *Management Science, 41*(12), 1827–1844.
Goodhue, D. L. (1998). Development and measurement validity of a Task-Technology Fit instrument for user evaluations of information systems. *Decision Sciences, 29*(1), 105–138.
Goodhue, D. L., & Thompson, R. L. (1995). Task-Technology Fit and individual performance. *MIS Quarterly, 19*(2), 213–236.
Gravill, J. I., Compeau, D. R., & Marcolin, B. L. (2006). Experience effects on the accuracy of self-assessed user competence. *Information & Management, 43*(3), 378–394.
Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2009). *Multivariate data analysis* (7th ed.). New Jersey: Prentice-Hall.
Hair, J. F., Tatham, R. L., Anderson, R. E., & Black, W. (1998). *Multivariate data analysis* (5th ed.). London: Prentice Hall.
Harman, H. H. (1976). *Modern factor analysis* (3rd ed.). Chicago: University of Chicago Press.
Harris, S. E., & Brightman, H. J. (1985). Design implications of a task-driven approach to unstructured cognitive tasks in office work. *ACM Transactions on Information Systems, 3*(3), 292–306.
Hasan, B. (2003). The influence of specific computer experiences on computer self-efficacy beliefs. *Computers in Human Behavior, 19*(4), 443–450.
Hernández, B., Jiménez, J., & Martín, M. J. (2008). Extending the technology acceptance model to include the IT decision-maker: A study of business management software. *Technovation, 28*(3), 112–121.
Herr, P. M., Kardes, F. R., & Kim, J. (1991). Effect of word-of-mouth and product-attribute information on persuasion: An accessibility-diagnostic perspective. *Journal of Consumer Research, 17*, 454–462.
Hill, T., Smith, N. D., & Mann, M. F. (1987). Role of efficacy expectation in predicting the decision to use advanced technologies: The case of computers. *Journal of Applied Psychology, 72*(2), 307–313.
Hsu, M. H., Chang, C. M., Chu, K. K., & Lee, Y. J. (2014). Determinants of repurchase intention in online group-buying: The perspectives of DeLone & McLean IS success model and trust. *Computers in Human Behavior, 36*, 234–245.
Igbaria, M., & Iivari, J. (1995). The effects of self-efficacy on computer usage. *Journal of Management Science, 23*(6), 587–605.
Igbaria, M., & Tan, M. (1997). The consequence of information technology acceptance subsequent individual performance. *Information and Management, 32*(3), 113–121.
Jaeger, P. T., Lin, J., & Grimes, J. (2008). Cloud computing and information policy. *Journal of Information Technology & Politics, 5*(3), 269–283.
Jarupathirun, S., & Zahedi, F. M. (2007). Exploring the influence of perceptual factors in the success of web-based spatial DSS. *Decision Support Systems, 43*(3), 933–951.
Jonassen, D. H. (1997). Instructional design models for well-structured and ill-structured problem-solving learning outcomes. *Educational Technology Research and Development, 45*(1), 65–94.
Joo, J., & Sang, Y. (2013). Exploring Koreans' smartphone usage: An integrated model of the technology acceptance model and uses and gratifications theory. *Computers in Human Behavior, 29*(6), 2512–2518.
Kerlinger, F. N. (1966). *Foundations of behavioral research: Educational and psychological inquiry* (2nd ed.). California: Holt, Rinehart and Winston.
Kim, W. (2009). Cloud computing: Today and tomorrow. *Journal of Object Technology, 8*(1), 65–72.
King, N. J., & Raja, V. T. (2012). Protecting the privacy and security of sensitive customer data in the cloud. *Computer Law & Security Review, 28*(3), 308–319.
Klopping, I. M., & McKinney, E. (2004). Extending the technology acceptance model and the Task-Technology Fit model to consumer e-commerce. *Information Technology Learning and Performance Journal, 22*, 35–48.
Korsgaard, M. A., & Roberson, L. (1995). Procedural justice in performance evaluation: The role of instrumental and non-instrumental voice in performance appraisal discussions. *Journal of Management, 21*(4), 657–669.
Kshetri, N. (2013). Privacy and security issues in cloud computing: The role of institutions and institutional evolution. *Telecommunications Policy, 37*(4), 372–386.
Langan-Fox, J., Wirth, A., Code, S., Langfield-Smith, K., & Wirth, A. (2001). Analyzing shared and team mental models. *International Journal of Industrial Ergonomics, 28*(2), 99–112.
Larsen, T. J., Sørebø, A. M., & Sørebø, Ø. (2009). The role of Task-Technology Fit as users' motivation to continue information system use. *Computers in Human Behavior, 25*(3), 778–784.
Lee, M. C. (2009). Predicting and explaining the adoption of online trading: An empirical study in Taiwan. *Decision Support Systems, 47*(2), 133–142.
Lee, Y. C. (2014). Impacts of decision-making biases on eWOM retrust and risk-reducing strategies. *Computers in Human Behavior, 40*, 101–110.
Lee, C. C., Cheng, H. K., & Cheng, H. H. (2007). An empirical study of mobile commerce in insurance industry: Task technology fit and individual differences. *Decision Support Systems, 43*(1), 95–110.
Liu, Q., Wang, G., & Wu, J. (2012). Secure and privacy preserving keyword searching for cloud storage services. *Journal of Network and Computer Applications, 35*(3), 927–933.
Luarn, P., & Lin, H. H. (2005). Toward an understanding of the behavioral intention to use mobile banking. *Computers in Human Behavior, 21*(6), 873–891.
Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., & Ghalsasi, A. (2011). Cloud computing – The business perspective. *Decision Support Systems, 51*(1), 176–189.
Martins, C., Oliveira, T., & Popovič, A. (2014). Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal of Information Management, 34*(1), 1–13.
Mathieson, K., & Keil, M. (1998). Beyond the interface: Perceived ease of use as a function of task/technology fit. *Information and Management, 34*(4), 221–230.
McCreary, L. (2008). What was privacy? *Harvard Business Review, 86*(10), 123–131.
Moon, J. W., & Kim, Y. G. (2001). Extending the TAM for a World-Wide-Web context. *Information & Management, 38*(4), 217–230.
Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perception of adopting an information technology innovation. *Information Systems Research, 2*(3), 192–222.
Murphy, C. A., Coover, D., & Owen, S. V. (1989). Development and validation of the computer self-efficacy scale. *Educational and Psychological Measurement, 49*(4), 893–899.
Nievelstein, F., Van Gog, T., Van Dijck, G., & Boshuizen, H. (2013). The worked example and expertise reversal effect in less structured tasks: Learning to reason about legal cases. *Contemporary Educational Psychology, 38*(2), 118–125.
Obeidat, M. A., & Turgay, T. (2013). Empirical analysis for the factors affecting the adoption of cloud computing initiatives by information technology executives. *Journal of Management Research, 5*(1), 152–178.
Oliver, R. L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research, 17*(4), 460–469.
Pagani, M. (2006). Determinants of adoption of high speed data services in the business market: Evidence for a combined technology acceptance model with task technology fit model. *Information & Management, 43*(7), 847–860.
Park, E., & Kim, K. J. (2014). An integrated adoption model of mobile cloud services: Exploration of key determinants and extension of technology acceptance model. *Telematics and Informatics, 31*(3), 376–385.
Park, N., Kim, Y. C., Shon, H. Y., & Shim, H. (2013). Factors influencing smartphone use and dependency in South Korea. *Computers in Human Behavior, 29*(4), 1763–1770.
Park, C. W., & Lessig, V. P. (1977). Students and housewives: Differences in susceptibility to reference group influences. *Journal of Consumer Research, 4*(2), 102–110.
Park, S. C., & Ryoo, S. Y. (2013). An empirical investigation of end-users' switching toward cloud computing: A two factor theory perspective. *Computers in Human Behavior, 29*(1), 160–170.
Patterson, P. G., Johnson, L. W., & Spreng, R. A. (1997). Modeling the determinants of customer satisfaction for business-to-business professional services. *Journal of the Academy of Marketing Science, 25*(1), 4–17.
Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903.
Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management, 12*(4), 531–544.
Rai, A., Lang, S., & Welker, R. (2002). Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information Systems Research, 13*(1), 50–69.
Ratten, V. (2013). Cloud computing: A social cognitive perspective of ethics, entrepreneurship, technology marketing, computers self-efficacy and outcome expectancy on behavioural intentions. *Australasian Marketing Journal, 21*(3), 137–146.
Richins, M. L. (1983). Negative word-of-mouth by dissatisfied customers: A pilot study. *Journal of Consumer Research, 10*, 73–82.
Seddon, P. B. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Information Systems Research, 8*(3), 240–253.
Sheth, J. N. (1971). Word-of-mouth in low-risk innovations. *Journal of Advertising Research, 11*(3), 15–18.
Shin, D. H. (2013). User centric cloud service model in public sectors: Policy implications of cloud services. *Government Information Quarterly, 30*(2), 194–203.
Spillner, J., Müller, J., & Schill, A. (2013). Creating optimal cloud storage systems. *Future Generation Computer Systems, 29*(4), 1062–1072.
Stantchev, V., Colomo-Palacios, R., Soto-Acosta, P., & Misra, S. (2014). Learning management systems and cloud file hosting services: A study on students' acceptance. *Computers in Human Behavior, 31*, 612–619.
Svantesson, D., & Clarke, R. (2010). Privacy and consumer risks in cloud computing. *Computer Law & Security Review, 26*(4), 391–397.
Takabi, H., Joshi, J., & Ahn, G. (2010). Security and privacy challenges in cloud computing environments. *IEEE Security & Privacy, 8*(6), 24–31.
Trenz, M., & Huntgeburth, J. (2014). Understanding the viability of cloud services: A consumer perspective. *Twenty Second European Conference on Information Systems*.

Tsai, J. M., & Hung, S. W. (2014). A novel model of technology diffusion: System dynamics perspective for cloud computing. *Journal of Engineering and Technology Management, 33*, 47–62.

Wang, C., Wang, Q., Ren, K., Cao, N., & Lou, W. (2012). Toward secure and dependable storage services in cloud computing. *IEEE Transactions on Cloud Computing, 5*(2), 220–232.

Wei, L., Zhu, H., Cao, Z., Dong, X., Jia, W., Chen, Y., et al. (2014). Security and privacy for storage and computation in cloud computing. *Information Sciences, 258*, 371–386.

Yang, K., & Jia, X. (2012). Data storage auditing service in cloud computing: Challenges, methods and opportunities. *World Wide Web, 15*(4), 409–428.

Yen, D. C., Wu, C. S., Cheng, F. F., & Huang, Y. W. (2010). Determinants of users' intention to adopt wireless technology: An empirical study by integrating TTF with TAM. *Computers in Human Behavior, 26*(5), 906–915.

Yeo, H. S., Phang, X. S., Lee, H. J., & Lim, H. (2014). Leveraging client-side storage techniques for enhanced use of multiple consumer cloud storage services on resource – Constrained mobile devices. *Journal of Network and Computer Applications, 43*, 142–156.

Yu, C. S., & Tao, Y. H. (2009). Understanding business-level innovation technology adoption. *Technovation, 29*(2), 92–109.

Zhang, X., Feng, W., & Qin, X. (2013). Performance evaluation of online backup cloud storage. *International Journal of Cloud Applications and Computing (IJCAC), 3*(3), 20–33.