AN EMPIRICAL STUDY ON THE PHYSICIANS’ BEHAVIORAL INTENTION WITH ELECTRONIC MEDICAL RECORD SYSTEMS IN TAIWAN

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AN EMPIRICAL STUDY ON THE PHYSICIANS’ BEHAVIORAL INTENTION WITH ELECTRONIC MEDICAL RECORD SYSTEMS IN TAIWAN

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Abstract

Currently in healthcare organizations paper-based patient record management faces many challenges. Most countries are promoting the full implementation of electronic medical records in every hospital. Medical environments change frequently and dramatically, which makes full acceptance of electronic medical records (EMR) by physicians an important issue. This empirical study combines the theory on reasoned action (TRA) and information technology acceptance model (TAM) resulted in a modified TAM to find what critical factors influence the acceptance behavior of EMR by physicians. To test these hypotheses, this study administered a cross-sectional mailed questionnaire survey during the period of three months in 2012. The survey was deployed to 1000 physicians randomly from the estimated total 2000 physicians of 50 regional acute hospitals (more than 300 beds) in Taiwan currently. From these, 252 effective responses were received, resulting in a net response rate of 25%.

These research findings indicate that four variables significantly positively impact the intention to adopt EMR. Among these, attitude has the most significant positive impact on adoption intentions. Moreover, it shows that the professional autonomy might play an important role to moderate the attitude with significant statistics. These results maintain enough explanatory power ($R^2 = 78.4\%$) to help explain the attitudes and intentions of physicians in adopting electronic medical record information systems. Our analysis revealed the importance of the perception usefulness which moderated by professional autonomy and pragmatism by physicians for their adoption electronic medical record systems in clinical practices.

Key Words: Physician Behavior, Electronic Medical Record, Modified TAM.
1 INTRODUCTION

Electronic medical records are patient records in electronic forms. Their advantages can be described as that the electronic medical record is indicative of the advances in medical informatics and allows patients, providers and payers to interact more efficiently in life-enhancing ways. It offers new methods of storing, manipulating and communicating medical information of all kinds, including text, images, sound, video and tactile senses, which are more powerful and flexible than paper-based systems.

Currently in healthcare organizations paper-based patient record management faces many challenges. In addition to the temporal, spatial, and monetary constraints associated with continued record accumulation and compression over time, paper-based systems have limited functionality. Many people cannot easily view the same record at the same time. In order to resolve these problems, some use information technology to help them manage medical records, called electronic medical record (EMR) systems. These systems represent the main direction of modern medical care development which can produce a real-time, shared, medical information system.

An electronic medical record (EMR) is an evolving concept defined as a systematic collection of electronic health information about individual patients or populations. It is a record in digital format that is theoretically capable of being shared across different health care settings. In some cases this sharing can occur by way of network-connected with enterprise-wide information systems and other information networks or exchanges. EMR may include a range of data, including demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, vital signs, personal stats like age and weight, and billing information.

The terms EHR (electronic health record), EPR (electronic patient record) and EMR (electronic medical record) are often used interchangeably, although differences between them can be defined. The EMR can, for example, be defined as the patient record created in hospitals (in-patient department) and ambulatory environments such as clinics (out-patient department, OPD), and which can serve as a data source for the EHR. It is important to note that an EMR is generated and maintained within an institution, such as a hospital, integrated delivery network, clinic, or physician office, to give patients, physicians and other health care providers, employers, and payers or insurers access to a patient's medical records across facilities.

1.1 Research Background

Even though EMR systems with a computerized provider order entry (CPOE) have existed for more than 30 years in the world, fewer than 10 percent of hospitals had a fully integrated system at the year of 2006. In the United States, the Center of Disease Control (CDC)
reported that the EMR adoption rate had steadily risen to 48.3 percent at the end of 2009. This is an increase over 2008, when only 38.4% of office-based physicians reported using fully or partially electronic medical record systems (EMR) in 2008. However, the same study found that only 20.4% of all physicians reported using a system described as minimally functional and including the following features: orders for prescriptions, orders for tests, viewing laboratory or imaging results, and clinical notes.

Paper-based records are still by far the most common method of recording patient information for most hospitals and practices in the U.S. The majority of physicians still find their ease of data entry and low cost hard to part with. However, as easy as they are for the physicians to record medical data at the point of care, they require a significant amount of storage space compared to digital records. Similar with those in Taiwan, most states require physical records be held for a minimum of seven years in the US by law. The costs of storage media, such as paper and film, per unit of information differ dramatically from that of electronic storage media. When paper records are stored in different locations, collecting them to a single location for review by a health care provider is time consuming and complicated, whereas the process can be simplified with electronic records. This is particularly true in the case of patient-centered records, which are impractical to maintain if not electronic. When paper-based records are required in multiple locations, copying, faxing, and transporting costs are significant compared to duplication and transfer of digital records.

A major concern is adequate confidentiality of the individual records being managed electronically. In the United States, this class of information is referred to as Protected Health Information (PHI) and its management is addressed under the Health Insurance Portability and Accountability Act (HIPAA) as well as many local laws. There is also evidence that the federal government intends to use electronic medical records in order to monitor and regulate prescription medication as part of the national regulation of medicine made possible by the Affordable Care Act of 2010. Moreover, in the United States, Great Britain, and Germany, the concept of a national centralized server model of healthcare data has been poorly received. Issues of privacy and security in such a model have been of concern. Privacy concerns actually in healthcare apply to both paper and electronic records. Recent revelations of "secure" data breaches at centralized data repositories, in banking and other financial institutions, in the retail industry, and from government databases, have caused much concern about storing electronic medical records in a central location such cloud computing EMR. Records that are exchanged over the Internet are subject to the same security concerns as any other type of data transaction over the Internet.

According to a statement issue by the Institute of Medicine (IOM) of the National Academies, “To significantly reduce the tens of thousands of deaths and injuries caused by medical errors every year, healthcare organizations must adopt information technology systems that are
capable of collecting and sharing essential health information on patients and their care such systems should be national and integrative in nature and conform to a national data standard in order to improve the quality and reduce the cost of healthcare (IOM, 2003)

Currently, the Taiwanese government is promoting the full implementation of electronic medical records in every hospital. Medical environments change frequently, which makes full acceptance of electronic medical records by hospitals and physicians an important issue. However, lately, most studies have focused largely on patient confidentiality and security(O’Neill et al. 2009). Studies rarely examine other EMR-related issues. The main users of EMR are medical professionals or physicians, and the intentions behind their adaptation are fairly important. Previous studies note that using these record systems is most advantageous in remote rural areas. As a result, this study examines the regional hospitals and physicians including remote rural areas in Taiwan (including islands). It combines the theory on reasoned action (TRA) and information technology acceptance model (TAM) resulted in modified TAM (MTAM) to find what critical factors influence the adaptation of EMR by physicians. The results may provide valuable information for the medical industry and government in their implementation of EMR, and improve acceptance of EMR among physicians.

2 LITERATURE REVIEW

The basic question is how could the concept of EMR diffused as efficiently as possible to the healthcare industry. This question might not be with importance, as electronic medical records have remained as unsettle promise for more than 40 years. Implementing EMR is a demanding task as seen from the computer professional point of view, not to speak of the challenge set for the medical profession. As matter of fact, implementing any information systems into healthcare organizations would be much easier than now if the organizations would have clear general and information strategies that would tell them that they have to do this. Unfortunately, this is often not the case (Winter et al., 2001; Douglas & Ryman, 2003; Suomi, 2006).

The term “acceptance” is used from authors with different background and approaches. In fact, in the literature, acceptance does not have a unique definition. TAM (Davis, 1989) describes acceptance as users’ decision about how and when they will use technology. Martinez (2008) noticed that initial use (acceptance) is the first critical step toward EMR, while sustainable success depends on its continued use (continuance). There is large variety of studies focus on information & communication technology (ICT) acceptance (Ngai, Poon & Chan, 2005; Abdul-Gader, 1996; Adams, Nelson &Todd, 1992; Igbaria, Guimaraes& Davis, 1995). As mentioned before, an empirical model was developed to explain the technology acceptance in general and ICT in particular.

The theory of reasoned action (TRA) proposed by Fishbein and Ajzen (1975) to explain and
predict the people’s behavior in a specific situation. TRA is a well-known model in the social psychology domain. According to TRA a person’s actual behavior is driven by the intention to perform the behavior. Individual’s attitude toward the behavior and subjective norms are the “loading factors” toward behavioral intention. Attitude is a person’s positive or negative feeling, and tendency towards an idea, behavior. Subjective norm is defined as an individual’s perception of whether people important to the individual think the behavior should be performed.

The theory of planned behavior (TPB) is another well-known model. TPB is a well known theory for many years that has been used to explain social behavior and information technology use (Ajzen, 1985, 1991; Conner & Armitage, 1998; Dillon & Morris, 1996; Sutton, 1998; Kwon & Onwuegbuzie, 2005). More specifically, according to Ajzen (Ajzen, 1985, 1991), intention is an immediate predictor of behavior. This intention is loaded by Subjective Norm (SN) (i.e. perceived social pressure), PBC (the beliefs about the ability to control the behavior) and one’s attitude towards a behavior. Furthermore, a behavioral belief (a specific behavior lead to a specific outcome) weighted by the evaluated desirability of this outcome forms an attitude (Kwon & Onwuegbuzie, 2005). Ajzen (1991) defines PBC as “the perceived easy or difficulty of performing the behavior”. TPB views the control that people have over their behavior as lying on a continuum from behaviors that are easily performed to those requiring considerable effort, resources, etc.

Expectation-disconfirmation model (EDT) according to Premkumar and Bhattacharjee (2006) is based on expectation-disconfirmation-satisfaction paradigm. Oliver (1980) introduced EDT to explain the critical factors of consumer satisfaction/dissatisfaction, in the marketing area. Here product information and marketing formed a pre-usage initial expectation. After that the customers use the product and form a perception of product performance. The comparison of initial expectation vs. perceived performance drives to the disconfirmation for the product. After that the customer forms his/her satisfaction level. The EDT is validated in information technology (IT) by Bhattacharjee (2001) in a study for online banking services. Furthermore Bhattacharjee and Premkumar (2004) used EDT in order to explain changes in beliefs and attitudes toward IT usage. Recently, Islam and Mäntymäki (2011) performed a meta-analysis on the EDT relationships across studies published in IT usage research area. They found EDT relationships were significant across studies.

Technology acceptance model (TAM) (Davis, 1989; Davis, Bagozzi & Warshaw, 1989) is an adaptation of the theory of reasoned action (TRA) to the field of information system (IS). TAM posits that perceived usefulness and perceived ease of use determine an individual’s intention to use a system with intention to use serving as a mediator of actual system use. Perceived usefulness is also seen as being directly impacted by perceived ease of use. Researchers have simplified TAM by removing the attitude construct found in TRA from the
current specification (Venkatesh et. al., 2003). Attempts to extend TAM have generally taken one of three approaches: by introducing factors from related models, by introducing additional or alternative belief factors, and by examining antecedents and moderators of perceived usefulness and perceived ease of use (Wixom and Todd, 2005).

TRA and TAM, both of which have strong behavioral elements, assume that when someone forms an intention to act, that they will be free to act without limitation. In practice constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act. According to Davis (1993), the user acceptance is often the pivotal factor determine the success or failure of an information system. The term external variables include all the system design features. These features have a direct influence on perceived usefulness (PU) and perceived easiness of use (PEOU), while attitude toward using has an indirect influence effect to the actual system use. Davis (1993) defines PEOU as “the degree to which an individual believes that using a particular system would be free of physical and mental effort”, and PU as “the degree to which an individual believes that using a particular system would be enhance one’s job performance. As Davis et al (1989) states, the goal is to provide us with an explanation of the determinants of information systems acceptance. Similar to TRA user beliefs determine the attitude toward using the information system. This attitude drives to intention behavior to use which lead to actual system use. Dishaw and Strong (1999) pointed out a weak point of TAM about task focus. According to them TAM differs from TRA “in two keys”. The first is that define PEOU and PU as external variables that determine the intention to use not the actual use. The second key is that TAM does not include subjective norms.

Venkatesh and Davis (2000), proposed an extension of TAM, the TAM2. TAM2 include social influence process such subjective norm, and cognitive instrumental process such as job relevance, output quality and result demonstrability. Venkatesh et al. (2003), proposed the Unified Theory of Acceptance and Use as a composition of eight prominent models (TRA, TAM, Motivational Model, TPB, Combined TAM-TPB, PC Utilization, IDT and Social Cognitive Theory, UTAUT). The UTAUT model aims to explain user behavioral intentions to use an IS and subsequent usage behavior. According to this theory four critical constructs are direct determinants of usage intention and behavior (Venkatesh et. al., 2003). The core constructs are: performance expectancy, effort expectancy, social influence, and facilitating conditions. Moreover, gender, age, experience, and voluntariness of use are posited to mediate the impact of the four key constructs on usage intention and behavior (Venkatesh et. al., 2003). Subsequent validation of UTAUT in a longitudinal study found it to account for 70% of the variance in usage intention (Venkatesh et. al., 2003). Also there recently a TAM 3 was proposed (Venkatesh& Bala 2008).

TAM has been tested across a number of industries and technologies, but not much in
healthcare. Hu, Chau and Tam (1999) investigated physician acceptance of telemedicine technology and found evidence that TAM does not fit well with physicians. A significantly modified version of the original TAM model has been tested for IT adoption by family physicians (Dixon & Stewart, 2000). Chau and Hu (2002) also examined physicians’ acceptance of telemedicine again with a theory comparison approach. Their study evaluated the extent to which the technology acceptance model, the theory of planned behavior (TPB) and an integrated model using both TAM and TPB could explain individual physicians’ technology acceptance decisions. The finding suggested that TAM was more appropriate than TPB and the integrated model for examining technology acceptance by individual professionals.

In this study, a modified TAM model was developed and tested the applicability in the healthcare settings, especially for the physicians who practicing in Taiwan. The goal was to help address the needs and behaviors of the medical community as a whole in implementing EMR in the modern world with networking systems. For the factors influencing physicians’ attitudes and intentions in acceptance behavior with Electronic Medical Records, in the information technology area, different groups have different cognitive biases, especially physician groups. As professionals, individual physicians have different personal knowledge that may affect their decision to accept information technology. Thus, focusing on the potential acceptance of information technology by physicians is important for successfully running medical institutions (Chau & Hu 2002). There are several critical factors to influence the physician acceptance behavior toward the EMR. In particular, there are four key factors, explained below.

Physicians rely on their autonomy and authority to make decisions. Even in cases where a decision support system aids their choices, they may not necessarily want to leverage this technology, because they may perceive certain technological advances as a challenge and threat to their authority. Furthermore, such advances may weaken the independence of the physician. As a result, information technology implementation may carry with it unintended but significant negative effects (Ilie et al. 2009; Berner et al. 2005; Walter & Lopez 2008).

Electronic medical records can substantially change hospital working environments. Every individual physician has a different expertise and background, and may in some cases lack the computer skills necessary to use an electronic medical information system. Likewise, hospitals may provide insufficient background knowledge on EMR and insufficient training (Ash 2000; Baron et al. 2005; Morton 2008). According to a Taiwan government electronic medical record survey, implementing proper training on EMR systems is difficult (Department of Health 2010). Previous studies have noted that training not only positively influences the usefulness of information technology (Walter & Lopez 2008; Hu et al. 1999), but also specific training will positively impact information technology self-efficacy (Staples et al. 1999).
Previous researches defined computer self-efficacy as “a person who uses your computer’s capabilities” (Compeau & Higgins 1995). Along these lines, many researchers describe computer self-efficacy as the perception of the use, ability, and attitude of individuals towards computers (Ma & Liu 2005; Venkatesh & Davis 1996).

In electronic medical records-related research, it is common to find basic demographic data on physicians, including information on personal characteristics. Past research has found that physicians who are more experienced, younger, and are aware of computer operations will more likely accept electronic medical record systems (Menachemi et al. 2008; Menachemi et al. 2007).

This study combines TRA with modified TAM, carefully incorporating other external variables such as limits on professional autonomy, training, and computer self-efficacy. Together, this methodology follows the following framework.

![The Research Conceptual Model](image)

**3 METHODOLOGY**

To test these hypotheses, this study employed a cross sectional mailed questionnaire survey during the period of three months in 2012. There are about 25,000 licensed physicians practicing currently in those four levels of healthcare organizations including 24 medical centers (more than 500 beds), 55 regional acute and chronic hospitals (more than 300 beds), 475 district hospitals (more than 100 beds), and primary healthcare clinics (private practice). According to the official report in the year of 2011, there were about 5,000 physicians (20%) practicing currently in those three levels of hospitals. Most of the medical centers (90%) in Taiwan have equipped with the electronic medical record systems already. The survey was
thus deployed to 1000 physicians randomly from the estimated total 2000 physicians of 50 regional acute hospitals (more than 300 beds) in Taiwan.

Thus, this study examines the regional hospitals in Taiwan including outlying islands. In doing so, we provided structured questionnaires, sent by mail, to each regional hospital. In designing our structural questionnaire, we referred to the methodology and measurements of related studies. Many of the constructs investigated in this study are latent variables that are not directly observable. Thus, we measured these concepts using a five-point Likert scale, where 1 represents “strongly disagree” and 5 represents “strongly agree”, and we carry on as before the researches in a ten-point Likert scale of the Computer self-efficacy questionnaires section, where 1 represents “strongly disagree” and 10 represents “strongly agree”. Furthermore, we invited experts from both academia and professional fields to offer modifications and feedback. All items were slightly modified to accommodate specific behavioral characteristics and the context of this study. From these, 252 usable responses were received, resulting in a net response rate of 25%.

The results were then imported and analyzed using PSS 12.0 and PLS 2.0. Regarding computer experience, 70% of respondents reported having ten years of experience or more with using computers, suggesting that the majority of physicians have a rich usage history.

### 3.1 Results

To help ensure validity, items in the questionnaire were constructed according to the related literature. Construct validity was assessed by convergent and discriminant validity. The reliability of the constructs was assessed by using Cronbach’s $\alpha$ as follows, which indicates the degree of internal consistency among the measurement items and is inversely related to the degree to which a measure is contaminated by random error. In this study, a construct with an alpha coefficient higher than the threshold level of 0.7 was deemed to provide satisfactory reliability (Table 1).

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Average variance extracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective Norm</td>
<td>0.887</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>0.918</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>0.836</td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td>0.805</td>
</tr>
<tr>
<td>Limit of professional autonomy</td>
<td>0.761</td>
</tr>
<tr>
<td>Computer Self-efficacy</td>
<td>0.929</td>
</tr>
<tr>
<td>Attitude</td>
<td>0.893</td>
</tr>
</tbody>
</table>

*Table 1  The Reliability Test (Cronbach’s $\alpha$)
Table 2  The Convergent Validity

These results maintain enough explanatory power (R² =78.4%) to help explain the attitudes and intentions of physicians in adopting electronic medical record information systems. Among the hypotheses above, only hypotheses 1 and 3a were not accepted. Results from hypothesis 1 indicate that there is no relation between limits on professional autonomy and perceived usefulness, and hypothesis 3a indicates that computer self-efficacy negatively impacts perceived usefulness. This final section summarizes our findings and provides various policy suggestions.

Partial least squares regression (PLS) applies to variables needed to predict huge, samples more small. In this study, the number of samples taken was not easy, so we use PLS complete path analysis to reduce errors. Furthermore, we adopt a bootstrap method for estimating p values. Table 4 displays the results of this method for each of our hypotheses.

<table>
<thead>
<tr>
<th>Between Facets</th>
<th>Path Coefficient (β)</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective Norm - &gt; Behavioral Intention</td>
<td>0.160</td>
<td>2.224</td>
<td>0.015***</td>
</tr>
<tr>
<td>Attitude - &gt; Behavioral Intention</td>
<td>0.569</td>
<td>5.104</td>
<td>0.000***</td>
</tr>
<tr>
<td>Training - &gt; Perceived Ease of Use</td>
<td>0.420</td>
<td>4.284</td>
<td>0.000***</td>
</tr>
<tr>
<td>Training - &gt; Perceived Usefulness</td>
<td>0.198</td>
<td>7.334</td>
<td>0.000***</td>
</tr>
<tr>
<td>Training - &gt; Computer self-efficacy</td>
<td>0.498</td>
<td>1.556</td>
<td>0.063*</td>
</tr>
<tr>
<td>Perceived Ease of Use - &gt; Attitude</td>
<td>0.373</td>
<td>7.345</td>
<td>0.000***</td>
</tr>
<tr>
<td>Perceived Ease of Use - &gt; Perceived Usefulness</td>
<td>0.705</td>
<td>5.920</td>
<td>0.000***</td>
</tr>
<tr>
<td>Perceived Usefulness - &gt; Behavioral Intention</td>
<td>0.147</td>
<td>2.066</td>
<td>0.023**</td>
</tr>
<tr>
<td>Perceived Usefulness - &gt; Attitude</td>
<td>0.527</td>
<td>4.796</td>
<td>0.000***</td>
</tr>
<tr>
<td>Limit of professional autonomy - &gt; Perceived Usefulness</td>
<td>0.110</td>
<td>1.259</td>
<td>0.107</td>
</tr>
<tr>
<td>Computer self-efficacy - &gt; Behavioral Intention</td>
<td>0.142</td>
<td>2.491</td>
<td>0.009***</td>
</tr>
<tr>
<td>Computer self-efficacy - &gt; Perceived Ease of Use</td>
<td>0.490</td>
<td>6.596</td>
<td>0.000***</td>
</tr>
<tr>
<td>Computer self-efficacy - &gt; Perceived Usefulness</td>
<td>-0.141</td>
<td>-1.348</td>
<td>0.092*</td>
</tr>
</tbody>
</table>
PLS does not provide model fit indices; it only tests the entire mode of forecast level by the coefficient of determination $R^2$ (0-1). In this study predictive tests are performed using an algorithm method. Figure 2 displays the path coefficient, $R^2$, and p-value integration results. Table 3 presents the final results of the hypothesis tests.

**Table 3** Standardized Total Effects

<table>
<thead>
<tr>
<th>Limit of professional autonomy</th>
<th>Perceived Usefulness</th>
<th>Behavioral Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>0.110</td>
<td>0.147***</td>
</tr>
<tr>
<td>Computer self-efficacy</td>
<td>-0.141</td>
<td>0.490***</td>
</tr>
</tbody>
</table>

$R^2=0.512$ $R^2=0.688$ $R^2=0.784$

4 DISCUSSIONS

The understanding of factors that influence physicians’ intention to adopt electronic medical record systems becomes increasingly more useful and commonplace in the healthcare settings. This study evaluated the modified TAM to explain the physicians’ attitudes and intentions with the electronic medical record systems in Taiwan. As theorized, perceived usefulness and perceived ease of use were both found to have significant and strong influences on physicians’ intention. It seems to be highly consistent with the original TAM tested by previous studies. However, the professional autonomy and computer self-efficacy will play certain critical roles in this empirical modified TAM. These findings are not fully consistent with prior studies that have not used physicians as the targeted subjects (Davis, 1989; Davis, Bagozzi & Warshaw, 1989; Venkatesh & Davis, 2000; Chrismar & Wiley-Patton, 2006). Moreover, these findings are also different from those studies conducted by others who tested TAM with physicians (Jayasuya, 1998; Hu et al., 1999; Chau & Hu, 2002). Chu & Hu (2002) also examining physicians’ acceptance with telemedicine information systems reported that perceived
usefulness was the most significant factor affecting physicians' attitudes and intentions, while perceived ease of use had no significant effect on either perceived usefulness or attitude. They explained further that the physicians on the average have a higher level of competence, intellectual and cognitive capacity, adaptability to new information technologies, and reliable access to assistance in systems. Physicians are considerably different from the students, administrative staff, knowledge workers, and system developers typically examined in previous studies.

Though the empirical modified model could predict more than 78% of the variance toward physicians' using behavior, however, the results suggest that TAM or Modified TAM were partially adequate and applicable in the profession context of physician. There might be some other critical factors to moderate the attitudes and intentions such as professional autonomy. Our analysis revealed the importance of the perception usefulness which moderated by professional autonomy and pragmatism by physicians for their adoption electronic medical record systems in clinical practices.

There are several significant findings in this study as following:

- **Factors Affecting Computer Self-efficacy**
  Our findings show that "training" has a significant positive effect on EMR self-efficacy. This means that if physicians are willing to adopt EMR and have received enough training on EMR, then their operation of EMR will improve. This finding is consistent with previous research (Staples et al. 1999), and suggests that medical institutions should provide comprehensive EMR training for individual physicians to increase their use of computer-based EMR information systems.

- **Factors Affecting Perceived Usefulness**
  Our results also indicate that training and computer self-efficacy significantly influence the perceived usefulness of EMR, while limits on professional autonomy have no effect. This result somewhat conflicts with previous studies, but is consistent with Morton (2008). It indicates that physicians were not exposed to the actual medical decision-making process for implementation, and therefore were reporting their perceptions only (Morton 2008). Thus this study conjectures that EMR only act as a database pooling system in Taiwan; it does not replace the decision-making power of physicians, so physicians do not feel EMR will limit their autonomy to make medical decisions.

These results also suggest that computer self-efficacy has a significant negative effect on the perceived usefulness of EMR. This relationship was not hypothesized, and differs from past research. Chau (2001) indicated self-efficacy with technology significantly negatively influenced EMR perceived usefulness (Chau 2001). It explained that users employ technology systems mostly because of their ease of use, rather than their usefulness. Therefore this study contends that while physicians’ computer experience is rich, EMR system functionality is not
recommended. Electronic medical record information system functionality should focus more on enhancing quality, speed, etc., and not expect to enhance physician EMR perceived usefulness.

- **Factors Affecting Perceived Ease of Use**
  
  This study finds that training and computer self-efficacy significantly positively impact perceived ease of use. As a result, hospitals should consider providing appropriate and continued formal training according to rates of physician computer self-efficacy to reduce physicians stress and work loading when he or she is learning a new system.

- **Factors Affecting Attitudes**
  
  Our results show perceived usefulness and perceived ease of use significantly positively influence attitudes towards the adoption of EMR information systems. If the physicians believe EMR information systems are useful and easy to use, physicians will have a positive attitude towards using these systems. Given this, when improving their EMR systems, the medical industry should especially strengthen system usefulness and ease of use, so as to attitudes towards their EMR systems and improve adoption.

- **Factors Affecting Intention of Adopting EMR**
  
  These research findings indicate that four variables significantly positively impact the intention to adopt EMR. Among these, attitude has the most significant positive impact on adoption intentions. Therefore this study suggests that in order to enhance the intention to adopt EMR systems, hospitals should strengthen independent impact variables, including perceived usefulness, attitude, subjective norms, and computer self-efficacy. If hospitals can strengthen the positive feelings of physicians towards EMR and convince physicians of its usefulness, they will maintain a healthier attitude towards adoption.

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