

5-26-2012

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Recommended Citation

Deng, Zhaohua; Zhang, Liang; and Zhang, Jinlong, "Applying Technology Acceptance Model to Explore the Determinants of Mobile Health Service: From the Perspective of Public User" (2012). *Eleventh Wuhan International Conference on e-Business*. 93.
<http://aisel.aisnet.org/whiceb2011/93>

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Applying Technology Acceptance Model to Explore the Determinants of Mobile Health Service: From the Perspective of Public User

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Abstract: With the rapid usage rate of mobile phone and advances in healthcare technology, as well as current concerns arise over public's health, mobile health are attracting the attention of more and more people. Although previous studies on the adoption of mobile services are quite extensive, few focus on public users' adoption of mobile health service (MHS). In this study, we examine the determinants of user adoption of MHS based on Technology acceptance model (TAM). The findings confirm that perceived usefulness positively affect users' attitude toward MHS, perceived service availability significantly impact on perceived ease of use and perceived usefulness, perceived usefulness and attitude directly enhance intention.

Keywords: mobile health service, Technology Acceptance Model, service availability

1. INTRODUCTION

Inadequate health service is very serious in developing countries^[1]. As such, mobile health service provides an effective method for health services in developing countries, that is, in the case of the shortage of health human resources, users can obtain health information or medical advice through mobile health service, thus to alleviate the problems of overcrowding in medical institutes, and of increasing medical expenses^[2]. More specifically, China, a big developing country, is facing the severe medical problems of "Kan bing nan, kan bing gui". These two Chinese phrases mean "proper health care is difficult to get" and "proper health care is expensive". In the other hand, according to the Ministry of Industry and Information Technology of the People's Republic of China(MIIT), the number of mobile phone users in China increasingly amounted to 0.97 billion as of November 2011, and the penetration rated reached 71.1% in that same period^[3]. As mobile phones have become an important part of everyday life for many people in China, providing health related service in mobile phone will be possible to encourage healthy living. Thus, low-cost mobile phones and global popularity of mobile communication networks promise great opportunities for the development of mobile health service in China.

Although MHS has a number of advantages, the applications have not been implemented as predicted. The probable reason is that user adoption rate is low. Accordingly, a study of how public users adopt mobile health is desperately needed to effectively promote the pervasion of such services. However, with respect of adoption of electronic health or mobile health, previous studies are centered on professionals^[4-8]. Little research concerned the mobile health adoption in a broader view of public users. In contrast, investigating the factors affecting the adoption of mobile healthcare is so important^[9, 10]. Thus, we aim to conduct an empirical study to examine the factors influencing user adoption of mobile health service from the perspective of public users.

Being able to anticipate and predict mobile health adoption in public will arm health care providers, as well as policy makers, with valuable information in order to make health-related decisions for their patients and

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community members, especially those living and working in rural, medically-underserved areas.

The technology acceptance model (TAM) and its extensions are widely used in exploring adoption of information systems. In recent years, increasing interests in users' reactions to health information technology has elevated the importance of TAM to predict and explain health IT acceptance and use^[11]. According to Chau and Hu^[9], in explaining personal acceptance of telemedicine technology, TAM might be better than TPB. Wu et al.^[4] examined the adoption of mobile healthcare by hospital's professionals based on TAM and TPB. Pai and Huang^[12] applied TAM in the study of health information systems.

However, TAM has not yet been employed in the context of mobile health service from the perspective of public users. We believe that user acceptance of mobile health can also be predicted by TAM. That is, users should at first find that mobile health service as an effective tool to obtain health information and to deal with health transactions is useful and easy to use. Previous studies suggest that TAM should integrate other theories of acceptance in order to incorporate relevant human and social factors and to facilitate its predictive and explanatory power^[13]. Thus we added a construct perceived service availability to TAM model to predict user adoption.

2. LITERATURE REVIEW

Technology acceptance model

Perceived usefulness and perceived ease of use are the main two constructs that predicting user adoption of information systems^[14]. perceived usefulness refers to "the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context"; perceived ease of use refers to "the degree to which the prospective user expects the target system to be free of effort"; attitude referred to "an individual's positive or negative feelings (evaluative affect) about performing the target behavior"; behavioral intention was defined as "a measure of the strength of one's intention to perform a specified behavior"^[14, 15]. TAM states that, perceived ease of use positively affects perceived usefulness and attitude has a positive impact on the behavioral intention. Moreover, perceived usefulness positively impact on attitude and behavioral intention and the relationships have been empirically tested in many previous studies^[13, 14, 16, 17].

Mobile health services use mobile phones as the terminals to receive health information or search for appropriate medical advice through mobile networks. Such services rely on advanced information technologies and networks as the platform. As a result, they can be viewed as outputs generated by information systems. When healthcare consumers use mobile health services, they are adopting new information technologies. Hence, we can use TAM to examine healthcare consumers' adoption of mobile health services.

According to Agarwal and Prasad^[18], behavior intention is measure contemporaneously with beliefs, it is suitable for survey-based research. Many other studies also stated that behavior intention significantly related to actual usage, and it can be used to predict actual usage. Furthermore, mobile health has been listed as a development design for newly emerging service industries for 2011 in China, while still in its infancy, and there are very few users who subscribe to this form of health care. Thus, we hypothesize behavior intention as a dependent variable to interpret the acceptance of mobile health.

For users to adopt mobile health service, they need first find mobile health service is useful for improving their efficiency of health management, enabling them to more conveniently obtain first hand health information. When consumers perceive such services as being helpful to their health, they will form a positive attitude toward the services, which will in turn affect the behavioral intention. In addition, users feel that mobile health is easier to use, they will perceive the service more useful, and will have more positive attitude toward it. As discussed previously, TAM states that perceived usefulness has a direct impact on behavioral intention,

perceived usefulness and perceived ease of use are two antecedents of attitude, and perceived ease of use has a direct effect on perceived usefulness. We argue that these potential linkages exist in the context of mobile health service.

Thus, we have the following hypothesis:

H1 attitude toward mobile health service positively affect behavior intention

H2 Perceived usefulness positively affects intention to use mobile health

H3 perceived usefulness positively affects attitude

H4 Perceived ease of use is positively related to perceived usefulness

H5 Perceived ease of use positively affects attitude toward the mobile health

Perceived service availability

Mobile technology can provide high availability of health information for users anytime and anywhere, thus to increase users efficiency to manage their health information. The main advantage of mobile health service compared with electronic health service is to access the health service ubiquitously. Thus, the usefulness is obviously decided on whether it can be regularly operated regardless of time and place. However, the mobile network is often instable, and the speed is quite slow. Thus, users usually hesitate to use it. Perceived service availability refers to “the degree to which an innovation is perceived as being able to support pervasive and timely usage”^[4].

Thus, we hypothesize:

H6 Perceived service availability positively affects perceived usefulness.

H7 Perceived service availability positively affects perceived ease of use.

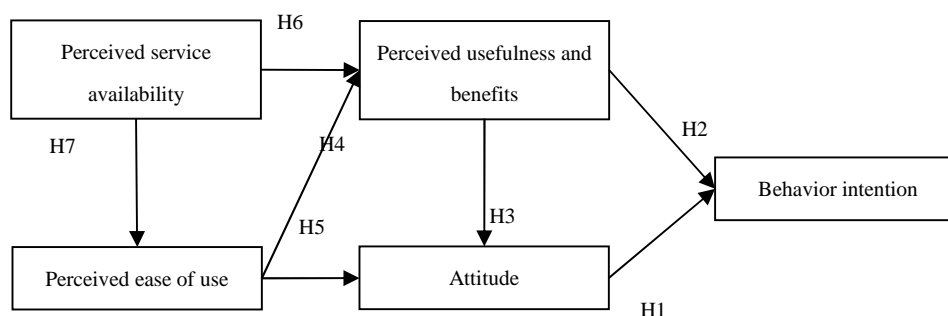


Figure1 Research model

3. RESEARCH METHODOLOGY

This study used a questionnaire survey to collect data on mobile phone users’ perceptions of m-health services. In order to ensure content validities, we mostly adapted scales used in previous studies. Specifically, the items measuring perceived usefulness and perceived ease of use were adapted from Davis ^[14]. The measuring items for perceived service availability were adapted from Wu et al.^[4]. Items measuring attitude toward using (ATT) and behavioral intention to use (BI) were adapted from Taylor and Todd ^[19].

After we developed the preliminary questionnaire, we conducted two pretests for mobile phone users, medical service researchers and practitioners. In the first pretest, we asked mobile phone users for their feedbacks on the questionnaire and revised the questions they identified as ambiguous. Next, we interviewed two health information systems researchers and two practitioners. We asked them for feedbacks on our survey and revised the questions based on their suggestions. All items corresponding to the constructs were measured using 7-point Likert scales, with answer choices ranging from strongly disagree (1) to strongly agree (7).

As mentioned above, mobile health is in its incipient stages in China, most people have not used this type

of service. Thus, in order to avoid that respondents undermine the questionnaires, we used a convenience sample, the college students in a university of central China. In the summer of 2011, we send the questionnaires to students in the canteen, and declared that if the respondents were willing to finish this questionnaire, they would have a gift. After two weeks, we collected 260 responses. We also collected data in another campus whose students are majoring in medical and medicines. One week later, a total of 353 responses were gathered. After eliminating insincere and incomplete responses through data filtering, we got a total number of 336 usable responses.

Of the 336 participants, 198 are males, 127 are females, and 86 are% below 30 years-old. Most of them are young people. Nearly 70% of the respondents have a bachelor’s degree or higher education level. RESULTS

A structure equation modeling approach is used in this study. We first conducted a confirmatory factor analysis to test the validity of the constructs, including item loading, construct reliability, and average variance extracted (AVE). the factor loadings of all standardized items are greater than 0.5 on their expected factor and less than 0.4 on other factors; thus the construct validity is acceptable [20]. Second, we measured the reliability of each construct using the composite reliability (CR) and Cronbach Alpha. The results show that all constructs have higher scores than that of the acceptable level of CR and Alpha 0.7.the composite reliability(CR) is suggested to be higher than 0.6. Third, we use AVE to measure the variance to the measurement error captured by the indicators. All the values of AVEs are greater than the cutoff value 0.5. Additionally, every scale item is statistically significant at the significance level of 0.05. Thus, our data have good convergent validity, which means that the measurement model is acceptable in terms of construct validity.

For the hypothetic SEM model, we used Lisrel 8.72 to test whether the empirical data conform to the proposed model. The model includes 18 items describing five latent constructs: perceived usefulness, perceived ease of use, perceived service availability, attitude, and intention. We examined the model fit of our research mode. The common criteria in the SEM were previously suggested by Hair et al.. The results indicate adequate model fit between our research model and the empirical data.

To test the significance of each hypothesis path in the research model, Lisrel reports raw and standardized estimates for all specified paths, as well as standard errors and test statistics for each path. Figure 2 shows the relative strengths of each path specified by the research model and the variance (R^2) explained by each path. Table 5 summarizes the results of hypothesis. First, as hypothesized, perceived usefulness and attitude significantly affect behavior intention and R^2 is 0.684. Second, perceived ease of use and service availability significantly affect perceived usefulness and the variance explained is 0.239. The results indicate that the behavior intention of adopting mobile health service is explained by PU and ATT, ATT is explained by PU, and PU is explained by PSA and PEOU.

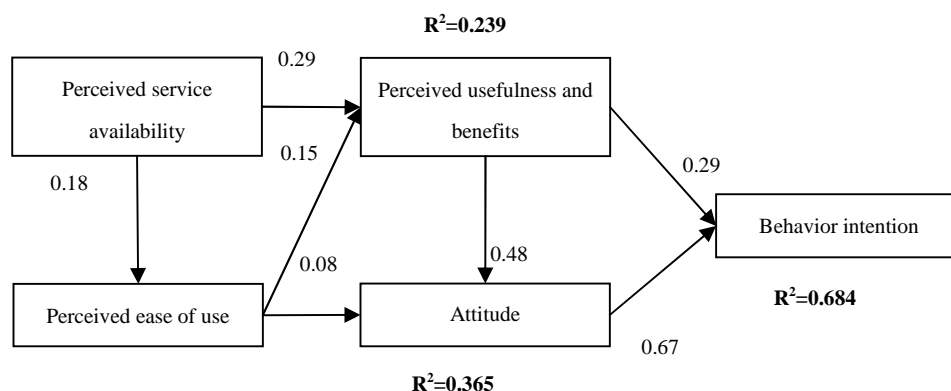


Figure 2 the results of research model

4. DISCUSSION AND CONCLUSION

This study attempts to examine the determination of healthcare adoption of mobile health service based on TAM. We believe that our research can gain some insights into mobile health service marketing strategies. The research found that, perceived ease of use and perceived service availability significantly affect perceived usefulness. Specifically, perceived service availability has more magnitude of significance than that of perceived ease use. This implies that the usefulness of mobile health service is greatly decided on whether it can be used anytime and anywhere. In addition, if a user perceives mobile health service as easier to use, they perceive it as more useful.

Furthermore, the results show that attitude and perceived usefulness are important factors in determining a user's intention to use mobile health service, and the magnitude of attitude is more significant than that of perceived usefulness. Additionally, while perceived usefulness has a significant direct impact on attitude toward using mobile health service, it also has an indirect effect on intention through the mediator of attitude. Perceived ease of use and perceived service availability have indirect effects on intention through perceived usefulness. Thus, we cannot ignore the impact of these two factors in adoption of mobile health service.

Our research has the following contributions. First, we explore mobile phone users' perceptions of MHS in China, which is seldom concerned by other researchers yet. Thus, our research fills the gap in understanding this application, which is undergoing a process of rapid development. Second, by integrating TAM and perceived service availability, we develop and validate a more comprehensive adoption model in China's MHS context than previous researches^[4, 12, 21].

ACKNOWLEDGEMENT

This research was supported by a grant from the Humanities and Social Science Foundation of Ministry of Education(12YJC630031),and a grant from the National Natural Science Foundation of China (70731001).

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