THE STUDY OF PERSONAL HEALTH RECORD USER'S BEHAVIORAL MODEL

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Abstract - The personal health record (PHR) is a system that enables borderless medical care services by combining technological innovation and human consideration. This study explored factors affecting the adoption of PHR from technical, medical, and social perspectives according to the Protection Motivation Theory (PMT) and Unified Theory of Acceptance and Use of Technology (UTAUT) model. A survey using a structured questionnaire was subsequently conducted, which produced the following results: (1) The PMT and UTAUT were effective at predicting PHR usage behaviors; (2) Perceived ease-of-use was the most decisive factor influencing the use of PHR, followed by self-efficacy and perceived usefulness; and (3) Behavioral intention for PHR was significantly and positively correlated with usage behavior. From the obtained results, this study recommends that health authorities and medical institutions promote self-efficacy in the use of PHR to improve the levels of behavioral intention and usage behavior among the people. Additionally, medical care institutions are recommended to promote health management and preventive healthcare concepts to help improve public acceptance of the PHR system as a means to self-manage their health. Finally, community centers, medical institutions, and health authorities are urged to work together to enhance public medical knowledge and pool resources for the PHR system, both of which are essential for improving the popularity of the PHR, public quality of life, and the effectiveness of health management.

Keywords - Personal Health Record; Protection Motivation Theory; UTAUT Model

I. INTRODUCTION

The American Health Information Management Association has defined the PHR as "An electronic system, generally available lifelong health information resource, which can help people to make a healthy decision". People use the information by PHR, which comes from health care providers and individuals. Another popular definition, from the Healthcare Information and Management Systems Society, describes it as "a universally accessible, layperson comprehensible, lifelong tool for managing relevant health information, promoting health maintenance and assisting with chronic disease management" [1]. A PHR enhances a patient's awareness of personal governance in health management, and reduces the wastage of medical resources that occurs from unnecessarily repeating tests and prescriptions. Furthermore, the adoption of the PHR system can help resolve the problem of unequal medical resource distribution. For example, residents in remote areas that lack medical resources (e.g., facilities and manpower) are compelled to seek medical attention from various places, resulting in a wide dispersal of personal medical records that are not readily available for physicians to review a patient's medical history and medication record. Therefore, transmitting medical data into an online PHR is instrumental for physicians and health care providers to effectively communicate with patients, and improves the physician-patient relationship as well as patient satisfaction [2–4]. PHR provides an integrated and broad range of health-related information, including disease symptoms, medical problems, allergies, vaccination history, medical records and medical provider recommendations.

1.1. Relationship between Self-Efficacy and Perceived Usefulness and Perceived Ease-of-Use

Previous studies on electronic health records have found that the decisive factors that influenced physicians' acceptance included PU and PEOU. Moreover, the use of computer self-efficacy as an antecedent variable has a significantly positive impact on PEOU, which in turn affects PU. This suggests that if a physician considered him or herself proficient with information technology, operating the electronic health records system would feel easier if additional training were given; furthermore, the physician's PU of the system would be enhanced [5].

H1: Self-efficacy positively influences perceived usefulness.

H2: Self-efficacy positively influences perceived ease-of-use.

1.2. Relationship between Social Support and Perceived Benefits Relationship between Behavioral Intention and Perceived Usefulness, Perceived Ease-of-Use, and Subjective Norm

A study on electronic health records discovered that although many countries have adopted a PHR system, physicians' acceptance has posed considerable limitations to its implementation. Four models were subsequently used to explore physicians' acceptance of the technology, and revealed that decisive factors influencing the physicians' acceptance included PU, PEOU, and subjective norms. According to the psychosocial model, social and professional norms are the most decisive factor for physicians'

acceptance. If a physician considered the use of the system an adequate medical practice, and at the same time earned the support of peers and patients, the physician's usage behavior of the system would be increased [5].

H3: Perceived usefulness positively influences behavioral intention.
H4: Perceived ease-of-use positively influences behavioral intention.
H5: Subjective norm positively influences behavioral intention.

1.3. Relationship between Behavioral Intention and Self-Efficacy, Perceived Severity, Perceived Susceptibility, Response Efficacy, and Response Costs

The perceived severity, perceived susceptibility, self-efficacy, response efficacy, and response costs are variables in the PMT that are effective in predicting short- or long-term health behaviors, and have all been successfully applied in studies on various public health issues. For example, a study found that if people had higher levels of perceived severity, perceived susceptibility, and self-efficacy in their awareness of the health risks of an unhealthy diet, their dietary behaviors would become healthier as a result; self-efficacy was found to the most decisive factor in this regard [6].

H6: Perceived severity positively influences behavioral intention.
H7: Perceived susceptibility positively influences behavioral intention.
H8: Self-efficacy positively influences behavioral intention.
H9: Response efficacy positively influences behavioral intention.
H10: Response costs negativity influences behavioral intention.

1.4. Relationship between Behavioral Intention and Usage Behavior

According to the TAM, attitude is influenced by PU and PEOU, and behavioral intention, which affects the usage behavior performed, is influenced by attitude and PU [7]. For example, research determined that a higher level of physicians' acceptance and behavioral intention increased their usage of electronic health record systems [8].
H11: Behavioral intention positively influences usage behavior.

II. RESEARCH METHOD

The online PHR system of a regional hospital in Zhushan, Nantou County was the subject of the present study. The front end of the system is a community telehealth system that gathers and transfers vital sign data of community residents into the hospital's patient database which, after incorporating with the back-end system (i.e., the hospital's information system), becomes a webpage-based PHR system accessible through mobile devices (e.g., smart phones and tablets). The system allows its users to review the historical data of their vital signs (pulse rate, temperature, respiration rate, and blood pressure), as well as their medical records, such as the diagnoses, tests, prescriptions, and treatments they have received. This increases the users' understanding of their health conditions and enables them to monitor the long-term progress of their therapies for the purpose of attaining health promotion and self-health management.

III. RESULTS

3.1. Descriptive Characteristics

There were 223 valid questionnaires available. The effective return rate was 50%. Descriptive statistics revealed that males comprised 39.9% (n = 89) and females comprised 60.1% (n = 134) of the participants. The majority of the participants were aged more than 70 years (65.5%, n = 146), followed by 60–69 years (20.2%, n = 45). Furthermore, most of the participants only had a primary school education (42.2%, n = 94) or were illiterate (31.8%, n = 71). The discussion about the participants' primary caretakers consisted of one multiple choice question, which revealed that most of the caretakers were the spouse of a participant (56.5%, n = 126) or the child of a participant (39.6%, n = 113). Finally, the participants identified chronic diseases they had developed: hypertension was the most common (39.5%, n = 123) and "other" was the second most common (21.5%, n = 67).

3.2. Reliability and Validity

The present study then evaluated the questionnaire's internal consistency using Cronbach's α, composite reliability (CR), and the average variance extracted (AVE). First, Cronbach's α was used to analyze the reliability of the constructs' Likert scores. According to Guilford [9], internal consistency was confirmed if Cronbach's α was >0.7. As outlined in Table 1, all of the scales exhibited a Cronbach's α >0.7, indicating a favorable internal consistency.

Construct	Cronbach's α	Composite Reliability	Average Variance Extracted
Perceived usefulness	0.992	0.992	0.968
Perceived ease-of-use	0.995	0.995	0.985
Subjective norm	0.937	0.944	0.850
Behavioral intention	0.988	0.997	0.993
Usage behavior	0.979	0.667	0.500

Perceived severity	0.774	0.796	0.574
Perceived susceptibility	0.992	0.992	0.978
Self-efficacy	0.955	0.957	0.883
Response efficacy	0.991	0.992	0.975
Response costs	0.959	0.964	0.900

Table 1. Internal consistency, convergent validity analyses.

3.3. Structural Equation Modeling

The overall model fit was as follows: $\chi^2/df = 1.985$, goodness-of-fit index = 0.875, adjusted goodness-of fit index = 0.795, nonnormed fit index = 0.960, comparative fit index = 0.913, incremental fit index = 0.913, and root mean square error of approximation = 0.067. Thus, these indicators all conformed to the standards set by Hair [10] and Jöreskog and Sörbom [11], and revealed a favorable overall model fit in the study's theoretical model.

3.4. Model and Hypothesis Testing

A path coefficient of 0.460 and $p < 0.001$ revealed that high self-efficacy was correlated with a high PU of the PHR system, which supported H1; a similar path coefficient of 0.465 and $p < 0.001$ suggested that high self-efficacy was also correlated with a high PEOU of the PHR system, which confirmed H2. The correlation between PU and behavioral intention was measured with a path coefficient of 0.172 and $p < 0.01$, which indicated that high PU corresponded to a high level of behavioral intention for the PHR system and substantiated H3. Similarly, the correlation between PEOU and behavioral intention was manifested in a path coefficient of 0.215 and $p < 0.001$, which revealed that high PEOU also corresponded to a high level of behavioral intention for the PHR system and supported H4. Furthermore, subjective norm and behavioral intention were found to be correlated, with a path coefficient of 0.103 and $p < 0.05$, indicating that a high level of subjective norm corresponded to a high level of behavioral intention for the PHR system and validating H5. The correlation between self-efficacy and behavioral intention exhibited a similar path coefficient of 0.202 and $p < 0.05$, signifying that high self-efficacy corresponded to a high level of behavioral intention for the PHR system and confirming H8. Response efficacy and behavioral intention were also correlated, and exhibited a path coefficient of 0.145 and $p < 0.05$, suggesting that high response efficacy corresponded to a high level of behavioral intention for the PHR system and verifying H9. Finally, the correlation between behavioral intention and usage behavior was determined by a path coefficient of 0.653 and $p < 0.001$, which demonstrated that a high level of behavioral intention corresponded to a high level of usage behavior of the PHR system and corroborated H11.

H6 was rejected following the limited correlation between perceived severity and behavioral intention, defined by a path coefficient of -0.048 and $p > 0.05$. Similarly, perceived susceptibility and behavioral intention demonstrated limited correlation, exhibited by a path coefficient of -0.051 and $p > 0.05$, which invalidated H7. Finally, the correlation between response costs and behavioral intention exhibited a path coefficient of only 0.052 and $p > 0.05$, which nullified H10. All the testing results are summarized in Figure 2.

CONCLUSIONS

We used PMT and UTAUT to explore the PHR usage behaviors from technical, medical, and social perspectives, with the goal of identifying the decisive factors that could facilitate improved public health and welfare through a widely accepted PHR system. This study recommends that health authorities and medical institutions promote self-efficacy in the use of PHR to improve the levels of behavioral intention and usage behavior among the people. Based on the result, we suggest medical care institutions to promote health management and preventive healthcare concepts to help improve public acceptance of the PHR system. Finally, community centers, medical institutions, and health authorities are urged to work together to enhance public medical knowledge and pool resources for the PHR system, both of which are essential for improving the popularity of the PHR, public quality of life, and the effectiveness of health management.

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