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Physicians' Intention To Use Electronic Medical Records In Sri Lanka

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ABSTRACT: Electronic Medical Record (EMR) is computerized medical information that provides means to create legible and organized recordings that allow access to clinical information about an individual patient. It represents an essential tool for improving the safety and quality of healthcare. Despite emerging evidence about the benefits of EMR, there are considerable barriers to adoption and use. The slow rate of adoption suggests that resistance among physicians must be strong as they are the main front line user group of EMR systems. Therefore, it is very important to study the physicians' perception towards accepting and using EMRs in medical practices. This research attempts to identify factors that affect the physicians' intention to use the EMR in Sri Lanka. The study model is based on Unified Theory of Acceptance and Use of Technology which is used to study the perception of users towards using a computerized system or new technology. The results indicate that the Performance Expectancy and Effort Expectance affect the Behavioral Intention of the physicians to use EMR in the healthcare settings of Sri Lanka.

Keywords : Electronic Medical Record, Intention, Physician, UTAUT

1 INTRODUCTION

Sri Lanka is one of the few countries in the world with free healthcare which has been national priorities for decades. The country provides free universal healthcare services through its extensive network of healthcare institutions. The Sri Lankan healthcare system is a combination of public and private sector. The public healthcare system is the main driver that enables universal access. It is completely financed, staffed, equipped and run by the government through the general revenue sources. On the other hand, the private sector which provides similar services is financed through fee levied for services offered. Healthcare services are completely free at the point of delivery for all patients through the public health institutions distributed island-wide [1]. However, there is no registered population for any particular healthcare institutions. Patients are free to select the doctor to consult and the hospital to which they prefer to get admitted to. In this unique healthcare system, one can go directly to the private or government hospital to see a general physicians or a specialist with no reference from a third party. At the same time, every person who visits a doctor is not necessarily a patient; it could be for a regular checkup, or an appointment for vaccination. The reason for the visit may vary from person to person. However, these visits need to be compulsorily documented by the care provider as the information is of great value to many, particularly to doctors to provide uninterrupted medical care. Medical records are the main sources of health information [2]. They serve as a repository of the doctor's observations and analysis of the patient. The records are important as they are used as a medium of communication between the doctors, patients, insurance company and other payers of government agencies. They also serve as legal record in the event of claims due to malpractice or occupational injury [3]. It is a common practice to maintain records in paper. Yet, these records are disorganized; not only disorganized but also fragmented across different doctors' offices and hospitals. Maintenance of integrated health information pertaining to a single person has become a formidable task, meaning that the patient information is scattered and disintegrated in different healthcare institutions. This situation arises due to the patients' free movement among different healthcare institutions, or different units within the same institution. The existence of duplicate and/or incomplete records leads to confusion and requires more effort of the hospital staff to traverse through the records to find the actual and updated record [4]. The delay is introduced to the treatment process as the ambiguous records need to be clarified. This leads to putting patients' wellbeing at risk and incurring additional expenditure to provision of healthcare services. The result is that the patient does not receive best service that is available and due to him.To address this situation healthcare technology is incorporated within the hospitals. It helps to improve the quality and performance of treatment [5]. Healthcare technologies can decrease medical errors, identify patients, manage physician/nurse teams, and improve service quality and safety [6-8]. The major revolution in information management is the widespread use of computers to collect, store and process data, and retrieve information when required. Having a computerized system with the records of patients' health information in digital form is the solution to overcome the problems faced in recording the same information on paper. Electronic Medical Record (EMR) is a digital version of the patient's record maintained in the doctor's office. An EMR contains the medical treatment history of patients in one practice. It contains key administrative clinical data together with patient's demographics, medical history, diagnoses, medications, treatment plans, progress notes, vital signs, immunization dates, allergies, radiology images, and laboratory and test results, all in electronic form [9]. Maintenance of records in digital format allows tracking data easily over time. The system of maintaining health information in digital format allows the records to be shared across different departments or healthcare institutions involving healthcare professionals at all levels – specialists, general physician, nurses, laboratories, medical imaging facilities, pharmacies, emergency facilities, and clinics. Further, EMRs are intended to replace existing paper medical records which are already familiar to practitioners [10]. The perceived advantages of EMRs can be summarized as optimizing the documentation of patient encounters, improving communication of information to physicians, improving access to patient medical information, reduction of errors, optimizing billing and improving reimbursement for services, forming a data repository for research and quality improvement, and reduction of paper [11]. EMRs are viewed as having a great potential for improving quality, continuity, safety and efficiency in healthcare, they are being implemented across the world. Despite the high expectations and inter-

est in EMRs worldwide, their overall adoption rate is relatively low and they face several problems [12]. Although, the complete EMR system does not currently exist in Sri Lanka, portions of the medical records are being computerized. The private hospitals in Sri Lanka lead their way in computerization of records mostly in the parts of administration and finance. Kulathilaka cites that the government hospitals focus on automating the in and out patient care units. The most commonly available computerized function is issuing the tokens/passes, briefing of required tests to be done and reporting of laboratory results [13]. A large number of commercial and open source medical record systems already cater to the need for EMRs worldwide. The implementation and use of EMRs has become high priority for healthcare providers, organizations, and government agencies. Developers of such systems report that many of these implementations are successful, and that their services have improved tremendously after the adoption of EMRs. However, there has been little interest in leveraging the success of EMRs in Sri Lanka. The attempts to incorporate computer-based solutions and electronic communication into the healthcare settings in Sri Lanka could not be sustained. According to Meinert, the slow rate of adoption suggests that resistance among physicians must be strong as they are the main frontline user-group of EMRs. Whether or not they support and use EMRs, they will have a great influence on other user-groups in a medical practice, such as nurses and administrative staff. It is obvious that physicians have a great impact on the overall adoption of EMRs within the practice environment [14]. As it requires physicians to actively support and use EMRs, to benefit from them, it is essential to understand the potential factors that affect their intention to use such beneficial system.

2 THEORY

A wide body of literature focuses on identifying factors affecting people's intentions to use new technologies and how these intentions predict actual usage [15]. At present, many user acceptance models with different determinants are created to measure the user agreement of Information Systems [16]. Each theory or model has been widely tested to predict the user acceptance [17,18]. However, no comprehensive instrument to measure the variety of perceptions of Information System users exists. In general, technology acceptance is conceptualized as an individual's perspective on his or her voluntary or intended use of a system [19]. Thus, studies on technology adoption focus on user intentions to use the system with the actual use of system. Venkatesh et al. proposed and tested a unified Information Technology acceptance and use research model, called the Unified Theory of Acceptance and Use of Technology (UTAUT). The theory aims to explain the user intentions to use a new computer technology and related usage behavior by integrating significant elements across eight prominent user acceptance models, and formulates a unique measure with core determinants of user behavioral intention and usage of a technology in place. The theory is developed though a review and consolidation of eight theories that were used in the literature to explain the behavioral patterns in using a new technology. The eight underlying theories are: Theory of Reasoned Action, Technology Acceptance Model, Theory of Planned Behavior, Motivational Models, Combined Theory of Planned Behavior and Technology Acceptance Model, Model of Personal Computer Utilization, Innovation Diffusion Theory and Social Cognitive Theory [20]. UTAUT proposes four core constructs that are determinants of technology acceptance behavior: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Performance Expectancy, Effort Expectancy and Social Influence are direct determinants of Behavioral Intention while Facilitating Conditions and Behavioral Intention directly affect the Actual Use of a system. Moreover, it suggests that gender, age, experience and voluntariness of use have moderate effect on the key constructs [20]. Most importantly, Performance Expectancy demonstrated a much stronger influence on intention to use compared to other factors. This finding is consistent with the results observed in a previous study by Venkatesh and Davis [18]. Effort Expectancy also had a strong influence, but its role diminished with use of the system. Social Influence's role in forming users' initial intention to use highlights the importance of having respected physicians serve as EMR champions in environments where system use will be mandatory. This social influence is important for forming initial positive intentions to use the system.

3 ANALYTICAL MODEL

This research uses UTAUT model to study acceptance and use of EMRs by doctors in Teaching Hospitals of Sri Lanka. In accordance to that theory, four major factors such as Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions influence the adoption of the system. The study does not consider the moderating effect of gender, age, experience, and voluntariness due to the fact that the adoption is mandatory and the moderators cannot be controlled.

The model can be viewed as follows:

Model A: Determination of factors that affect Behavioral Intention
Dependent variable: Behavioral Intention
Independent variables: Performance Expectancy, Effort Expectancy and Social Influence

Model B: Determination of factors that affect Actual Use
Dependent variable: Actual Use of the system
Independent variables: Behavioral Intention and Facilitating Conditions

This paper focusses on the Model A; hence the following are the hypotheses to be tested: "Performance Expectancy" is defined as a degree to which an individual believes that using the system will help him attain benefits in his job and has shown to be a determinant of Behavioral Intention to use technology [20, 21]. Therefore,

H1: Performance Expectancy affects user's Intention to use EMRs.

"Effort Expectancy" is defined as the degree of effort an individual believes is required to use a system. Effort Expectancy has shown negative impact on an individual's intention to use new technologies [17, 20]. Thus,

H2: Effort Expectancy affects user's Intention to use EMRs.

"Social Influence" is defined as the degree to which an individual perceives that important others believe he should use the new system and is shown as a major determinant of Behavioral Intention to use new technologies [20, 22].

H3: Social Influence affects user's Intentions to use EMRs.

4 METHODOLOGY

4.1 Participants and Setting

Although the government of Sri Lanka runs different types of hospitals such as National Hospital, Teaching Hospitals, Provincial General Hospitals, District General Hospitals, Base Hospitals of type A and B, Divisional Hospitals of type A, B, and C, Primary Medical Care Units, Dispensaries and Maternity Homes, only Teaching Hospitals are selected for this study. The reason for selecting the Teaching Hospitals is that they widely deal with any type of disease. Therefore, in general they provide variety of services through different units. It is desirable to have EMRs accepted in such service providing organizations as there could be one individual who is undergoing treatment from different units of a hospital and his medical records need to be preserved and exchanged among different units within the hospital. The study is limited to the physicians who could be Consultants, General Physicians or Intern Medical Officers working at Teaching Hospitals in Sri Lanka. All 21 Teaching Hospitals were put into 6 groups based on the services offered. The reason for this grouping is to make sure that the study covers most of the hospitals that provide different type of services. Also, it is important to choose hospitals from different provinces and districts. Therefore, the grouping is the only possible option to make sure that participants from different healthcare settings are included to the study.

4.2 Sample

There are 21 Teaching Hospitals in Sri Lanka and approximately 6400 physicians are employed. Even though, this is the count in reality, not all units of all hospitals are equipped with an EMR system, and not all physicians who are employed in these Teaching Hospitals are using the EMR systems. Therefore, the population of interest is 505. This count is based on the approximate value provided by the Medical Officer – for Planning of a particular Teaching Hospital, at the time of data being collected. Initially, it is decided to represent one third of the population (168 respondents) through a Simple Random Sampling. It is identified that even though a unit of a particular hospital is automated, not all physicians who work at that unit uses the system; resulting in picking a staff who has no exposure to the EMRs. Therefore, the sampling is done in two levels. First, the unit and the doctors who are exposed to the EMRs are identified through Snowball Sampling technique. From that identified group of target, physicians are randomly picked for this study. The precondition is that the hospital has at least one unit that uses EMRs. 270 questionnaires are distributed among the selected sample of physicians, 249 responses are received. Even though, it is initially decided to include only 168 physicians, at the end of the data collection process, responses of 249 physicians are received. The responses received are sufficient to represent the population.

4.3 Instrument and Administration

Questionnaire is used as the tool to collect primary data from the respondents. A questionnaire with 33 self-administered questions was prepared. The questionnaire is split into 3 sections where the first section focused on demographics of the respondents, the second section on gathering the background information of the system deployed in the hospital and the last section evaluated the acceptance and usage behavior of the respondent. The last section is categorized into subsections, representing the constructs that are to be evaluated through the study model mentioned in section 3. Constructs and statements relevant for the study are adopted from Venkatesh et al. and modified to suit the research context. Each item in third section is measured using a five point Likert scale where, 1 corresponds to strongly disagree, 2– disagree, 3– neutral (neither disagree nor agree), 4– agree and 5– strongly agree. The questionnaire is designed to be short, unambiguous and easy for the respondents to complete. Similar items are grouped together for higher reliability and validity of the model. The questionnaire is developed only in English. Data is collected from December 2014 to March 2015. No organizations or individuals are contracted to administer the data collection process.

4.4 Pretest

A pretest is conducted on a sample of size 20 randomly selected physicians (10 Medical Interns and 10 Consultants) serving at Batticaloa Teaching Hospital to validate the instrument in use. Feedback on the layout of the questionnaire and ambiguity of the questions is obtained. Changes are made to the questionnaire as deemed appropriate. The revised questionnaire is used as the tool to collect data for this study.

5 ANALYSIS

270 questionnaires are distributed among the selected sample of physicians, a total of 249 responses are received. However 12 questionnaires have been rejected due to the missing values found in the questionnaire related to the major constructs. The study achieves the response rate of 87.7%, which is fairly high. 51.5% is males and 48.5% is females, which represents a gender balanced sample. Out of 237 respondents, 33.8% represented the Consultants while 66.2% represented Medical Officers (General Physicians and Medical Interns). Majority of the respondents (95 out of 237) were between 31 to 40 years of age, followed by those between 41-50 years and minority of over 50 years. Cronbach's Alpha is used to determine whether the construct is reliable when there are multiple Likert questions in a questionnaire that form a construct. The recommended threshold value is 0.70. The alpha value is 0.70 or higher is generally considered acceptable [23]. The constructs in this study yield the Cronbach's Alpha values, such that confirming a high level of reliability for the construct with this specific sample, as their respective statistics fall well above 0.70. Therefore, all constructs in the model have adequate reliability. This analysis confirms the validity of the UTAUT model by showing strong connection for items belonging to the same construct. The research model suggests that the Performance Expectancy, Effort Expectancy and social Influence are the factors that affect the physicians' Behavioral Intention to use EMR. Performance Expectancy is measured using the variables usefulness of the system (P1), accomplishment of tasks (P2), productivity (P3) and quality of service (P4). While clarity and understandability (E1), perceived ease of use (E2), ease of use (E3), easy to learn (E4) and provision of accurate and up-to-date information (E5) are the variables that measure Effort Expectancy. Social Influence is measured by administration's expectance to use the system (S1), colleague/peer's expectance to use the system (S2), importance given to technology in workplace (S3) and administrative support in using the system (S4). Intention to use the system within next 6 months (B1), Intention to use the system continuously in the future medical practice (B2) and Intention to use

the system to improve the job performance (B3) are the items that measure the major construct Behavioral Intention. The Chi-square test is used to check whether there is statistically significant association between variables. The results suggest that the variables P1, P2, P3, P4, E1, E2, E3, E4, E5, S1, S2, S3 and S4, are associated with the variables B1, B2 and B3; considering a pair at any given time. The Pearson's correlation is a measure of the strength and direction of association that exists between two variables. Hence, Pearson's correlation could be used to understand whether there is an association between variables of interest. The following pairs were taken into consideration to assess the association between Model A constructs:

- Performance Expectancy and Behavioral Intention
- Effort Expectancy and Behavioral Intention
- Social Influence and Behavioral Intention

The test for Pearson's Correlation Coefficient suggests that all the correlations are significant ($p<0.05$ in all cases). The Pearson's Correlation value for the constructs in this research model is high; indicating a positive relationship between the constructs. The test for Pearson's Correlation Coefficient suggests that all the correlations are significant ($p<0.05$ in all cases); confirming hypotheses H1, H2 and H3. Multiple Regression Analysis is used to determine the overall fit of the suggested model and the relative contribution of each of the predictors to the total variance explained. A regression analysis is performed to check how the independent variables, in this context, Performance Expectancy, Effort Expectancy and Social Influence affect the dependent variable Behavioral Intention. The test statistics indicate nearly 68% of total variability in Behavioral Intention is explained by the predictors. Based on the outcome of the regression analysis it is concluded that only Performance Expectancy and Effort Expectancy significantly affect the Behavioral Intention to use the EMR system in the healthcare settings of Sri Lanka. Social Influence does not significantly affect the Behavioral Intention in the presence of Performance Expectancy and Effort Expectancy.

6 Conclusion

The recording of patient information on papers impedes the continuity and quality of patient care. Additionally, paper-based systems have limited functionality; it is incapable of being view by many people at the same time. In contrast, EMRs store patients' clinical information electronically and enable instant availability of this information to all providers in the healthcare chain. EMRs are viewed as having a great potential for improving quality, continuity, safety and efficiency in healthcare. Despite the high expectations and interest in EMRs worldwide, their overall adoption rate is relatively low. This slow rate of adoption suggests that resistance among physicians must be strong as they are the main frontline user-group of EMRs. Physicians have a great impact on the overall adoption of EMRs. This study attempts to identify the factors that affect the intention of physicians to use EMR in healthcare settings. The sample has been chosen from the Teaching Hospitals and the study is underpinned to the UTAUT. In accordance to UTAUT, the study model can be viewed as two sub modules. One, a model that determines the factors that affect physicians' intention to use the EMR (Model A) and the other, to determine the factors that affect the actual use of EMRs (Model B). This paper focuses on Model A which reflects the theory that Performance Expectancy, Effort Expectancy and Social Influence affects the Behavioral Intention of the user of the system. The study tests the following hypotheses:

H1: Performance Expectancy affects user's Intention to use EMRs.

H2: Effort Expectancy affects user's Intention to use EMRs.

H3: Social Influence affects user's Intentions to use EMRs.

The study is conducted on 237 respondents; randomly selected samples of physicians who serve at Teaching hospitals in Sri Lanka. A questionnaire is constructed with 33 questions; 24 directly reflecting the major constructs of the UTAUT. Collected data is analyzed using SPSS 20. The results indicate that only Performance Expectancy and Effort Expectancy significantly affect the Behavioral Intention of the physicians to use the EMR system in the healthcare settings of Sri Lanka. Further studies on this matter shall focus on Model B that predicts the actual use behavior of the EMR.

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