

Private Healthcare in Malaysia: Investigation on Technology Profiles and Technology Acceptance Factors

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Keywords:

User acceptance
Private healthcare
Technology acceptance model
Theory of planned behavior
structural equation model

ABSTRACT

The implementation of information technology in healthcare sector is growing due various great benefits offered by its usage. This study investigates IT profiles of Malaysian small, medium and enterprise (SME) private healthcare as well as personnel perception towards Health Information System (HIS) usage in their organization. A conceptual framework of factors affecting intention to use HIS is developed by adapting the technology acceptance model and the theory of planned behavior focusing on specific dimensions - individual, technological and implementation. This study uses survey that involves 252 respondents from SME private healthcare in Malaysia. A descriptive analysis results of SME private healthcare IT profile, user perceptions of HIS and the developed conceptual framework are presented in this paper together with the structural equation modeling analysis result of the proposed model.

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1. INTRODUCTION

Healthcare industry is seen to increasingly tap the benefits offered by information technology (IT). IT usage enables healthcare organizations to increase their quality of patient care and services as well as staff efficiencies and effectiveness [1], which at the same time reducing organizational expenses [1]. However, IT implementation in healthcare faces issues of user acceptance among healthcare staff which then may resulted in user resistance towards effective IT implementation [2] which must be addressed urgently [3]. At the same time, technology acceptance studies in healthcare are found to be limited [3] especially in small and medium enterprise (SME) private healthcare in Malaysia. Although IT could increases SME competitiveness in the business arena [4], its' adoption rate by the Malaysian's SMEs businesses including healthcare is quite slow [5]. Therefore, it indicate a significant gap in knowledge of technology acceptance research focusing at small and medium scale private healthcare organization. The aim of this paper are two folds: first, to investigate utilization of IT and HIS utilization among the SME private healthcare; and second is to develop model of technology acceptance of Malaysian small, medium and enterprise (SME) private healthcare organization's personnel in using information system, specifically Health Information System (HIS). HIS is referring to any information system that is currently utilize by physicians and staff in managing private healthcare or clinics day to day operations.

2. THEORETICAL BACKGROUND

Various studies such as [3] and [6] have focusing on technology acceptance and adoption of various system in healthcare and other domain such as online online learning education [7], e-procurement [8], e-government [9] and mobile wireless technology [10]. These studies [3], [6] exploited various theories and models of technology acceptance, namely as the theory of reasoned action (TRA), the TPB, the TAM, the diffusion of innovation (DOI), and the unified theory of acceptance and use of technology (UTAUT). Among the finding includes various factors affecting the behavioural intention to us information systems such as computer anxiety, computer self-efficacy, attitude, perceived behavioral control, subjective norm and facilitating conditions (see for example study by [3], [6]).

TAM, adapted from the TRA model is found to be the main and widely referred research model by many technology adoption studies [6], which have psychological factors included as factors that affect technology acceptance. Using TAM, individual's perceived usefulness and perceived ease of use determine their behavioural intention to use technology [6], [11]. Many researchers have employed TAM in predicting users' adoption behavior for range of technologies including healthcare such as [3], [4], and [6], as TAM has the advantage of can easily be extended to be applied to different type of technology. However, among limitations portray by TAM are limitation in addressing important external factors [2], as well as individual and organizational aspects [13] such as subjective norm [31]. For that reason, external variables extension to the TAM would aid in understanding its effect on TAM constructs in view to reveal definite, contextualized and actionable factors affecting users' acceptance and use of health IT. At the same time, the TPB is also found to be among main theories associated with attitude and intention theories in use to describe and forecast people behavior of different technologies [15], which was also been developed based on the TRA. Using TPB, individual's behavioral intentions was affected by three main factors namely: subjective norm, attitude toward the behavior, and the perceived behavioral control. Various past studies have utilized and examined that the three factors of TPB are basically suitable in relating individual intention to use of different types of information technologies [16] adoption studies such as internet banking [17], education [18], healthcare [19] and many more.

3. RESEARCH MODEL

In this study, a research model is developed in view to study the Malaysian private healthcare personnel acceptance of HIS by integrating the TAM [11] and TPB [20]. Also, the research model is designed by considering the multi-contextual framework of technology acceptance as recommended by [6], namely: individual, implementation and technological contexts. The individual context focuses at variation of users' individual factors that may present among staff at different organizations and cultures, namely: computer self-efficacy (individual's belief in his or her capability in using computer to perform behavior to achieve goal or an outcome and individuals with little confidence in using computers might perform poorly on computer-based tasks), computer anxiety (individual's fear of using computer) and perceived behavioural control (individual's belief as how easy or hard towards implenting the intended behavior [20]. The implementation context refers to the organization's environment where encouraging environment able to increase users' acceptance rate. Subjective norm, facilitating conditions, training and management support are viewed as the implementation context in this study. Facilitating conditions refer to perceived enabler in environment that influences an individual perception of easy or difficulty of performing a task and training is defined as organization's effort to teach and train their personnel to acquire skills to use HIS. Also, management support refers to management ability to provide adequate time and resources for successful HIS implementation [21] and subjective norm is defined as the degree to which an individual perceives the demands of the important others on him or her to use the computerized system. And finally, the technological context that concentrates on the information systems or technologies on study and for this research it refers to the HIS. The technological context specifies the factors of the system and their relationship with usage behaviour which include system level of usability, interface, interaction style, quality and many others [3]. In this study, the technological context includes perceived usefulness and perceived ease of use. Perceived usefulness and perceived ease of use have been identified as major factors of behavioural intention [11] and also been supported by various studies, e.g. [22], [23]. The research model is graphically presented in Figure 1 showing all the variables and the three major contexts that are measured as reflective indicators. Thus, the following hypotheses are posited:

- H1: Computer anxiety will negatively affect personnel perceived ease of use of the HIS.
- H2: Perceived behavioral control will positively affect personnel perceived ease of use of the HIS.
- H3: Personnel behavioral control will positively affect their behavioral intention to accept HIS.
- H4: Computer self-efficacy will positively affect personnel perceived ease of use of the HIS.
- H5: Facilitating condition will positively affect personnel perceived ease of use of HIS.
- H6: Facilitating condition will positively affect personnel perceived usefulness of HIS.
- H7: Training will positively affect personnel perceived ease of use of HIS.
- H8: Training will positively affect personnel perceived usefulness of HIS.
- H9: Management support will positively affect personnel perceived ease of use of HIS.
- H10: Management support will positively affect personnel perceived usefulness of HIS.
- H11: Subjective norm will positively affect personnel perceived ease of use of HIS.
- H12: Subjective norm will positively affect personnel perceived usefulness of HIS.
- H13: Subjective norm will positively affect personnel behavioral intention to accept HIS.
- H14: Perceived ease of use will positively affect personnel perceived usefulness of HIS.
- H15: Perceived ease of use will positively affect personnel attitude toward HIS.

H16: Perceived usefulness will positively affect personnel attitude toward HIS.

H17: Perceived usefulness will positively affect personnel behavioral intention to accept HIS.

H18: Attitude will positively affect personnel behavioral intention to accept HIS.

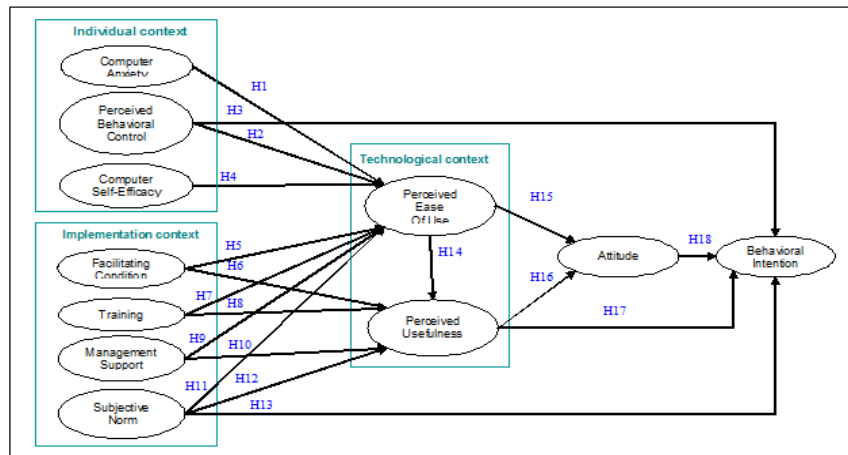


Figure 1. Research Model

3. RESEARCH METHODS

This study employs random sampling that has been distributed manually to 300 respondents who were the staff of SME private healthcare in Perak, Malaysia. 252 responses were received (76.4%) and used for descriptive and structural equation modeling (SEM) analysis. The questionnaire contains two main sections, where section 1 is designed to investigate respondents' IT profile and section 2 focuses at assessment of the nine factors evaluated in this research: computer anxiety (CA), computer self-efficacy (CSE), attitude (ATT), perceived ease of use (PEOU), perceived usefulness (PU), facilitating conditions (FC), subjective norm (SN), perceived behavioural control (PBC) and behavioural intention to use (BI). A five point Likert scale was used as the measurement scale of this section. Statistical Package for Social Sciences (SPSS) version 19 was used for the preliminary and descriptive analyses, while, Amos version 18 was used for the structural equation modelling analysis.

4. ANALYSIS AND RESULT

4.1. Descriptive Analyses and Results

With regard to SME private healthcare current pattern of IT and HIS utilization, section D of the questionnaire is designed for that purpose. Specifically, the descriptive analyses focus on IT utilizations profiles among personnel, SME private healthcare's ICT profile and usage and finally on personnel perceptions towards computerization of business processes. Firstly, this study investigated the computer utilization profile of the respondents and it was found that majority of the respondents using the computer to surf internet (54.8%); accessing patient and medical information such as HIS and online panels systems such as FOMEMA, MEDIJARING, MEDICLINIC and MEDILINE (52.8%). 47.2% of them using computer to email (47.2%); and 31.7% of them using the computer to access the office automation software such as Microsoft Word and Excel to support their daily processes. It was also found that 13.1% of the respondents claimed they never used computer or any information system in their clinics.

Secondly, ICT profile of the SMEs private healthcare participated in this study was investigated, which include computer availability, internet connection availability and current computer utilization or Health Information System (HIS) utilization of the organizations. The definition of HIS as mentioned in the earlier section is provided to respondents as to assist common understanding of the term. 88.9% of the respondents stated that their organizations have computer/s installed in the premises, with 83.3% having internet installed. Nearly 70% of the organizations have some kind of HIS installed in their clinics and has utilizing HIS. Interestingly, only 11.5% having 100% computerized system in facilitating businesses with paperless system. This signifies that although majority of the clinics have computers and internet installed, utilizing HIS to facilitate some of their activities, they are still unwilling to eliminate paper and file system. Respondents' frequency level of accessing HIS was also analyzed where 47.2% of HIS users have accessed the HIS frequently and 15.1% with infrequent access. It was also found that 9.1% of the respondents stated that they have used the HIS before but no more using now. 28.6% of the respondents claimed that they have never use and access the HIS.

4.2 Structural Equation Modeling Result

Using the Anderson & Gerbing [24] approach of Structural Equation Model, Confirmatory Factor Analysis (CFA) was conducted followed by Structural Equation Model. On the Confirmatory Factor Analysis (CFA) results, the measurement model evaluation was incorporating the assessment of reliability, convergent and discriminant validity of each of the measurement scale. Two measures of reliability are used in this study: ie. Cronbach's alpha and composite reliability. Results show that each scales had indicated strong internal reliability with Cronbach's alpha value exceeding the cut-off criterion 0.70 recommended by [25] and composite reliabilities ranged from 0.77 to 0.94, above the recommended cut off of 0.70 [26], indicating adequate reliability of the scales. With regards to convergent validity, it was assessed based on factor loadings and average variance extracted (AVE) as recommended by [27]. For discriminant validity, all constructs have an AVE at least 0.5 and all the square roots of each AVE value are higher than the off-diagonal correlation elements, satisfying Fornell and Larcker (1981) [27] criteria for discriminant validity.

Structural model was next tested using SEM by evaluating its goodness-of-fit using the chi-square test. Since chi-square test has a tendency to be sensitive to sample size [28], therefore, the ratio of χ^2 to its degree-of-freedom (χ^2/df) was used, with a range of less than 3 being indicative of an acceptable fit between the proposed model and the sample data [29]. The study examines various common goodness-of-fits (GOF) measures for testing the overall model fit, which includes: the comparative fit index (CFI), the goodness-of-fit index (GFI), the normed fit index (NFI), and the root mean square error of approximation (RMSEA) [28]. The accepted threshold value of GFI, NFI, CFI and IFI should be more than 0.9; and acceptable value for RMSEA is up to 0.08 as stated by [26]. The result of the first test of GOF of the proposed conceptual model has revealed reasonable validity and majority of the goodness-of-fit indices are fall inside an satisfactory values ($\chi^2 = 1007.267$, $\text{df} = 555$, $p = .000$) and the ratio of χ^2 to its degree-of-freedom (χ^2/df) value = 1.815. In addition, the GFI = .827, AGFI=.793, NFI=.876, CFI=.939, RMSEA = .057 and ECVI = 4.897. However, path analysis results have found that six hypotheses were insignificant and rejected (significance level >0.05) were six paths were found not significant. Thus, some modifications were incorporated with an attempt to statistically identify the best model using modification indices (MIs) method to find some evidence of misfit in the model following methods suggested by [30].

Figure 2 shows the outcome of the modified model, where six of the initial hypotheses are rejected i.e. H2, H6, H10, H11, H13 and H17, while two new paths are recommended to be included in the modified model ie. path from facilitating condition to attitude (FC \rightarrow ATT) and path from management support to attitude (MGT \rightarrow ATT).

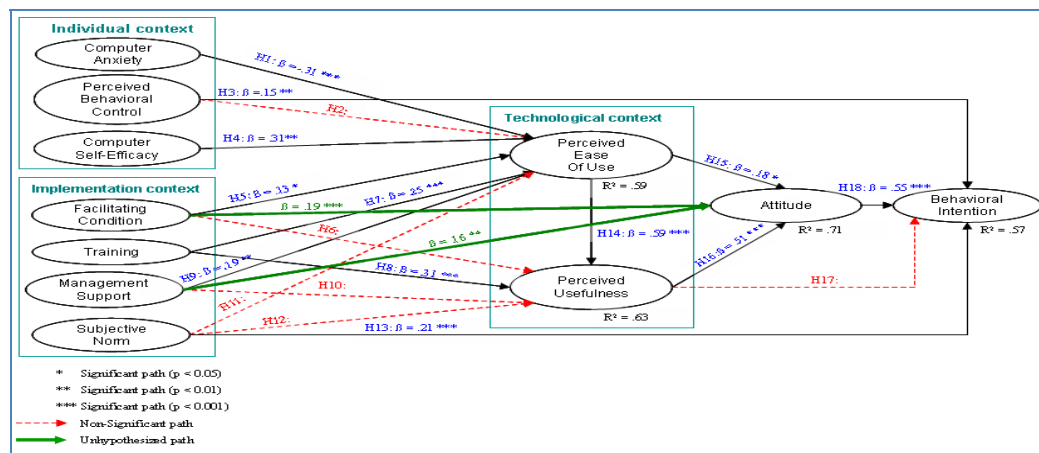


Figure 2. Final SEM Model

As is evident from Figure 2, the coefficient for determination (R²) shows that the model has high predictive power. It explains approximately 57% of the variance in the behavioral intention to use (BI) and 71% of the variance in the attitude towards HIS use (ATT). The perceived ease of use (PEOU) and perceived usefulness (PU) respectively account for 59% and 63% of the variance. Then, the GOF of the two models is evaluated, where most of the model-fit indices of the modified models had improved and better than the initial model; and are within acceptable range recommended by the past studies. Thus, indicating that the model reveals good fit with the data. To conclude, both models (initial and modified) illustrate good fit which indicate that the initial result is quite strong and statistically valid.

Table 1. Goodness-of-fit indices results

Model	χ	d.f.	$(\chi^2)/d.f.$	CFI	GFI	AGFI	RMSEA	ECVI
Threshold value	N/A	N/A	<3	>0.90	>0.90	>0.80	<0.08	
Initial model	1007.27	555	1.81	.939	.83	.79	.057	4.90
Modified model	981.80	559	1.76	.943	.83	.79	.055	4.76

5. CONCLUSIONS

This paper aims to investigate technology usage of SME private healthcare ie. the ICT profile as well as to understand personnel behavioural intention to use technology by developing an extended hybrid TAM-TPB model. The proposed model considered the relationships among three contextual factors: individual factors (, technological factors and implementation factors. Moreover, the model aims to interpret that not only technological factors, but also individual and implementation factors are important determinants of technology use. The inclusion of the psychological individual and implementation factors in the proposed model; it extends beyond traditional IT-based view of clinic information system acceptance and could provide practitioner with better assessment of clinic information system. Outcomes have demonstrated that twelve from the initial eighteen hypotheses were supported and demonstrated moderate validity and most of the goodness-of-fit indices lie within acceptable ranges. The findings show that the modified proposed model demonstrates good explanatory power and prove its strength in forecasting private healthcare personnel's intention to use such technologies.

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