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### Critical Acceptance Factors of Cloud-Based Public Health Records

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## Critical Acceptance Factors of Cloud-Based Public Health Records

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### ABSTRACT

Personal health records (PHR) is a tool that can be used to assist patients in health management, and cloud-based PHR is expected to effectively integrate medical resources and information, elevate overall healthcare quality, and reduce unnecessary medical costs. This study tends to explore the factors that affect users' intention to use with regard to the Microsoft HealthVault hybrid cloud health system in Taiwan. A research model combined with Unified Theory of Acceptance and Use of Technology (UTAUT) and Task-Technology Fit (TTF) models as well as perceived risks and trust is proposed including 10 hypotheses. After conducting a series survey, in total, 254 valid questionnaires in Taiwan were received. Some preliminary findings are discussed, and it is hoped that this model can be used to explore the key factors influencing usage intent toward the HealthVault.

*Keywords:* personal health records, technology acceptance, trust, task-technology fit

### INTRODUCTION

Personal health records (PHR) is a tool that can be used to assist patients in health management [3] [4] [27]. Because of PHR's characteristics including personal autonomous control, personal uniform recording, ease of sharing of medical information, and high participation by users [8] [11] [34] [39], thus PHR can be applied to medical care. If it is possible to put PHR on the cloud, it would be possible to use the internet to achieve cross-platform data access and storage, which is no longer limited to the computer, but different devices can be used to access and save data. Also, because PHR is a user-centered personal health record, it can be independently managed by the user. In summary of the foregoing, cloud-based PHR is expected to effectively integrate medical resources and information, elevate overall healthcare quality, and reduce unnecessary medical costs. Thus, this study plan to explore the factors that affect users' intention to use with regard to the Microsoft HealthVault hybrid cloud health system in Taiwan, combined with Unified Theory of Acceptance and Use of Technology (UTAUT) and Task-Technology Fit (TTF) models to explore the fit between PHR's task characteristics and HealthVault's technological characteristics, adding perceived risks theory and trust theory to propose the research model. To do so, a research model is proposed and will be discussed later after the literature review.

### LITERATURE REVIEW

#### PHR Personal Health Records

Personal health records (PHR) is a type of record that includes all medical information relating to patients, including personal health information such as dietary habits, exercise, measured biological indicators, medical treatment records, drug administration records, and medical insurance. PHR refers to "an electronic record used to store and share personal health information, and the user has the power to independently manage the record" [7] [8] [11] [20]. PHR is characterized by the following [4] [11] [19] [36]: (1) Life-long recording; (2) Personalized data and sharing controls; (3) Ease of use; (4) User participation; (5) Can save all necessary information; (6) Health education functions. In addition, scholars believe that if only electronic health records (EMR) provided by hospitals are used, there would be problems of accuracy and continuity [36]; various reasons are behind the development of PHR [11] [12].

#### HealthVault

HealthVault is the platform developed by Microsoft for medical operating systems. Via HealthVault, users can control their personal health information, and share with their families, doctors, and care centers [10]. In recent years, cloud-based services and online services have begun to appear. Cloud-storage systems like Dropbox and Google Drive allow the user to enjoy high-capacity online storage and flexible data access without bearing the costs of infrastructure. HealthVault (2014) pointed out that HealthVault's benefits include organization and usage of health information of users and family members, preparing for treatment and emergency treatment in advance, comprehensive display of user health conditions, and achieving users' health goals.

#### Combining UTAUT and TTF

In the field of information management, the adoption of information technology has long been a focal point [9] [6] [40]. Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT of Venkatesh et al. (2003) included the four constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions to explain personal intention to use information technology. Goodhue & Thompson (1995) proposed task-technology fit (TTF) primarily to assess the correlation and fit between characteristics of personal tasks and characteristics of information technology, and how these affect usage behavior and performance.

However, UTAUT does not consider technological dimensions. Past studies have shown that under different scenarios and technologies, dimensions produce different effects and significance in behavioral intent and actual usage behavior, but integration of UTAUT and TTF models can make up for the insufficiency in the models. For example, Pai & Tu (2011) used UTAUT and TTF to research the factors that would cause the delivery service business to accept and adopt CRM; the studies showed that effort expectancy, social influence, and task-technology fit would positively affect intention to use. Razeghi & Nasiripour (2014) studied which factors would affect the acceptance and usage of electronic health records by medical care centers, finding that facilitating conditions, characteristics of technology, task characteristics, performance expectancy, effort expectancy, and social influence all have considerable importance. Therefore, this study used an integrated model of UTAUT and TTF to explore intention to use HealthVault.

### **Perceived risks**

Since personal health records contain sensitive data involving personal privacy of users, information security is very important for personal health records [38] [37], which would also affect the intention to use personal health records [5]. Past studies showed: “Users would not use the PHR system when they have doubts about information security” [35]. However, currently the government and society have considered privacy risk and security risks to be important and indispensable issues in information transmission. In past studies on electronic online services and applications, safety and privacy have long been important factors in perceived risks. In sum of the scholars’ research, the study defined perceived risks as “the result of user perception of uncertainty of information technology.”

### **Trust**

According to past studies, trust is an important factor of information technology; after users have established trust, they would be more willing to participate [30]. Trust is also a complex and multifaceted concept; it is an important element in interpersonal interaction and the indispensable basis in commercial relationships. The concept of trust has been applied to many fields, such as psychology, sociology, e-commerce, and knowledge management. Many studies have pointed out that trust would affect intention to use.

Past studies on trust showed that we can understand many different dimensions of trust, including for nations, vendors, and products. However, in their study on e-commerce, Gefen et al. (2002) pointed out that whether consumers trust online retailers would significantly affect whether they are willing to make purchases. This means that in online service research, the willingness of users to use a certain online e-service is dependent on whether there is trust for the system provider.

Like e-commerce, in studies exploring personal health records, Hessels (2014) and Spil & Klein (2014) used the PRIMA model to research the acceptance of personal health records, finding that perceived risks and trust are both key factors. In the study by Li, Gupta, Zhang, & Sarathy (2014) on intention to use personal health records, it was found that perceived risks and trust would affect intention to use, while trust would affect perceived risks. However, the study by Li, Gupta, Zhang, & Sarathy (2014) showed that since research focused on intention to use personal health record systems, trust is based on whether the user trusts the system provider. This meant that in studies on electronic health services, user trust for the system provider would affect whether the user would use the electronic health service. This result is also consistent with that from e-commerce research.

## **RESEARCH METHOD**

Based on the literature, this study proposed the usage of UTAUT, TTF, perceived risks theory, and trust theory to construct 10 hypotheses and a model (see Figure 1) to explore intention to use HealthVault.

Venkatesh et al. (2003) believed that performance expectancy, effort expectancy, social influence, and facilitating conditions are key factors in exploring behavioral intent in the usage of information technology. This study summarized past studies on intention to use PHR, and found that performance expectancy, effort expectancy, social influence, are facilitating conditions key factors affecting usage of PHR [17] [33] [13] [32] [28] [24] [21] [18].

Performance expectancy refers to if using information technology can help users increase performance when executing tasks, then there would be a positive effect on users’ intention to use information technology. Hessels (2014) and Spil & Klein (2014) used the PRIMA model to explore acceptance of PHR, finding that perceived usefulness would significantly affect intention to use. Liu, Tsai & Jang (2013) and Jian, Shabbir, Sood, Lee, Hsu, Ho, Li, & Wen (2012) researched Taiwanese people’s acceptance of PHR, finding that perceived usefulness would affect Taiwanese people’s intention to use PHR. UTAUT’s performance expectancy integrated the construct of perceived usefulness. Therefore, the study hypothesizes that when using the personal health information system, performance expectancy would affect users’ behavioral intent.

H1: “Performance expectancy” has a positive effect on the people’s “behavioral intent” in using HealthVault.

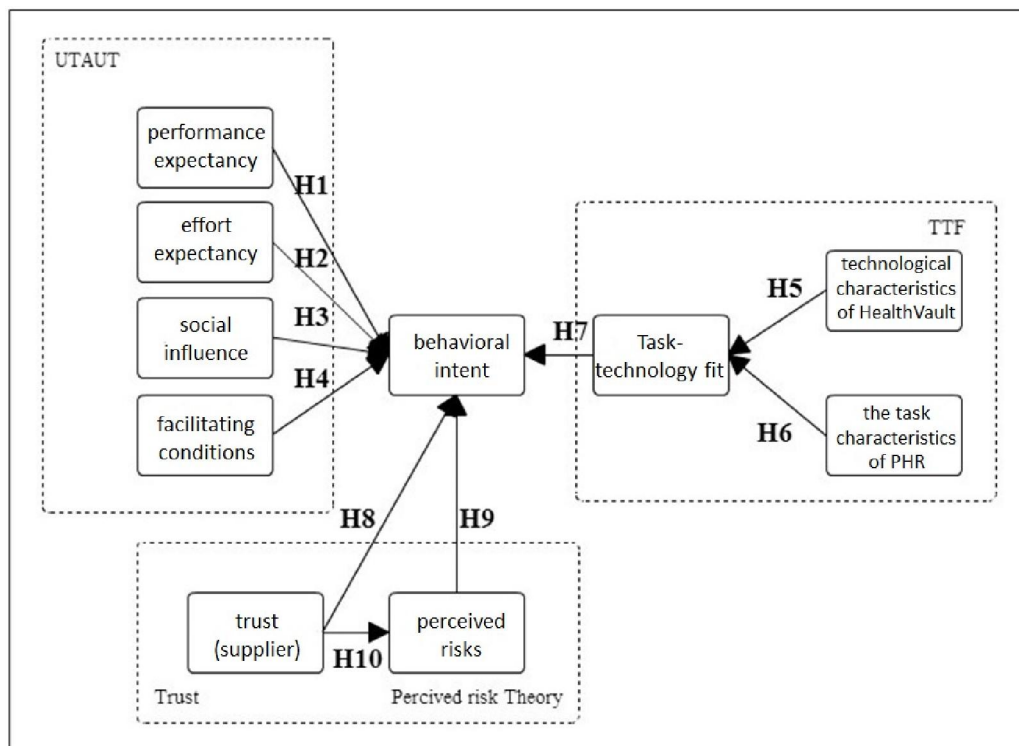


Figure 1: Proposed research model and hypotheses

Effort expectancy pointed out that if information technology is easy to use, then there would be a positive effect on users in their intention to use information technology. Hessels (2014) and Spil & Klein (2014) used the PRIMA model to explore acceptance of PHR, finding that perceived ease of use would significantly affect intention to use. Liu, Tsai & Jang (2013) and Jian et al. (2012) researched Taiwanese people's acceptance of PHR, finding that perceived ease of use would affect Taiwanese people's intention to use PHR. UTAUT's effort expectancy integrated the construct of perceived ease of use. Therefore, the study hypothesizes that when using the personal health information system, effort expectancy would affect users' behavioral intent.

H2: "Effort expectancy" has a positive effect on the people's "behavioral intent" in using HealthVault.

Social influence refers to when users believe that other people think he should use new information technology, then this would have a positive influence on intention to use information technology. Hessels (2014) explored Dutch acceptance for PHR and Spil & Klein (2014) explored why Google Health failed and which potential factors should HealthVault emphasize, pointing out that social influence is a key factor. Gagnon et al. (2014) believed that social norms affect doctors' intention to use electronic health records. Razeghi & Nasiripour (2014) believed that social influence is important in influencing medical care centers' acceptance for electronic health record systems. Jian et al. (2012) studied Taiwanese consumers in personal health record, finding that subjective norms would affect intention to use. Therefore, this study hypothesized that in using personal health information system, social expectations would affect behavioral intent of users.

H3: "Social influence" has a positive effect on the people's "behavioral intent" in using HealthVault.

Facilitating conditions refer to when a user perceives that other people think he should use the new information technology, then there would be a positive effect on intention to use information technology. Hessels (2014) explored Dutch acceptance for PHR and Spil & Klein (2014) explored why Google Health failed and which potential factors should HealthVault emphasize, pointing out that perceived compatibility is a key factor. Razeghi & Nasiripour (2014) believed that facilitating conditions are important in influencing medical care centers' acceptance for electronic health record systems. Therefore, this study hypothesized that in using personal health information system, facilitating conditions would affect behavioral intent of users.

H4: "Facilitating conditions" has a positive effect on the people's "behavioral intent" in using HealthVault.

Goodhue (1988) believed that the fit between technology and task would affect performance. When technological characteristics are better suited to needs in a task, better performance can be produced; therefore, task characteristics and technological characteristics information technology would significantly affect task-technology fit. Aldhaban (2012) integrated UTAUT and TTF to explore user acceptance of smartphone technology, which showed that task characteristics and technological characteristics would significantly affect task-technology fit. Pai & Tu (2011) explored the Taiwanese delivery service industry's acceptance and adoption of CRM, pointing out that task characteristics and technological characteristics would significantly

affect task-technology fit. In research of electronic online services, Zhou, Lu, & Wang (2010) explored user acceptance or adoption of mobile banking, believing that task characteristics and technological characteristics would significantly affect task-technology fit. Since the Microsoft HealthVault is a type of electronic online service, therefore, this study deduces that when using online electronic services, technological characteristics and task characteristics would affect task-technology fit.

H5: “Technological characteristics of HealthVault” have a positive effect on “task-technology fit”.

H6: “Task characteristics of PHR” have a positive effect on “task-technology fit”.

Vessey (1991) proposed the perceived fit model, stating that when the user perceives fit between the tool for the solution and the task to be resolved, it would effectively reduce task complexity and elevate efficiency in resolving tasks. Goodhue & Thompson (1995) pointed out that when the functions of information technology meet user task needs, it is possible for the information technology to be accepted. This means that when information technology is accepted and adopted, it means that there is good fit between information technology technological characteristics and task characteristics.

Razeghi & Nasiripour (2014) indicated that task-technology fit is one of the most important factors that would affect medical care centers’ acceptance for electronic health record systems. Aldhaban (2012) researched user acceptance for smartphone technology, believing that task-technology fit would significantly affect intention to use. Pai & Tu (2011) suggested task-technology fit would positively affect the Taiwanese delivery service industry’s acceptance and adoption of CRM systems. In the study by Zhou, Lu, & Wang (2010) about acceptance and adoption of mobile banking, task-technology fit would positively affect whether users adopt mobile banking services. Zhang, Huang, & Chen (2010) integrated UTAUT and TTF to construct the model framework for acceptance of mobile search, pointing out that task-technology fit is an important factor. Therefore, the study deduced that when using personal health information systems, task-technology fit would affect users’ behavioral intent.

H7: “Task-technology fit” has a positive effect on “behavioral intent” of using HealthVault.

Since PHR contains sensitive data contain sensitive data involving personal privacy of users, information security is very important for PHR [38] [37] and would affect user intention to use personal health records [5]. Srinivasan (2006) pointed out that users would not use the PHR system when they have doubts about information security. In studies on online electronic services, perceived risk and trust are key factors of intention to use [23] [17] [26] [25] [22] [29]. Thus, perceived risk and trust are two critical factors for whether users use personal health record.

Li, Gupta, Zhang, & Sarathy (2014) researched intention to use personal health records, finding that in the context of personal health record, perceived risk and trust would significantly affect intention to use. Other studies showed that when users have perceived risks for the usage of information technology, it would negative affect intention to use information technology. The more trust users have for information technology, there would be a positive effect on intention to use information technology. Therefore, the study deduced that when using the personal health information system, perceived risk and trust would affect the behavioral intent of users.

H8: User “trust” has a positive effect on “behavioral intent” for using HealthVault.

H9: User “perceived risks” have a negative effect on “behavioral intent” for using HealthVault.

Kim, Ferrin, & Rao (2008) pointed out that when using electronic services, because it involves private user information, user trust for information technology would significantly affect users’ perceived risks. Li, Gupta, Zhang, & Sarathy (2014) studied intention to use personal health records, and pointed out that trust would positively affect intention to use personal health records, but it would negatively affect users’ perceived risks. Nicolaou & McKnight (2006) found that in electronic data exchange, trust would significantly affect users’ perceived risks. Therefore, this study deduced that when using personal health information systems, trust would affect users’ perceived risks.

H10: User “trust” has a negative effect on users’ “perceived risks”.

#### PRELIMINARY FINDINGS

This study used questionnaire surveys to collect statistical data. The questions derived from variables in the dimensions of this research model are all measured by the Likert 7-point scale. In questionnaire design, in order to elevate reliability and validity of the questionnaire, this study chose questionnaire scales suitable to the research purpose and translated them. Then, 4 professionals from academia and industry were invited to revise the pretest of the questionnaire to avoid unclear semantics or inappropriate questions. This study collected questionnaires through online forums and retrieved 280 questionnaires in Taiwan. In order to maintain validity for data analysis and statistics, 12 questionnaires with incomplete answers and errors, ending up with 254 valid questionnaires; the retrieval rate was 90.7%. Based on analysis of the 254 valid questionnaires, in terms of age,

most respondents ranged between 21-30 and 10-20 years of age, with 143 and 82 people in each age group, or 88.6% of the valid sample. In terms of education, most had university educations, at 179 people (70.5%). In terms of gender, 154 were men, at 60.6%, and 100 were women, at 39.4%. In terms of number of visits to medical institutions per year, most visited 0-5 times, at 180 people or 70.9%. In terms of whether they have used HealthVault, 89.4% had not.

The next steps for this research are to conduct a series of analytical processes including factor analysis, discriminant validity measures, and structural equation modeling (SEM) to test if the proposed hypotheses can be supported by the results. The SEM software will be smartPLS 2.0. By testing this proposed model, it is hoped that we can find the key factors affecting users to adopt the HealthVault system.

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