

Factors Affecting on Personal Health Record

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Abstract

Due to aging societies and increasing cost of healthcare service, the management of Personal Health Record (PHR) has become one of the hot issues of social security policy. PHR is a newly developed concept about the managing of health information in the healthcare service sector. This kind of paradigm shift affects not only the management of personal health information, but also the service form of healthcare service in the future. Perspective of this paper is to examine factors that affect consumers' intention to use PHR. To achieve the goal of this research, the Exploratory Factor Analysis (EFA) was conducted in order to construct the factors affecting the adoption of the PHR. We have also built several hypotheses about the relationship among these factors. To test the hypotheses about these factors, the Structural Equation Model (SEM) was executed. The result of this paper showed that the factor, "ICT infrastructure of PHR" and "Personal tendency to PHR", have positive influence on the factor, "Intention to use PHR". The mediator effect of the factor, "Perceived usefulness of PHR" is not significant to "Intention to use PHR". The results of this research will contribute as the reference in understanding which factors have the positive influence on the user's intention to adopt the PHRs. And these results will help the healthcare service provider to promote the use of PHR.

Keywords: Consumer Behavior, ICT-Infrastructure Exploratory Factor Analysis, Personal Health Record, Public Health, Structural Equation Model

1. Introduction

Personal Health Record (PHR) has been spotlighted as a consumer-self-control tool in health information management¹⁴. The American Health Information Management Association (AHIMA) has stated: "PHR allows individuals to be more active partners in their healthcare, and gives them up-to-date information when and where they need it"^{1,11}. PHR is designed to allow individual patients to manage their health information¹³. Thus, PHR enforces the activity of individual patients in managing their health information and data so that individual patients are able to maintain their health conditions and treat their own illness¹². The primary beneficiaries of PHR are individuals with chronic diseases, and those who are elderly and disabled⁵. Several researches have proven that some considerable parts of total healthcare costs can be saved if the chronic diseases, such as obesity, high blood pressure, and

diabetes resulted from life style, could be attributed to the self-treatment¹⁰. In that sense, PHR can take the role of a means for supporting, prevention, and early detection of chronic diseases. Although PHR offers many advantages, the future of successful implementation of PHR is unclear because of uncertainties surrounding PHRs⁴. To achieve the successful implementation of PHR, the integration of health data is essential. The healthcare information of individual patients are stored in several repositories, namely, at doctors, laboratories, clinics, and hospitals⁹. Within such a context, the successful development and implementation of PHR is not an easy task. Since a critical success factor for adoption of PHR is to aggregate healthcare data from many segmented repositories, a key problem for the development and adoption of PHR is the disrupted flows of individual healthcare information across the many constituents in the healthcare industry³. As PHR is currently in the developing stage, it needs the

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governmental support program and researches about the factors for the successful deployment and adoption of PHR⁸. This paper begins with an overview of PHR and relevant definitions of factors and variables. We then present our methods, data, and analyses. This will be followed by a discussion of the results. We conclude with the implications and limitations of this research, and recommendations for future work. The research framework of this study is to analyze the relationship of variables in a suggested research model. In this framework, we assume that the consumer's intention to use PHR is affected by the several factors related with information technology and personal tendency. For the purpose of this research, we selected several variables: "ICT infrastructure of PHR", "Personal Tendency to PHR", "Perceived Usefulness of PHR", as the independent and mediator variables and "Intention to Use PHR" as dependent variable. We examine the direct and indirect relationship of these independent and mediator variables on the dependent variable, "Intension to use PHR". For this purpose, a survey based on the 5-point Likert scale questionnaire was administrated to 255 university students in Korea. From this questionnaire survey, 14 measured variables were defined. After factor analysis, 4 factors were composed from 12 measured variables. With Factor Analysis these variables were evaluated in terms of the validity and reliability. And as the second step, an analysis about the relationship among these factors administrated with structural equation model². The results of this paper could be the valuable references for the healthcare policy maker in Korea.

2. Research Model Hypothesis

As defined above, PHR is regarded as a self-management tool for health information repository⁷. For the adoption of PHR to the users, several ICT technology requirements, e.g. ICT technology, like easy access in internet, data security, etc. should be considered. Besides ICT technology, the individual tendency about the perception of PHR is also studied. For the purpose of this study, the following research model has been built shown in Figure 1. With this research model we analyze the question: Which factors have the influence on the user intension to use PHR? The research model consists of four variables: "ICT-Infrastructure of PHR", "Personal Tendency to PHR", "Perceived PHR Usefulness" and "Intension to Use PHR". In the context of the research model, the two

variables "ICT-Infrastructure of PHR" and "Personal Tendency to PHR" are the independent variables. Therefore, the variable "Intension to use PHR" is the dependent variable. In this context, the variable "Perceived PHR Usefulness" has the role of mediator variable. Based on this research model, we have designed the following 5 hypotheses. These hypotheses describe the relationships among 4 variables. The assumed relationships between two variables is 'positive' correlation one to other variable.

Hypothesis 1: "ICT-Infrastructure of PHR" has positive correlation with "Perceived PHR Usefulness".

Hypothesis 2: "Personal Tendency to PHR" has positively correlated with "Perceived PHR Usefulness".

Hypothesis 3: "Perceived PHR Usefulness" has positive influence on "Intension to use of PHR".

Hypothesis 4: "ICT-Infrastructure of PHR" has positive influences on "Intension to use of PHR".

Hypothesis 5: "Personal Tendency to PHR" has positive influence on "Intension to use of PHR".

For the acceptance or rejection of hypotheses, research models were analyzed with structural equation model. The result, which hypothesis is rejected or accepted, is shown in Table 2.

3. Method

3.1 Survey and Measurement

This research paper consists of three steps. In the first step, we tried to define the measured variables (constructs). With these variables, a survey based on the 5-point Likert scale questionnaire was administered to 255 students in Korea. In the second stage, we carried out the Exploratory Factor Analysis (EFA) with these variables to define the factors that represented the group of certain measured variables, which will later be categorized into the 1 dependent, 2 independent, and 1 mediator variable. In this stage, we can explain what kind of measured variables belong to which factors. In the Last step, hypotheses about the relations between factors will be tested. Based on the test about correlation coefficient between-factors, the hypotheses could be accepted or rejected.

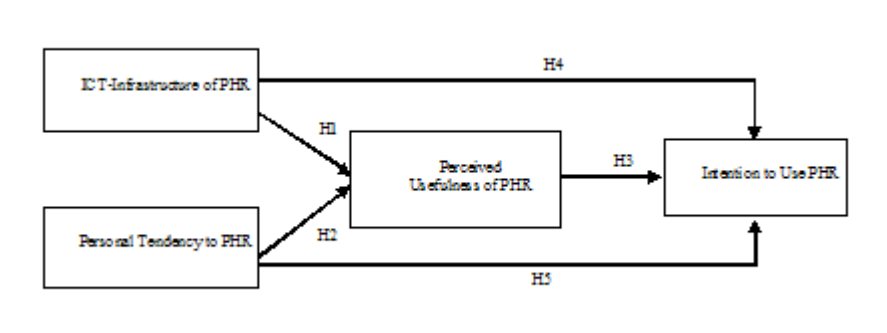


Figure 1. Research model.

3.2 Operational Definition of Variables and Data Collection

In order to carry out this research, the questionnaires in 5 point Likert scale were conducted to find out all factors influencing on the “Intention to use PHR”. On the survey, 255 replies were collected. The questionnaire was composed in 4 categories, i.e., ICT-infrastructure of PHR, Personal Tendency to PHR, Perceived Usefulness of PHR and Intention to Use PHR. These 4 categories comprise 12 measured variables. After Factor Analysis, these variables were classified into 4 groups after deletion of several variables. The Table 1 shows details of above mentioned variables and criteria. After Factor Analysis, the SEM model was deployed to analyze the correlation among these variables. As the result of this effort, we can have the Table 2, Table 3, and Figure 2 which show the result of each hypothesis’s analysis designed from research model.

3.2.1 ICT-Infrastructure of PHR

‘IT-infrastructure of PHR’ is the collection of several information and communication technologies, like data communication, data base and PHR related application software. The function of PHR application software, ease use of PHR service, technical support of system vendor, and safety in the use of PHR are the measured variables in IT-infrastructure of PHR category.

3.2.2 Personal Tendency to PHR

‘AS PHR is to realize based on internet communication technology, the main user group of PHR is young or middle aged people. The old and senile people are generally not familiar with information and communication technology.

The personal tendencies, like individual character, education background, etc., are important attribute which have influence on the use of PHR. Therefore, we assumed that, ‘Personal tendency to PHR’ will have an important role in the decision of using PHR. To this category we have included gender of user, personal intimacy with PHR, perceived safety of PHR, IT-education background, as the measured variables.

3.2.3 Perceived Usefulness of PHR

‘Perceived usefulness of PHR’ is most important factor for decision to use PHR. The following questions were regarded as the predefined measured variables in this category:

- Is PHR helpful in managing my health (help of PHR for my health)?
- Can I manage my health condition more effectively with PHR (effect of PHR for my health)?
- Is using PHR making it easy to manage my healthcare (easy management of healthcare with PHR)?

3.2.4 Intention to use PHR

To measure the variable about the readiness to use PHR, we have provided the following questions:

- How do you like to use PHR, if your PHR is ready to use (preparation of PHR)?
- Are you willing to create your PHR for the management of your health (self-creation of PHR)?

- Are you willing to have education about how to use PHR (education about PHR)?

The above defined variables will be processed statistically with SPSS v.20.0 to be grouped in certain number of factors.

4. Result of Research

4.1 Validity and Reliability of Measure

As discussed, we administered an internet-based 14-item questionnaire survey to 255 students in Korea. Then, item-to-total score correlation and deleting items based on Cronbach's alpha were applied together to determine measured variables for factors. Items with lower correlations were deleted, because they do not contain an additional domain of interest¹⁵. This resulted in the retaining of 12 measured variables, which converged to 4 factors in the Exploratory Factor Analysis (EFA) with Varimax rotation using SPSS 20.0. The result of this stage is represented in Table 1. As shown in Table 1, the Cronbach's alphas of the 4 factors ranged from 0.75 to 0.92, and the factor loadings were all above 0.5 as minimum level suggested by Fornell⁵. Table 1 shows the result of the exploratory factor analysis with measured variables. Exploratory Factor Analysis (EFA) is a statistical technique within factor analysis whose overarching goal is to identify the underlying relationships between measured variables¹⁵. It is commonly used by researchers when developing a scale (a scale is a collection of questions used to measure a particular research topic) and serves to identify a set of latent constructs underlying a battery of measured variables. It should be used when the researcher has no a priori hypothesis about factors or patterns of measured variables. EFA procedures are more accurate when each factor is represented by multiple measured variables in the analysis¹⁵.

As shown in Table 1, we can find 4 factors derived from 12 variables. The Cronbach Alpha (>0.7) of each CSFs in Table 1 means that the reliability of derived factors is assured¹⁵.

4.2 Result of Hypotheses Test

After we executed EFA, we evaluated the Hypotheses based on research model with structural equation model (SEM). The models provided good levels of

fit: $\chi^2(12) = 41.044$, $p = 0.751$, $GFI = 0.974$, $RMSEA = 0.000$, $CFI = 1.000$, $TLI = 1.005$, $AGFI = 0.958$). Therefore, the 4 factor (12 items) correlated research model has acceptable reliability and validity². The results of analysis about the correlations among the variables are as follows:

- "ICT-Infrastructure of PHR" is positively associated with "Usefulness of PHR".

- "ICT-Infrastructure of PHR" is positively associated with "Intention to use of PHR".

- "Personal tendency to PHR" has positive correlation with "Usefulness of PHR".

- "Personal tendency to PHR" has positive correlation with "Intention to use of PHR".

- "Perceived usefulness of PHR" has not positive correlated with "Intention to use of PHR".

Therefore, H1, H2, H4 and H5 were strongly supported (significant, when $p < 0.05$). But H3 has rejected, that is, "Usefulness of PHR" does not have positive relationship with "Intention to use PHR". This means that, the mediator variable, "Usefulness of PHR", in research model does not have mediated influence to independent variable, "Intention to use PHR". Table 3 shows the average and standard deviation of measured variables of 4 factors and also correlation's coefficient between them. The correlation's coefficient for * are significant when $P < 0.05$ and for ** significant when $P < 0.02$ ².

5. Discussion

As discussed before, PHR service is the combination of ICT technology and Healthcare services. The PHR service makes us possible to create and manage the personal health record. That is, PHR is regard as a tool for the management of personal healthcare service. In this paper, the combination of the Exploratory Factor Analysis (EFA) and Structural Equation Model (SEM) was conducted based on the questionnaire and interviews about PHR. The purpose of this study was to assess whether "Intention to use PHR" was positively related to "ICT-infrastructure", "Individual tendency to PHR", and "Usefulness of PHR". The finding confirms as shown in Table 2 that, the Hypotheses, H1, H2, H4 and H5 are accepted and H3 is rejected.

Table 1. Result of Exploratory Factor Analysis

Factor	Measured Variables	Factor Loadings				Cronbach Alpha
		F1	F2	F3	F4	
ICT-Infrastructure of PHR	Easy use of PHR service	0.883	0.178	0.177	0.239	0.901
	Technical support of system vendor	0.876	0.171	0.180	0.241	
	Function of PHR application software	0.832	0.137	0.125	0.058	
	Safety in use of PHR	0.750	0.099	0.098	0.148	
Perceived usefulness of PHR	Effect of PHR for my health	0.143	0.864	0.188	0.127	0.38
	Easy management of healthcare with PHR	0.080	0.824	-0.092	0.113	
	Help of PHR for my health	0.249	0.739	0.220	0.038	
Personal tendency to PHR	Perceived safety of PHR	0.194	0.121	0.839	0.202	0.755
	Education background	0.220	0.157	0.826	0.241	
	Personal intimacy with PHR	0.061	0.019	0.682	-0.039	
Intention to use PHR	Preparation of PHR	0.197	0.132	0.123	0.924	0.923
	Self-creation of PHR	0.298	0.130	0.169	0.883	

Table 2. Result of research model test

Hypothesized Path			Hypothesis	Estimate	S.E.	C.R.	P	Finding
Usefulness of PHR	←	ICT-Infrastructure of PHR	H1	0.357	0.082	4.364	***	Accept
Usefulness of PHR	←	Personal tendency to PHR	H2	0.283	0.088	3.211	0.001	Accept
Intention to use of PHR	←	Usefulness of PHR	H3	0.086	0.055	1.559	0.119	Reject
Intention to use of PHR	←	ICT-Infrastructure of PHR	H4	0.358	0.063	5.698	***	Accept
Intention to use of PHR	←	Personal tendency to PHR	H5	0.211	0.064	3.289	0.001	Accept

Table 3. Analysis of Inter-factors Correlation

Factors	Average	Standard Deviation	Inter-Construct Correlation			
			ICT-Infrastructure of PHR	Personal tendency to PHR	Usefulness of PHR	Intention to use of PHR
ICT-Infrastructure of PHR	4.55	0.70	1.00			
Personal tendency to PHR	4.35	1.08	0.169**	1.00		
Usefulness of PHR	4.10	0.89	0.357**	0.283**	1.00	
Intention to use of PHR	4.62	0.64	0.358**	0.0211**	0.086	1.00

*correlation's coefficient 0.05 (bilateral significant). ** correlation coefficient 0.01(bilateral significant).

The following Figure 2 shows the analysis result of research model. Every digit on the arrow means the correlation coefficients between related factors.

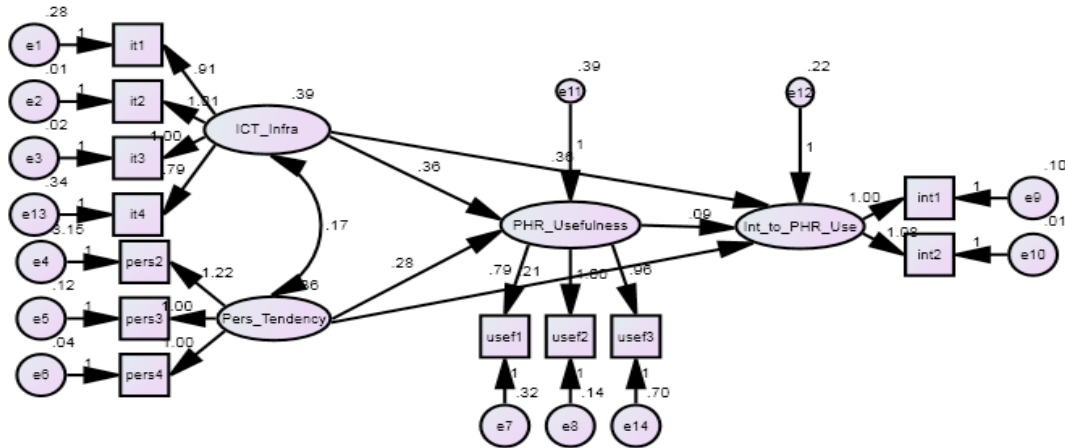


Figure 2. Result of structural equation model to test the Hypotheses.

This means that mediator affect of “Usefulness of PHR” on “Intention to use of PHR” is not significant. The result of this study could be an important reference to the policy maker in promoting and supporting the PHR for the healthcare system in Korea. This study is tempered with limitations. First, there was lack of sample data for measured variables. The questionnaire survey and interview was conducted to 255 university students in Korea. This means that the preparation of perfect and more sophisticated questionnaire and various selection of interviewee is necessary for the betterment of the quality of research.

Second, this kind of quantitative research alone is enough to test the correlation among factors related to “Intention to use PHR”. So it may be necessary to consider the qualitative variable, like word to mouth effect, to improve quality of research. Third, it is possible that other significant social variables have not been included in this model. Variables such as the income status of potential user of PHR, and the perceived cost for adoption of PHR can be included in future research model. This research can also bring meaningful strength and implication to both academics and practices. The academics can review the whole research procedure of this study

and make effort to improve the research methodology for the better result. And in the practice the result of this study could be meaningful references for the implementation and successful operation of PHR service system.

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