# A Study on the Attitude of Use the Mobile Clinic Registration System in Taiwan

Yi-Horng Lai

Department of Health Care Administration
Oriental Institute of Technology (Taiwan)
New Taipei City, Taiwan
Email: FL006 {at} mail.oit.edu.tw

*Abstract*—**The application programs (App) for smart phones provide diverse and multiple services and various convenient functions. This study applied the modified technology acceptance model (MTAM) in information systems research to the using of the mobile clinic registration system in Taiwan. The MTAM posits that perceived ease of use and perceived usefulness of technology influence users' attitudes toward to use technology. Research subsequent to MTAM has added information technology experience as a factor in predicting attitude. This study test the validity of this MTAM model while applied to mobile registration system via data collected from 501 patients in Mackay Memorial Hospital in Taiwan. Path analytic results show that the perceived usefulness and the perceived ease of use are positively associated with user's attitude toward using, the perceived ease of use is positively associated with the perceived usefulness, and the information technology experience was positively associated with the perceived usefulness and the perceived ease of use.**

*Keywords- hospital information system, mobile technology, technology acceptance model, structural equation modeling*

## I. INTRODUCTION (HEADING 1)

The current standard operating procedure in hospital for patient appointment scheduling was time consuming. It could be find that patients walk to the hospital and filling out registration forms and waiting to be called or patient calls in for getting appointment and waits for the response for an agreed date. These years, clinic appointment can be done online via internet, but patient still should to walk in with the appointment card to be swiped by the front desk personnel before being sent to the concerned doctor. In view of these problems, many techniques like online patient registration and scheduling appointment, etc., have been suggested to improve the work flow and thereby smoothen the waiting time.

There were many ways to make a clinic appointment in Taiwan, such as walking in, with the telephone, with the internet, or with the registration machine. Now, this new mobile registration APP was added on and is expected to combine with other prompt and multiple services for the general public.

In order to provide people with faster and more services, most Taiwanese hospital had launched the new mobile service to provide the service of mobile registration, travelling direction guidance, appointment reminder and waiting number request (Figure 1). This application programs (App) is now ready for download at APP store (iOS) and Android Play Store (Android). The App for smart phones provide diverse and multiple services and various convenient functions.



Figure 1. The mobile clinic registration system of Mackay memorial hospital in Taiwan

Building on the technology acceptance model (TAM) as a theoretical basis, this study investigated the inclination of consumers to use mobile registration system from the viewpoint of patients' decision influence factors. Factors of patients' decision influence factors fall within the domain of behavioral psychology and have not been widely applied to the analysis of mobile registration system users.

### A. The Technology Acceptance Model

Based on the theory of reasoned actions (TRA) [1], TAM addresses factors influencing a user's attitude toward using (ATT) and intention to use technology [2]. TAM has been widely adopted in studies exploring technology acceptance due to its parsimonious nature and highly reliable constructs.

Examples include studies testing user acceptance of word processors [2], spreadsheet applications [3], email [4], and websites [5].

TAM considers perceived usefulness (PU) and perceived ease of use (PE) as two major factors influencing a user's attitude toward using technology (ATT) in using hospital system [6]. The former refers to the perceived effectiveness of improving the user's performance, while the latter refers to how effortless a user perceives using the technology to be. Prior research has found that PE mostly influences attitude and intention indirectly through PU [7]. Perceived usefulness and user attitude in turn influence intention to use, which predicts actual usage of technology. Treating the telemedicine information system as a new technology is used in Hospital in Hong Kong. This paper proposes that the same relationships from TAM hold in relation to using the Cardiac Arrhythmia Monitoring in as a telemedicine technology used in Taiwan.

- H1: PE is positively associated with ATT.

- H2: PU is positively associated with ATT.

- H3: PE is positively associated with PU.

### B. Personal Prior Experience

This model that built base on Tam be called Modified Technology Acceptance Model (MTAM). Experience was not explicitly included in the original TAM. Davis [1] and consumer behavior researchers has studied the relationship between a person's experiences and his or her behavior. Experience, which is the result of acquiring and processing stimulation over time, is one factor that determines how much exposure to a particular stimulus a person accepts.

"Personal experience of a given objects (in this study, information technology experience and medical treatment experience) affects a person's behavior" [8]. They found that the more positive a person's experience about an object is, the more positive beliefs he or she will hold about it. As a result, the more positive beliefs a person has, the more positive attitude this will create. On the other hand, according to the user behavior literature, beliefs and attitudes are principally created based on a person's personal experience of a given object. User experience drive a users' initial understanding of the system, while more experienced users focus on usefulness and compatibility. Theoretical and practical contributions are discussed [9].

Prior information technology experience (IFE) influences the attitude and performance of using technical devices [10]. Generally, it has found that experts show a superior performance with respect to the utilization of technology. This finding is rather trivial as long as the relationship between computer experience, technology acceptance, and performance is not completely clarified.

Thompson, Higgins, and Howell [11] argued that within the context of information technology, both self-reported computer skill and length of use should be measured because they represent distinct dimensions of general computer experience. As a reflection of self-reported computer skill, computer self-

efficacy measures the level of confidence that a user has when working with new software packages. On the other hand, the length of computer experience is an objective measure of a user's computer experience. More computer experience usually implies greater exposure to different types of applications and higher level of familiarity with various software packages. Although computer expertise and its effect on performance has been studied thoroughly [10], the underlying concept of expertise and its measurement are not exactly defined yet. This expectation leads to the hypothesis:

- H4: IFE is positively associated with PU.

- H5: IFE is positively associated with PE.

## II. METHODOLOGY

### A. Research Framework

With PE, PU and related propositions integrated, Figure 2 was the summarize the research framework of this study in a TAM model in which perceived ease of use, perceived usefulness, information technology experience and medical treatment experience positively influence users' attitude and intentions.
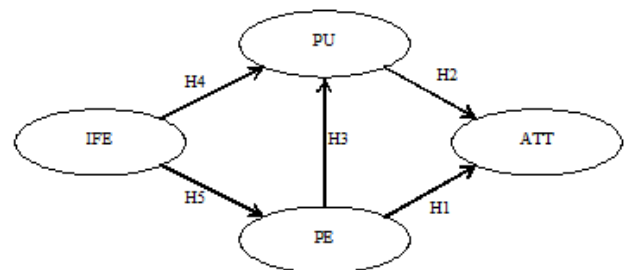


Figure 2. Research framework

### B. Methodology

The validity of the proposed relationships in the research model presented above was investigated through a field study. This study incorporated use of mobile registration system in a Taiwanese medical center (Mackay Memorial Hospital in Taiwan) from September 1, 2013 to October 31, 2013. There were 501 patients' feedbacks in this study.

This study was developed in a way that the model constructs in TAM were adapted to the context of using Cardiac Arrhythmia Monitoring. Scale items on the survey include those measuring perceived usefulness (PU), perceived ease of use (PE), a user's attitude toward using (ATT) and intention. The questionnaire contains no identifying information about the individual participants.

The questionnaire of PU, PE, ATT, Intention and IFE in this study are modified from David's study [2].All variables exhibit a high level of reliability with the Cronbach's alpha values (Table 1) exceeding the recommended 0.6 [12]. There are 6 parts in the research questionnaire with 5 scales.

TABLE 1: SCALE RELIABILITY

| Scale | N of Items | Mean | S.D. | Cornbach's α |
|---|---|---|---|---|
| PU | 9 | 5.63 | 1.03 | .98 |
| PE | 4 | 5.42 | 1.04 | .97 |
| ATT | 4 | 5.73 | 1.04 | .92 |
| IFE | 6 | 5.94 | 1.07 | .94 |

*C. Model Testing*

The structural model is investigated using Mplus 7. Path analysis was performed on the model using standardized maximum likelihood estimation. The path analytic method offers the advantage of testing the overall model fit with multiple endogenous variables as in the model as well as individual a priori hypotheses.

TABLE 2. RESULTS OF CORRELATION COEFFICIENT

|  | PU | PE | ATT | IFE |
|---|---|---|---|---|
| PU | .98 | | | |
| PE | .82* | .98 | | |
| ATT | .78* | .64* | .89 | |
| IFE | .41* | .43* | .43* | .79 |

*: P-value<.05

The likelihood ratio chi-square test assesses the overall model fit. Chi-square per degree of freedom (CMIN/DF), the relative Chi-square, was 34.93. RMSEA was .15, CFI was .91, TLI was .90, and SRMR was .07.

The result of correlation coefficient was as Table 2. It could be found those square of AVE were between .79 and .98. They are larger than most of other ration in the table.

## III. RESULTS

A total of 501 mobile registration system users' feedbacks were collected. Some basic demographic information is collected, indicating approximately 207 male (41.32%) and 294 female (58.68%) in the sample population. Most of them were under 25 years old (133; 26.55%) (Table 3).

*A. Structural equation model*

Correlations among the variables are illustrated in Figure 3. This model explains .98 of the variance in attitude.

The result of hypothesis testing in this study was as Table 4. Perceived ease of use is positively associated with a user's attitude toward using. Perceived usefulness is positively associated with a user's attitude toward using. Perceived ease of use is positively associated with perceived usefulness. Prior information technology experience is positively associated with perceived usefulness. Prior information technology experience is positively associated with perceived ease of use.

TABLE 3. DATA SUMMARIZE

| Variable | | Frequency | Percent (%) |
|---|---|---|---|
| **Gender** | Male | 207 | 41.32 |
| | Female | 294 | 58.68 |
| **Appointment with APP** | Yes | 66 | 13.17 |
| | No | 435 | 86.83 |
| **Experience of appointment with APP (times)** | 0~3 | 474 | 94.61 |
| | 4~10 | 21 | 4.19 |
| | 11~ | 6 | 1.20 |
| **Age** | ~25 | 133 | 26.55 |
| | 26~30 | 106 | 21.16 |
| | 31~35 | 103 | 20.56 |
| | 36~40 | 54 | 10.78 |
| | 41~45 | 55 | 10.98 |
| | 46~50 | 23 | 4.59 |
| | 51~ | 27 | 5.39 |
| **Education** | Primary school | 1 | 0.20 |
| | Junior High School | 15 | 2.99 |
| | Senior School | 88 | 17.56 |
| | Under Graduate | 341 | 68.06 |
| | Graduate | 56 | 11.18 |
| **Total** | | 501 | 100.00 |
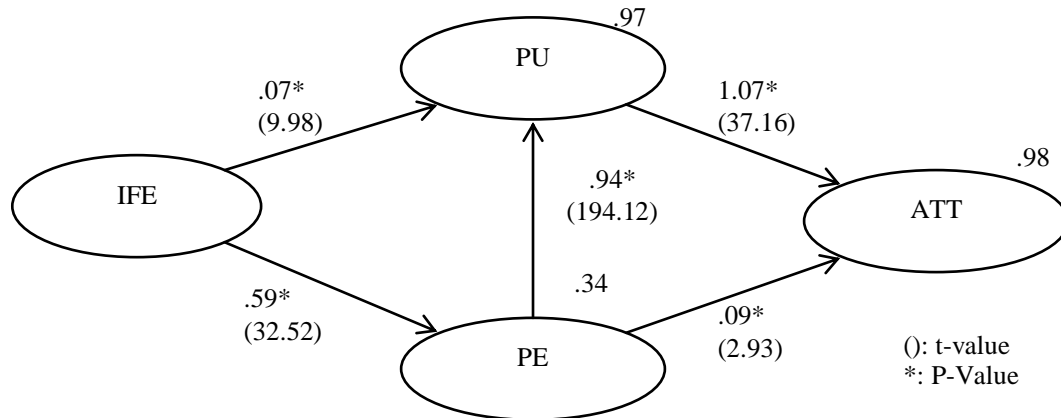
Figure 3. Structural model with inter-construct correlations

TABLE 4. RESULTS OF HYPOTHESIS TESTING

|  | Path | Estimate | S.E. | z-value | Support |
|---|---|---|---|---|---|
| **H1** | PU → ATT. | .25* | .01 | 19.56 | Yes |
| **H2** | PE → ATT. | .02* | .01 | 2.91 | Yes |
| **H3** | PE → PU. | .89* | .01 | 108.79 | Yes |
| **H4** | IFE → PU. | .21* | .02 | 9.77 | Yes |
| **H5** | IFE → PE. | 1.80* | .08 | 21.87 | Yes |

*: P-value<.05

## IV. CONCLUSION

### A. Research and Practical Implications

Findings of this study provide evidence that TAM was an applicable model in examining factors influencing users' attitudes of using the mobile registration System.

In this study, it could be finding that the perceived usefulness and the perceived ease of use are positively associated with users' attitude toward using. A useful and ease of use the mobile clinic registration system can improve users' attitude of using it. The perceived ease of use was positively associated with the perceived usefulness. It means the easily operation of the mobile clinic registration system was very important for the users, and the easier for set on the mobile clinic registration system, the more people think it was usefulness. These results are the same as the point at issue of Davis [2], Wade, Cartwright, & Shaw [13], and Chen & Hsiao [6]. The perceived usefulness was positively associated with intention, and these results are the same as the point at issue of Davis [2], Huang [14], Wade, Cartwright, & Shaw [13], and Chen & Hsiao [6]. For the personal prior experience, the information technology experience was positively associated with perceived usefulness and the perceived ease of use. These results are the same as Davids [2] and Moores [9].

Due to high cell phone usage, mobile devices have become necessary tools in the daily life, and it is time to make use of mobile for providing patient service. Based on the advantages of mobile technology, this study considers that it is sufficiently reliable and powerful to improve patient service and patient-physician relationships. In order to increase healthcare service quality, more and more hospital has implemented a mobile registration system in Taiwan. The process of the mobile registration system was conducted by mobile technology, and its primary function is to help physicians and hospital administrators manage individual patients in a systematic fashion. Since cell phones are so popular in Taiwan, it is time to launch mobile healthcare service for patients, physicians and hospital administrators. Better service quality in medical care and health care can be fulfilled by mobile technology.

### B. Limitations

While it could be believe that this study have developed a sound and rich theoretical model and tested it with a reliable survey instrument and data, there also enumerate next some limitations and unanswered questions. First, due to time and budget limitation, it was difficult to completely develop the back-end system. Because the development of homecare systems has to co-work together with hospital, it needs to integrate with hospital information system. This will be very complex and time consumed. Therefore, it was not examined the 'Actual Use' factor in the model in this study. Follow-up study can investigate whether the gap exists between Intention and Actual Use.

Second, it was not have an avenue to collect data from a random sample of health service providers and hospitals. All of the data is collected from two medical centers in Taiwan; it may be limited in generalizing our finding widely. An

interesting follow-up study would be to collect data from a random sample of health service providers and hospitals.

## C. Future Research Directions

This study was only focus on the factors that affect patients use the mobile clinic registration system. This study didn't detect the different of using the mobile clinic registration system in different gender, age, and social-economical status. Further research can continue to test and verify those. Besides, for the strong effect of physicians in using of the Mobile Clinic Registration, the effect of physicians can be an external factors in future research.

The surveyed samples used in this research are Taiwanese patients. The cultural background and medical environments for which that patients stand are different from those living in other countries (such as United States, German, United Kingdom…). Further research can continue to test and verify those impacts through extensively interviews with patients.

REFERENCES

The template will number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use "Ref. [3]" or "reference [3]" except at the beginning of a sentence: "Reference [3] was the first . . ."

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the reference list. Use letters for table footnotes.

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For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

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