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

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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

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.\cite{6} 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.\cite{7}

Haslin mentioned that currently the closest framework model concerning electronic medical record is TAM\textsuperscript{2},\cite{8} that was proposed by Davis in 1989 in two categories of perceived ease-of-use and perceived usefulness.\cite{9} These two categories predict only system acceptance by the user and they were mentioned under the title of TAMI.\cite{10} 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.\cite{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.\cite{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.\cite{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.\cite{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.\cite{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”.\cite{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’](image-url)
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 record systems” it shows that 96.6% of physicians and midwives in New Zealand believe that working with EMR, its learning, and its using is easy, 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%. 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), 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.

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