WHAT DRIVES PHYSICIANS’ INTENTION TO USE ELECTRONIC MEDICAL RECORD SYSTEM: THE ROLES OF PERCEIVED SERVICE LEVEL, COMPUTER SELF-EFFICACY, AND PERCEIVED RISK

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Abstract

The electronic medical record (EMR) system is one of the important components of healthcare policy in the more developed countries of the world. Implementing EMR not only reduces the associated management problems of paper medical records but also improves the repetition of laboratory tests and clinical observations, and consequently, improves the accuracy of medical decisions increasing the patient’s safety. Since physicians are the primary users of EMR, their willingness to use it deems to be a critical success factor for its implementation in hospitals. This paper aims to extend the individual-level IT adoption models by incorporating three additional variables to investigate if the individual characteristics of a physician will affect EMR adoption. A total of 217 samples were obtained from physicians through a field survey. The analysis results indicated that the perceived level of service is an important antecedent of perceived usefulness. Additionally, computer self-efficacy, perceived risk, and perceived service level are all important antecedents of perceived ease of use. Finally, implications for academics, hospital managers, governments and medical information service providers are presented to conclude this study.

Keywords: Physician, Perceived Service Level, Perceived Risk, Electronic Medical Record, Health Care IT Adoption/Acceptance
1 INTRODUCTION

In the medical environment, decisions made by physicians in consultation with one another or with patients can be extremely critical to the point of life saving. With the trend of a growing aging population, health insurance policy has to be developed to increase medical treatment accessibility. However, the paper medical record management proves to be a serious problem in hospitals. Specifically, huge stacks of formatted paper medical records may involve a substantial cost because of the need to house them somewhere. Another logistical problem is the sharing of them with different stakeholders in a timely manner when they are physically located in the one place. However, electronic medical records (EMR) overcome the aforementioned disadvantages of paper ones.

According to information gained from the Department of Health in Taiwan (2010), 21.03% of their hospitals have adopted EMR and 73.59% of the remaining hospitals have either adopted an automatic medical record (AMR) or share medical records between hospitals through the Internet. Another study with an analysis subject obtained from 240,281 U.S. medical sites through a telephone survey, SK&A (2012) reported that 45.6% of medical sites have adopted EMR. From these aforementioned facts, the development of infrastructure and applications in this area has increasingly grown and hence, the understanding and appreciation of EMR has gained much popularity in the medical arena.

However, EMR implementation requires a change from the habit of hand-writing medical records built up during the past several decades for medical staff in general and for senior members in particular. Prior studies have pointed out that the critical success factor for EMR implementation in hospitals lies with the physicians (Bleich and Slack, 2010; Sherer, 2010; Venkatesh et al., 2011). Indeed, EMR implementation in hospitals does suffer from the resistance of physicians, nurses or other medical staff and physicians’ resistance proves to be the strongest.

Recently, empirical studies have focused on the influence of particular individual characteristics of physicians’ relating to EMR adoption (Mishra et al., 2012, Venkatesh et al., 2011). At this stage understanding is still lacking in this regard. Moreover, information system (IS) research is proving to be of value to deal with unique contextual issues, the medical industry in particular (Ilie et al., 2009). The study of Liu and Ma (2005) utilized 79 senior students’ feedback collected from a Medical School and explored how the perceived service level can influence the willingness of healthcare workers to use the EMR system and proved that service level is a key indicator to evaluate the application service of it. The same study used perceived service level instead of service quality for the following two major reasons: (1) service level is more common in terms of adoption by application service providers; (2) the dimension of service quality is much more complex since it comprises many sub-dimensions which are not relevant to end users. This study aimed to extend individual-level IT adoption models (Davis et al., 1989) by incorporating three individual characteristics from a practical viewpoint. To be specific, this study extends the study by Liu and Ma (2005), and uses a field
survey approach with a large sample to examine how the individual characteristics of physicians can affect their adoption of EMR.

The remainder of this paper is organized as follows. Section 2 discusses EMR and related studies of EMR adoption; research variables including perceived service level, perceived risk and computer self-efficacy; and the proposed research hypotheses. Subsequently, section 3 presents the research model, research measures and sample. The results and data analysis including the analytical process, sample demographic statistics, assessment reliability and validity, and hypotheses testing are covered in sequence in section 4. The research results are then covered in section 5 and finally, the last section presents concluding remarks with suggestions for future research.

2 LITERATURE REVIEW

2.1 Electronic Medical Record

Electronic medical record (EMR) refers to medical records stored in information systems. It possesses many advantages compared to paper medical records. Several major ones include: improving the quality of treatment processes, enhancing the security protection of medical records, helping pharmacies or other specialists to access medical information in a timely manner, reducing the risks of adverse drug events in the in-patient and ambulatory settings (Sykes et al., 2011), increasing the resulting medical quality (Bleich and Slack, 2010), improving patient safety and facilitating the coordination of care (Yeager et al., 2010). Recently, empirical studies have begun to focus on addressing the impact of physicians’ individual characteristics on EMR adoption.

2.2 Perceived Service Level

Perceived service level is the end-users’ perceived application of service conditions in terms of reliability and responsiveness. In practice, physicians consider that the service level of EMR should comprise multi-dimensional factors such as good stability, easy presentation of hand-drawing functions, strong standardization of system interfaces, easy creation of templates or drag in phrases, convenient searching capability of medical databases or statistical data, and a quick recording procedure of patients’ information.

The study of Sturm et al. (2000) indicated that the perceived service level is a critical criterion to assess the application service systems. Marketing related research justified that perceived service level can be employed to evaluate the service performance and thus constructed a model of perceived service level correlated with perceived usefulness (PU) and perceived ease of use (PEOU) based on the performance-satisfaction perspective (Churchil and Surprenant, 1982). Liu and Ma (2005) also investigated the perceived service level to see how it affected the acceptance of the application service of medical records and further uncovered that if the perceived level of service is less than the user’s expectation, PU and PEOU are low. From the above discussion, the following hypotheses are proposed:
H1: Perceived service level of physicians has a positive influence on PU of EMR.

H2: Perceived service level of physicians has a positive influence on PEOU of EMR.

The study of Grover et al. (1996) indicated that service quality would directly affect the success of information system outsourcing and perceived behaviour control, and then directly affect the intention to use the system. Triandis (1979) also showed that reinforcement is a key factor of behaviour control affecting the perceived service. Reinforcement includes the following items such as responsiveness, reliability and accessibility of application service. Consequently, the following hypothesis was proposed:

H3: Perceived service level of physicians has a positive influence on the intention to use EMR.

2.3 Computer Self-Efficacy

Despite the requirements of a hospital’s strategic objectives or the pervasive trend of government medical policy, physicians do not usually voluntarily adopt the EMR system. For this reason, the computer self-efficacy of physicians has a significant influence on the clinical systems adoption. Aggelidis and Chatzoglou (2009) pointed out that computer self-efficacy significantly affects the behavioural usage of EMR. Computer self-efficacy is defined as “a judgment of one's capability to use a computer” (Compeau & Higgins, 1995). Moreover, the research of Jha et al. (2009) demonstrated that almost 60% of physicians view computer skills as a possible barrier to the adoption of EMR. Further, Agarwal et al. (2000) also indicated that computer self-efficacy is a critical antecedent for PEOU. For this reason, physicians may pay much attention to the PEOU of EMR. From the above discussion, the following hypothesis was proposed:

H4: Computer self-efficacy of physicians has a positive influence on PEOU of EMR.

2.4 Perceived Risk

Previous studies have tried to explore how perceived risk can influence the psychological processing of consumers in Internet shopping (Pavlou and Gefen, 2004). However, since most prior studies have focused on the perceived risk of Internet behaviour there may be a lack of sufficient understanding in identifying the risks in the medical field. Since assessing the security of the EMR involved with the Healthcare Information Protection Act in general and patients’ privacy in particular, medical staff and hospital managers have a serious responsibility to strictly protect patients’ information in regard to EMR adoption. Angst and Agarwal (2009) pointed out that the privacy concern is indeed an important issue..

Featherman and Pavlou (2003) demonstrated in their study that the perceived risk significantly correlated with PU and PEOU in terms of the Internet shopping context. On the other hand, the perceived risk conflicts with PU and PEOU in regard to the adoption of EMR. This is simply because
a high perceived risk would lead to a low PU and PEOU and thus might indirectly lead to a negative intention to use EMR. From the above discussion, the following hypotheses were proposed:

H5: Perceived risk of physicians has a negative influence on PU of EMR.
H6: Perceived risk of physicians has a negative influence on PEOU of EMR.

2.5 Technological Perception

Related studies in this field demonstrated that PU and PEOU could effectively predicate a favourable attitude toward EMR and also a behavioural intention to use it. Ilie et al. (2009) pointed out that these two variables could significantly affect the intention to use it. Aggelidis and Chatzoglou (2009) also found PEOU and PU were positively correlated to behavioural intention. Moreover, Sykes et al. (2011) too indicated that PU had a direct impact on EMR system use.

Physicians are the creatures of habit and do not like to change their routine hand-writing of medical records (Ossoff et al., 2010). In other words, physicians do not want to spend additional time learning how to use the EMR system. Since PU and PEOU would have a positive effect on physicians’ attitude toward EMR and also the intention to use it the following hypotheses were proposed:

H7: Physicians’ PEOU has a positive influence on PU of EMR
H8: Physicians’ PEOU has a positive influence on attitude toward EMR.
H9: Physicians’ PU has a positive influence on attitude toward EMR.
H10: Physicians’ PU has a positive influence on the behavioural intention to use EMR.
H11: Physicians’ attitude has a positive influence on the behavioural intention to use EMR.

Based on the field interviews and literature review, the proposed research model and hypothesized relationships are summarized in Figure 1. The following research methodology section is covered to validate relationships of variables obtained from the empirical data collected from the survey.

Figure 1 Research Model
3 RESEARCH METHODOLOGY

For this study, field interviews were carried out initially with a panel of eight physicians in one large regional teaching hospital in Taiwan. Accepted EMR adoption factors from medical practice were identified including computer self-efficacy and perceived risk in addition to the perceived level of service. As a result, this study proposed to fill the aforementioned gap by using a large survey to explore the full impact of these three variables on physicians’ adoption of EMR.

3.1 Research Design

To investigate physicians’ acceptability of the EMR system, the population of this study included 85 medical centers and regional hospitals as determined by the Department of Health in Taiwan. To carry out this research, the authors contacted the target hospitals and presented to them the research purpose and its contents. The hospitals gave their consent to have the questionnaire distributed to their physicians and agreed to assign a person as the principal contact in order to assist with the research. The questionnaire was then posted and gifts of appreciation were sent. The authors made special appointments where physicians were encountering difficulties and assistance was given to fill out the questionnaire. Because of their heavy workload care was taken not to inconvenience them unduly. The following parts of this paper will present research subjects and the definition and measurement of variables.

3.2 Research Subject

The physicians who were asked to participate in the survey had previously received training in the use of EMR systems. However, sample interviews revealed that most of them were not yet in the habit of using the system, so appropriate subjects for this study had to be selected. 258 physicians voluntarily participated completing the questionnaire after the research objectives and process had been explained to them. The sample data was obtained from six medical centers and nine regional hospitals. A total of fifteen hospitals had implemented the EMR system approved by the Medical Records Institute and all of them, as confirmed by the Department of Health in Taiwan, had already adopted the picture archiving and communication system (PACS) giving them the capability to exchange clinical reports with others.

3.3 Measurement of Variables

In this study, the perceived service level refers to the subjective perception with regard to system reliability, stability, and responsiveness. The perceived service level scale proposed by Churchill (1979) employed a five-point Likert scale ranging from 1 (indicating strongly disagree) to 5 (indicating strongly agree). As for computer self-efficacy, it is defined as a physician’s self-evaluation of the system. This scale refers to that developed by Compeau and Higgins (1995), which was measured using a ten-point scale, ranging from 1 (indicating strongly unconfident) to 10 (indicating
strongly confident). Perceived risk refers to a physician’s perceived risk and uncertainty in terms of using the system. The perceived risk scale proposed by Stone and Gronhaug (1993) employed a five-point Likert scale.

Moreover, the mediated variables included PU, PEOU, and attitude toward EMR adoption. Both the PU and PEOU scales proposed by Venkatesh and Davis (2000) were employed with a five-point Likert scale. In this study, attitude toward EMR refers to a physician who has a positive or negative perception of using the system, and the scale, modified from Lord (1997) employed a five-point Likert scale. Finally, intention to use EMR was the dependent variable. This scale was also proposed by Venkatesh and Davis (2000) and employed a five-point Likert scale.

4 RESULTS

After receiving the questionnaires, forty-one invalid or incomplete ones were eliminated. The valid sample comprised 217 and the response rate was 84.11%.

4.1 Demographics Analysis

Of the 217 respondents sampled, male physicians comprised the majority (68.7%). The average age of the respondents was 31 to 40 years old (51.6%). In terms of education, most had an undergraduate degree (79.3%). Additionally, most respondents’ clinical experience was in the range of 6 to 10 years (32.7%), and 40.5% had over 13 years computer experience. Doctors-in-charge comprised 36.4%, and almost half of them were from the Department of Medicine (46.1%). Finally, the number of respondents from regional hospitals totalled around 60.8%.

4.2 Reliability and Validity Tests

4.2.1 Reliability test

The constructs were analyzed for both reliability and validity. Cronbach’s α of each construct exceeded 0.78, indicating that the scales had good consistency and reliability.

4.2.2 Content validity

All questionnaires were theoretically examined and reviewed by a panel of medical experts and management information system scholars to assess the fitness of each question, the correctness of semantic expressions, and the appropriateness of phrasing. Further, a pretest was administered to several medical staff to identify possible problems with the research design before conducting the formal survey. By doing so, content validity was thus ensured.

4.2.3 Construct validity

All measurements of the research constructs were modified based on the scales provided by previous studies. Since translation of scales was involved, exploratory factor analysis (EFA) was conducted.
KMO (Kaiser-Meyer-Olkin measure of sampling adequacy) measures of the sampling adequacy were larger than 0.88, and Bartlett’s test of sphericity achieved a significant level. Consequently, the null hypothesis was rejected and the tests were appropriate for conducting factor analysis. Principle component analysis was conducted subsequently to extract common factors for verifying the variance explained by each item based on the eigenvalue and explained variance (%). All variables were above 0.67. Additionally, the factor loading of the different constructs was significantly low and accordingly the correlation of the different constructs was low which meant each construct reached discriminant validity.

4.2.4 Structural Equation Model (SEM) Test Results

Using the SEM for data analysis required steps such as: checking normality, independence, homogeneity and multi-collinearity. These four criteria fit with basic presuppositions. SPSS 15.0 and AMOS 18 were used for conducting path analysis. The results showed that Chi-Square/d.f., NFI, IFI, CFI, and RMSEA values achieved goodness of fit (Table 1). In addition, both GFI and AGFI values achieved an acceptable fit. However, the RMR value is 0.077 which is not lower than 0.05. This may be due to the fact that the RMR value is easily influenced by units of measurement and thus often tends to be varied.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Chi-Square/d.f.</th>
<th>GFI</th>
<th>AGFI</th>
<th>NFI</th>
<th>IFI</th>
<th>CFI</th>
<th>RMR</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>1.097</td>
<td>0.884</td>
<td>0.851</td>
<td>0.924</td>
<td>0.993</td>
<td>0.993</td>
<td>0.077</td>
<td>0.021</td>
</tr>
</tbody>
</table>

*Table 1 Validity Test of Structural Equation Model*

4.3 Hypotheses Testing

Figure 2 and Table 2 show the SEM test result with standardized estimates for the strength of each hypothesized relationship. Physicians’ perceived service level ($R^2 = 0.358; p = 0.000 < 0.001$) and PEOU ($R^2 = 0.608; p = 0.000 < 0.001$) had a positive influence on the PU of EMR. However, the perceived risk did not reach a significant level ($R^2 = 0.039; p = 0.481$). As a result, H1 and H7 are both supported and H5 is rejected. Perceived service level ($R^2 = 0.303; p = 0.000 < 0.001$) and computer self-efficacy ($R^2 = 0.092; p = 0.000 < 0.001$) also had a significantly positive influence on PEOU. On the contrary, perceived risk ($R^2 = -0.104; p = 0.026 < 0.05$) had a significantly negative influence on PEOU. Therefore, H2, H4 and H6 are all supported. Additionally, attitude toward EMR was also affected by PU ($R^2 = 0.290; p = 0.000 < 0.001$) and PEOU ($R^2 = 0.242; p = 0.000 < 0.001$). Consequently, H8 and H9 are supported. Moreover, PU ($R^2 = 0.288; p = 0.000 < 0.001$) and attitude ($R^2 = 0.702; p = 0.000 < 0.001$) had a significantly positive influence on intention to use EMR. Thus, H10 and H11 are also supported. However, H3 is rejected ($R^2 = -0.016; p = 0.809$). From the above discussion, apart from H3 and H5 not being supported, all other hypotheses are supported.
Figure 2 Analysis Results

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Relations</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>PSL → PU</td>
<td>0.358</td>
<td>0.077</td>
<td>4.676</td>
<td>0.000***</td>
</tr>
<tr>
<td>H2</td>
<td>PSL → PEOU</td>
<td>0.303</td>
<td>0.064</td>
<td>4.768</td>
<td>0.000***</td>
</tr>
<tr>
<td>H3</td>
<td>PSL → Intention</td>
<td>-0.016</td>
<td>0.065</td>
<td>-0.241</td>
<td>0.809</td>
</tr>
<tr>
<td>H4</td>
<td>CSE → PEOU</td>
<td>0.092</td>
<td>0.018</td>
<td>5.032</td>
<td>0.000***</td>
</tr>
<tr>
<td>H5</td>
<td>PR → PU</td>
<td>0.039</td>
<td>0.055</td>
<td>0.704</td>
<td>0.481</td>
</tr>
<tr>
<td>H6</td>
<td>PR → PU</td>
<td>-0.104</td>
<td>0.047</td>
<td>-2.227</td>
<td>0.026**</td>
</tr>
<tr>
<td>H7</td>
<td>PEOU → PU</td>
<td>0.608</td>
<td>0.091</td>
<td>6.708</td>
<td>0.000***</td>
</tr>
<tr>
<td>H8</td>
<td>PEOU → Attitude</td>
<td>0.242</td>
<td>0.059</td>
<td>4.125</td>
<td>0.000***</td>
</tr>
<tr>
<td>H9</td>
<td>PU → Attitude</td>
<td>0.290</td>
<td>0.051</td>
<td>5.722</td>
<td>0.000***</td>
</tr>
<tr>
<td>H10</td>
<td>PU → Intention</td>
<td>0.288</td>
<td>0.073</td>
<td>3.935</td>
<td>0.000***</td>
</tr>
<tr>
<td>H11</td>
<td>Attitude → Intention</td>
<td>0.702</td>
<td>0.109</td>
<td>6.469</td>
<td>0.000***</td>
</tr>
</tbody>
</table>

PSL = Perceived Service Level; CSE = Computer Self-efficacy; PR = Perceived Risk

Table 2 Hypotheses Test Results

5  DISCUSSION

5.1 Physicians’ perceived service level positively influences PU and PEOU of EMR

Analysis results of this study showed that perceived service level had a significant effect on PU of EMR. That is, when physicians perceived good service quality, they quickly perceived the usefulness of EMR. Liu and Mu (2005) described physicians’ acceptance of the EMR application service system as an antecedent of PU. As discussed earlier, EMR provides information exchange across hospitals and also shares medical records at the same time but paper medical records can only be accessed by one physician at a time. In practice, this study found that physicians do worry about the problem of
computers crashing or other possible calamities while using the EMR service. However, physicians do appreciate that exchanging information or sharing the service aspects of EMR is more important than dealing with the other aforementioned problems. Hence the EMR system does have advantages and these factors do affect physicians’ perceived usefulness of the system.

In addition, this study also found that physicians’ perceived service level is good, and that it does affect the PEOU significantly. Attributes such as reliability, responsiveness and stability were used to measure this. In terms of the clinical practice, if physicians perceive that the system is accurate and reliable and can provide a quick response to regular searching, recording, downloading medical information, or inputting medical orders, then their perceived service level of the process is very good. Further physicians will think that using it does not require spending extra time to learn it and nor will they anticipate having to wait a long time for an outcome.

5.2 Physicians’ perceived service level of EMR did not significantly influence their intention to use it

Interestingly enough, it was found that physicians’ perceived service level of EMR did not significantly affect their intention to use it. Since physicians have a high level of professional autonomy (Walter and Lopez, 2008), hospitals tend to adopt a positive attitude towards physicians using the system. It is notable that most of them still use paper records to examine the state of an illness. In Taiwan, EMR is actually in the promoting phases or counselling phases in terms of its implementation. Most hospitals even think EMR is government planning policy, so they are currently working on it. However the use of it is still a voluntary matter for physicians. For this reason, the service level had no direct correlation with the intention to use it. However, physicians perceived service level indirectly influenced the intention to use EMR through PEOU, PU, and the attitude toward its adoption.

5.3 Physicians’ computer self-efficacy significantly positively influenced PEOU.

Further, physicians’ computer skills proved to be another important barrier against the acceptance of the system (Jha et al., 2009). Several prior studies uncovered the fact that computer self-efficacy significantly affects the behavioural usage of EMR (Aggelidis and Chatzoglou, 2009). From these aforementioned discussions, computer self-efficacy may be considered as a factor to explore how individual characteristics can have an effect on the acceptance of EMR by physicians.

Analysis results showed that physicians’ computer self-efficacy significantly affected PEOU. Interviewed physicians indicated that the barriers of computer self-efficacy such as typing challenge (i.e., typing speed being too slow for entering medical orders in Chinese), additional tools to support reading, or extra capability for searching EMR (templates or drag in phrases) would influence EMR usage. In addition, if physicians had high computer literacy or information literacy or possessed a
strong determination to learn the system, they would be able to reduce the barriers of inputting medical records, operating the user interfaces or drawing body graphs to pinpoint medical problems.

5.4 Physicians’ perceived risk of EMR negatively influenced PEOU

Moreover, physicians perceived risks during medical treatment, especially in regard to using the EMR system. For example, possible risks could include time loss (i.e., increased record entry time and a heavy workload in creating medical orders) and hazard loss (i.e., suffering from malicious behaviour and an easily modified EMR). Analysis results of this study found that physicians perceived the risk did not significantly affect PU. That is, physicians did not believe the perceived risk of EMR would affect the PU. The physicians interviewed in this study pointed out that if the privacy control of EMR is not well developed, it will be targeted by others, leading to possible medical disputes.

On the other hand, from the analysis results, the perceived risk had a significantly negative effect on the perceived ease of use. When physicians’ perceived risk is high, the intention to use EMR will decrease. They are more worried about potential losses incurred from using the system, such as, loss of work efficacy, reduction of treatment time or increased workloads. Nowadays, even though some hospitals have already implemented EMR systems, they are still asking physicians to use both paper medical records and EMR during the introduction stage of implementation. To this end, physicians must input the medical orders on EMR after their diagnosis of the patient’s medical condition, print the record then paste it back on to the paper record. In clinical practice, physicians face a risk of wasting too much time completing medical orders if this dual handling is required. Such dual handling will not only increase workloads for diagnosis but also severely reduce treatment effectiveness and efficiency. Physicians work with a number of risks or constraints including limited time, additional workloads and reduced expected efficacy, and these factors can become a real deterrent to the ease of use of EMR systems. Thus, physicians’ perceived risk of EMR will indeed negatively affect the PEOU.

5.5 Research Implications

Academic and practical implications can be drawn from these aforementioned findings. For academia, this study found that the perceived service level of physicians had a significant influence on the PEOU and PU of EMR but had no direct influence on the intention to use it. However, statistical analysis demonstrated that the perceived service level of physicians had influence indirectly on the intention to use EMR through the mediated effect of PU and PEOU. This result is rather different from previous related studies in the area of information systems adoption. This study has inferred that the characteristic of the medical field and working environment of physicians is unique and thus the findings obtained show that the perceived service level of physicians indirectly influenced their intention to use the EMR system. Moreover, perceived risk also is a very important variable in medical information system study. However, there has been an unexplored gap in previous studies. It has not been researched how perceived risk can influence healthcare workers’ willingness to use
medical related information systems in general, physicians in particular. This study tends to fill this gap. By doing so, it was found that both the perceived service level and the perceived risk of physicians are interesting and valuable variables and the results of this study will help other scholars understand the role of these two variables.

In practice, the findings presented in this study have several useful implications for hospital managers, governmental agents, and medical information service providers. For hospital managers, physicians play a very important role and have a major part to play in the implementation of EMR in hospitals. Managers’ understanding of how the individual characteristics of physicians can influence EMR acceptance is critical to the success of it. Two comments can be made here to them. The first one is that a better service level of EMR should place emphasis on such factors as user-friendly interfaces, a well guarded privacy set-up, better security protection, and the desired stability of EMR systems to respond to physicians’ treatment needs. Secondly, increased on-the-job training through an e-learning platform to increase the computer skills of physicians is another critical success factor. In the hospital, physicians are usually very busy with medical services, teaching, research, and even hospital administration. In other words, a physician has almost no extra time to learn how to use an EMR system and this is the reason that most of them designate their assistants to participate in this training. Another possible reason may be that because of their heavy workload they do not have the concentration for new learning. Hence E-learning may be a better alternative. Thirdly, the hospitals should use the physicians’ assistants to ease in the new system.

For governmental agencies the Department of Health has strongly promoted the EMR system for hospitals and physicians are no doubt major users of it. Understanding how the individual factors of physicians can influence the using of EMR is very important for it to be successfully implemented. According to the analysis results related to computer self-efficacy, perceived risk, and perceived service level, governmental agencies should be able to understand more about the different characteristics and attributes of physicians. Currently, the government’s promotion of the system is usually oriented from the legal and supervision perspectives. However, the focus needs to be placed on the system’s requirements and physicians’ opinions to enhance its usefulness. EMR system implementation can also contribute to the improvement of the medical quality which will indirectly have an influence on the effectiveness of the National Health Insurance Policy.

For medical information service providers, this study found that computer self-efficacy, perceived risk, and perceived service level directly or indirectly had an influence on the intention to use the EMR system. Medical information service providers should carefully analyze physicians’ computer skills and system requirements. But interviewing physicians is very difficult simply because they have a heavy work loads and usually no free time for interviews. Physicians’ assistants may be a good alternative for understanding their requirements of EMR or their customary way of entering medical orders. Designing the system prototype and performing a usability testing is a prerequisite for a successful EMR implementation. To decrease the gap existing between physicians’ habits and the
system’s function should significantly improve the perceived service level. A possible functional module to improve physicians’ inherited habits may include changing the site on the system screen to accommodate personal habits, and medical terminology can be set freely making entry of medical orders more convenient. A high service level of EMR and perceived risk are also critical factors for medical information service providers to work on to further provide the system with attributes such as stability, reliability, responsiveness and ease of use.

6 CONCLUSION

From the above discussion, perceived service level, computer self-efficacy and perceived risk are all critical factors influencing physicians’ psychological acceptance of the EMR system. However, previous empirical studies have considered less about those aforementioned factors. This study conducted a field survey in fifteen hospitals (six medical centers and nine regional hospitals). Further, it aimed at extending individual-level IT adoption models by incorporating additional individual characteristics from a practical standpoint. Specifically, this study extended that of Liu and Ma (2005) through a field survey involving 217 physicians to examine how the individual characteristics of physicians can affect their adoption of EMR. Empirical results demonstrated that their perceived service level, computer self-efficacy, and perceived risk can significantly and indirectly affect their intention to use the EMR system. One interesting finding is that the perceived service level did not directly influence the intention to use the system, but, indirectly did so through the internally perceived ease of use and usefulness.
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