Original Article

Users' acceptance and attitude in regarding electronic medical record at central polyclinic of oil industry in Isfahan, Iran

Nahid Tavakoli, Arash Shahin, Maryam Jahanbakhsh, Habibollah Mokhtari, Maryam Rafiei

Department of Management and Health Information Technology, Faculty of Management and Medical Informatics, Isfahan University, Isfahan, Iran

ABSTRACT

Introduction: Simultaneous with the rapid changes in the technology and information systems, hospitals interest in using them. One of the most common systems in hospitals is electronic medical record (EMR) whose one of uses is providing better health care quality via health information technology. Prior to its use, attempts should be put to identifying factors affecting the acceptance, attitude and utilizing of this technology. The current article aimed to study the effective factors of EMR acceptance by technology acceptance model (TAM) at central polyclinic of Oil Industry in Isfahan. **Materials and Methods:** This was a practical, descriptive and regression study. The population research were all EMR users at polyclinic of Oil Industry in 2012 and its sampling was simple random with 62 users. The tool of data collection was a research-made questionnaire based on TAM. The validity of questionnaire has been assigned through the strategy of content validity and health information technology experts' views and its reliability by test-retest. **Findings:** The system users have positive attitude toward using EMR (56.6%). Also, users are not very satisfied with effective external (38.14%) and behavioral factors (47.8%) upon using the system. Perceived ease-of-use (PEU) and perceived usefulness (PU) were at a good level. **Conclusion:** Lack of relative satisfaction with using of EMR derives from factors such as appearance, screen, data and information quality and terminology. In this study, it is suggested to improve the system and the efficiency of the users through software' external factors development. So that PEU and users' attitude to be changed and moved in positive manner.

Key words: Electronic medical record, polyclinic, technology acceptance model

Address for correspondence: Maryam Rafiei,
Department of Management and Health Information Technology,
Faculty of Management and Medical Informatics, Isfahan University of
Medical Sciences, Isfahan, Iran.
E-mail: Rafiei.maryam@ymail.com

INTRODUCTION

So far, a variety of technologies has been employed in hospitals to improve the quality of services provided for the patients and the efficiency and effectiveness of the personnel.[1] One of the most common technologies is electronic medical record (EMR's) which nowadays a great number of hospitals utilize to offer medical information and health care services in a better way.[2] This technology is a computer- based system for input, storage, display, retrieval and printing of information contained in a patient's medical record.[3] Besides, its benefits include quality improvement of the health care provided for the patients, better information organizing, improvement in timely process, accuracy and completeness of documentation,

patients' access to the version of their electronic record, avoidance of drug interactions and of allergies, decrease of medical errors, instant access to data in different places, support technology for decision making, and improvement in the process of activity.[4] In Boonstra's study entitled "Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions", 22 articles were examined in which the physicians had found the obstacles of EMR. The obstacles were categorized in 8 main respects including financial, technical, time, psychological, social, legal, organizational and change process. The study showed that while using EMR, physicians face barriers. In addition, implementing the EMR must be supported as a change process or they must be carried out by change manager in medical clinics. Moreover, the quality of change management plays a key role in successful implementation of EMR. Boonstra concluded that despite the impacts and benefits of implementing EMR, acceptance among the physicians are limited.[5]

Haslin mentioned that currently the closest framework model concerning electronic medical record is TAM2,[6] that was proposed by Davis in 1989 in two categories of perceived ease-of-use and perceived usefulness.[7] These two categories predict only system acceptance by the user and they were mentioned under the title of TAMI.[6,8] Besides, TAM is used to understand the user acceptance of internet-based applications and services such as mail, websites, or online shopping etc. Recently, the number of studies regarding TAM is increasing and it has been developed for accepting and utilizing health IT systems and services.[9,10] However, using EMR in health care facilities. Follows barriers and one of the most important barriers is users' attitude toward the using EMR [Figure 1].

According to TAM, the behavior of using information system technology is related to the intent of using a specified system and the intent of the using itself is determined by the perceived usefulness from consumers' point of view and by perceived ease-of-use.[11] Actually, Davis claims that individual perceive upon the usefulness of a special technology and its ease-of-use in acceptance of the technology are very important and these are considered as two main categories of TAM.[12,13] Perceived ease-of-use is identified as a degree to which a person believes that learning the way of using a special system or working with that might be of little effort perceive. And, perceived usefulness is a degree to which a person supposes that using a special technology would enhance his or her job performance in an organization or would help doing better the job through saving time or presenting the timely information.[14,15] As the
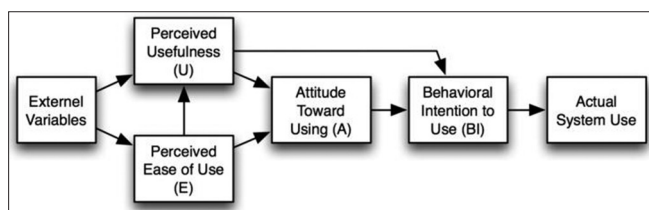
direct relationship between these two factors with technology acceptance has been proved in most of the studies done, the researchers in different organizations and industries have studied the factors affecting these two factors.[16]

The significance of IT acceptance has been noticed more and more by the users and it should be considered in designing the infrastructure IT solutions. Obviously, if the users in hospitals do not accept the electronic systems, delivering these services will face the failure. Therefore, identifying the factors that cause the users to intend to use a new technology like EMR is important, because identifying these factors help the hospitals create their strategies to apply and improve their new electronic systems. Additionally, because the role of users in utilizing the system, it is necessary to consider the factors affecting the acceptance of the technology after setting up the EMR. For this purpose, the researchers have studied EMR using technology acceptance model done by Davis at central polyclinic of Oil Industry.

MATERIALS AND METHODS

This was a practical, descriptive and regression study. The population of the study, were EMR users at central polyclinic of Oil Industry in Isfahan. Because statistical population was limited, sampling has been done by conducting the census and the sample was according to the population. Tool for collecting data was research-made questionnaire obtained from previous studies in other countries, especially the study of Haslina under the title of "Acceptance Model of Electronic Medical Record".[6] The questionnaire had two parts. In fact, the first part was related to demographic information, years of service at polyclinic, job environment and the second part was based on the five sections of technology acceptance model. External factors include data quality and those that are related to user interface factors involving several parts as screen, terminology, ease of learning the system, system capabilities, perceived ease-of-use, perceived usefulness, attitude and behavioral intent to use. Scoring the questions ranges from very low score (1 score) to very high score (5 scores). The validity of study instrument was assessed through assigning content validity based on other related studies and the point of views of health information management and technology professionals, senior and middle managers of the clinic and other experts in this subject. To evaluate the internal consistency of the questionnaire, Cronbach's alpha of the data was calculated and it was 95.6. According to the opinions of respondents, factors affecting the acceptance and using computer-based systems have been categorized and analyzed by using descriptive and deductive statistics and the testing used was co-relational, as well as regression test.

RESULTS

Demographic information and years of service
The results showed that out of 62 respondents, 50% were female and 50% were male. 32.25% of respondent were employed for 5 or less than 5 years and 19.35% of them for more than 15 years.

Figure 1: Davis', Bagozzi's and Warshaw's[18]

Quality of data and health information at EMR system

The findings in regarding data and health information quality of EMR system at central polyclinic of Oil Industry showed that the most users (48.4%) announced that they were understandable and 22.6% of them announced that the least quality was in regarding data currency.

User interface factors

The results of user interface factors have been displayed in Table 1.

Perceived ease of use

The results of perceived ease of use in users' acceptance have been displayed in Table 2.

Perceived usefulness

The results of perceived usefulness of EMR system have been displayed in Table 3.

Behavioral factors

Behavioral inclination toward using EMR system at central polyclinic of Oil Industry showed that 58.1% of the users find the system useful but the satisfaction with the adequate power and wonder of system was the least.

Attitude

The results show that 79% of the users believe that using EMR is a wise idea but 19.3% of the users believe that using EMR is worrisome.

DISCUSSION

Technology acceptance model is a popular and common one to predict the using new technologies and this study amid to examine the factors that affect the acceptance of EMR. Also, understanding the effective factors upon the users' attitude and behavior, which make their efficiency to improve.

The polyclinic users' satisfaction concerning the quality of data and health information was low. It seems that in order to obviate the problem, we can ask for the help of a specialist in health information management. In fact, by their help, the system can be designed in a way that covers all the quality factors including accuracy and completeness, currency, effectiveness, understandable, standardized and timely.

The results of factors related to user interface factor show that 51.1% of the users were satisfied with screen of EMR system at polyclinic. Furthermore, the level of satisfaction with the terminology, data, ease of learning the function of system and EMR system capabilities is under 50%. Therefore, it shows that while setting up the EMR system at polyclinic of Oil Industry, external factors affecting the acceptance of system were ignored. However, these factors play very important roles in system acceptance. Generally, external factors are related to appearance of EMR system and users deal with them all the time. Consequently, while designing a

Table 1: Results of user interface factors		
User interface factors	Percentage agreeing (score 4-5)	Mean score
Screen		
Legibility of characters	62.9	3.58
Clarity of characters	71	3.72
Font clearness	58.1	3.54
Highlighting	64.5	3.72
Blinking	51.6	3.58
Highlighting characters	56.4	3.77
Sufficiency of information	27.4	3.08
Data organization	38.7	3.2
Sequence of screen	48.4	3.46
Predictability of next page on the screen	43.5	3.32
Possibility of returning to the previous page	40.3	3.35
Marking of activity progress	50.3	3.37
Terminology		
Consistency of terms	32.2	3.2
Consistency of the computer terminology	32.3	3.1
The relation of computer terminology with duties	42	3.4
The appropriateness of computer terminology	46.8	3.29
Precise of terminology	54.8	3.4
System information		
Consistency of position of instructions	30.6	3.2
Clarity of instructions	32.2	3.24
Ease of controlling the amount of feedbacks	30.6	3.01
Computer alarms for reminding the duties	34.4	3.22
Acceptability of delay in completing the duties	27.4	2.9
The usefulness of warning messages	35.4	3.29
Correct identifying the errors messages	29	3.06
Learning		
Rapid learning	56.4	3.59
Ease of features of learning progress	56.5	3.58
Appropriateness of time of learning	38.7	3.35
Ease of discovering new features	32.3	3.16
Ease of memorizing the names	33.9	3.17
Consistency of duties with an organized pattern	40.3	3.2
Have a few steps of every duty	38.7	3.19
Logical of step of activities	32.2	3.22
Clarity of feedbacks in completion of stages	32.2	3.17
Ease of error correction	43.5	3.17
Dependence of activity easiness upon the level of experience	45.2	3.3
Ease of learning to operate the system	54.8	3.64
EMR system capabilities		
Proper speed of EMR system	27.4	2.77
Proper period of time for responding the functions	29	3.01
Reliability of EMR system	46.7	3.29
Rare failure in the system	41.9	3.3

(Contd...)

Table 1: (*Continued*)		
User interface factors	**Percentage agreeing (score 4-5)**	**Mean score**
Warning against potential problems of system	20.9	3.01
The possibility of correcting the mistake inputs	27.4	3.04
Possibility of returning to the previous function	25.8	3.09
Doing the duties according to system instructions	35.5	3.25
The easy use of EMR capabilities and shortcuts	35.5	3.09

EMR=Electronic medical record

Table 2: Results for perceived ease of use		
Perceived ease of use	**Percentage agreeing (score 4-5)**	**Mean score**
Clarity	56.5	3.54
Easy to use	56.4	3.58
Easy to remember	61.3	3.59
User-friendly	53.2	3.56
Easy to start	41.9	3.45

Table 3: Results for perceived usefulness		
Perceived usefulness	**Percentage agreeing (score 4-5)**	**Mean score**
Speed of doing tasks	64.5	3.74
Improvement in job performance	62.9	3.74
More effectiveness on the duties	56/5	3/61
Quality improvement	59.6	3.72
Improvement in communications	51.6	3.67
Decreasing the duties	59.7	3.69
Meeting the needs of patients, organizations and people	46/8	3/51
Protect against litigation	61.3	3.58
Usable in Judicial courts	54.9	3.59
Flexibility against the changes	58	3/59

new technology, not only its usage must be noticed but also appearance and all the user-related should be considered. Regarding perceived ease-of-use of EMR system, a study was done by Jocelyn Handy under "A technology acceptance model for inter-organisational electronic medical recoeds systems" it shows that 96.6% of physicians and midwives in New Zealand believe that working with EMR, its learning, and it's using is easy,[17] but in our study its ease is 53.66%.

Also, perceived usefulness of EMR system in a study done by Jocelyn Handy was welcomed up to 90%,[17] Actually, 90% of physicians and midwives believe that using EMR system cause their efficiency to improve but the perceived usefulness was 57.7% in our study.

Behavioral inclination toward EMR system in our study is under 50% (47.8). This result is expectable because of lack of users'

satisfaction with previous factors at polyclinic of Oil Industry. General satisfaction with EMR assesses users' intend, system attraction, its excitement, its flexibility against the changes and its powerfulness. Additionally, all these factors depend on users' perceives and finally the external factors of the system.

Nevertheless, polyclinic users had almost a positive attitude of 56.6% toward using EMR system and even their attitude in relation to using EMR was more than that of Jocelyn Handy (55.75),[17] and this is a positive factor and shows that generally the polyclinic users had almost a positive attitude toward using EMR. Finally, if other factors for using EMR are considered, EMR users' satisfaction will increase.

CONCLUSION

So while designing EMR system for central polyclinic of Oil Industry, all effective factors such as appearance, screen, data and information quality, were not considered the users' satisfaction has been existed relatively. It is suggested that in order to improve the system and users' function, software developments must be done in external factors field so that the users' perceive and attitude to be changed and trend to positive manner.

ACKNOWLEDGMENT

REFERENCES

1. Aggelidis VP, Chatzoglou PD. Using a modified technology acceptance model in hospitals. Int J Med Inform 2009;78:115-26.
2. Vathanophas V, Pacharapha T. information technology acceptance in health care service: The study of electronic medical record (EMR) in Thailand. In: Kocaoglu D, Anderson T, Daim T, editors. Technology management for global economic growth Portland: Portland international center for management of engineering and technology 2010. p. 1-5.
3. Otieno GO, Hinako T, Motohiro A, Daisuke K, Keiko N. Measuring effectiveness of electronic medical records systems: Towards building a composite index for benchmarking hospitals. Int J Med Inform 2008;77:657-69.
4. Miller RH, Sim I. Physicians' use of electronic medical records: Barriers and solutions. Health Aff 2004;2:116-26.
5. Boonstra A, Broekhuis M. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. BMC Health Serv Res 2010;10:231. Available from: http://www.biomedcentralcom/1472-6963/10/231. [Last accessed date 2012/01/09].
6. Haslina M, Sharifah M. Acceptance model of electronic medical record. J Adv Inform Manag Stud (JAIMS) 2005;2:75-92.
7. Chuttur M. Overview of the technology acceptance model: Origins, developments and future directions. Indiana University, USA Sprouts: Working Papers on Information Systems; vol 9. 2009. p. 1-23.
8. Abdulai T. Implemanting EHR in developing country: Potential chalenges and benefits. Tromsø: Faculty of Medicine Institute of Clinical Medicine University of Tromsø; 2009.

9. Ortega Egea JM, Román González MV. Explaining physicians' acceptance of EHCR systems: An extension of TAM with trust and risk factors. Comput Human Behav 2011;27:319-32.

10. Chung JE, Park N, Wang H, Fulk J, McLaughlin M. Age differences in perceptions of online community participation among non-users: An extension of the technology acceptance model. Comput Human Behav 2010;26:1674-84.

11. A survey on factors related to customer intent to use of e-banking Saman bank case study. Management Knowledge (Not Publish) 2005;18:45-61.

12. Holden RJ, Karsh B-T. The technology acceptance model: Its past and its future in health care. J Biomed Inform 2010;43:159-72.

13. Seeman E, Gibson S. Predicting acceptance of electronic medical records: Is the technology acceptance model enough? SAM Adv Manag J 2009;74:21-6.

14. Kim D, Chang H. Key functional characteristics in designing and operating health information websites for user satisfaction: An application of the extended technology acceptance model. Int J Med Inform 2007;76:790-800.

15. Veer AJEd, Francke AL. Attitudes of nursing staff towards electronic patient records: A questionnaire survey. Int J Nurs Stud 2010;47:846-54.

16. Factors related to accept of "e-learning" in nursing students. Educ Strateg J [Research] 2009;2:103-8.

17. Handy J, Whiddett R, Hunte I. A technology acceptance model for inter-organisational electronic medical recoeds systems. Australas J Inf Syst 2001;9:39-50.

18. Davis F, Bagozzi R, Warshaw P. User acceptance of computer technology: A comparison of two theoretical models. Manag Sci 1989;35:982-1003.