

# Factors Influencing Doctors' Satisfaction of Electronic Medical Records: A Survey in Malaysian Public Hospitals

<sup>1</sup>Mohd Haslina, <sup>2</sup>Syed-Mohamad Sharifah Mastura, <sup>3</sup>Baharom Fauziah, <sup>4</sup>Muhd. Darus Norida, <sup>5</sup>Hashim Nor Laily

<sup>1,3,4,5</sup>Applied Science Division, College of Arts & Sciences, Universiti Utara Malaysia,  
06010 UUM Sintok, Kedah, Malaysia.

<sup>1</sup>[haslina@uum.edu.my](mailto:haslina@uum.edu.my), <sup>3</sup>[fauziah@uum.edu.my](mailto:fauziah@uum.edu.my), <sup>4</sup>[nor854@uum.edu.my](mailto:nor854@uum.edu.my), <sup>5</sup>[laily@uum.edu.my](mailto:laily@uum.edu.my),  
Phone: 04-9284701, Fax: 6049284753

<sup>2</sup>School of Health Sciences, Health Campus, Universiti Sains Malaysia,  
16150 Kubang Kerian, Kelantan, Malaysia

[sharifah@kck.usm.my](mailto:sharifah@kck.usm.my)  
Phone: 09-7663823

## ABSTRACT

*Implementation of Electronic Medical Record (EMR) in Malaysian Public Hospitals has started since 1999. This study aims to identify perception of doctors in using EMR by focusing on information quality (IQ), usefulness (PU) and ease of use of the system (PEOU). A cross-sectional study was conducted at two public hospitals in Malaysia. Findings show that main issues of IQ that was raised by doctors are format of output, timeliness and sufficiency of information. Reduction of productivity in terms of number of patients consulted in a session seems to be the main issue of PU. In terms of PEOU, the main issue is flexibility to interact with EMR. All these issues were mainly related to poor user interface design of EMR. In order to increase doctors' satisfaction of EMR, it is recommended that new development of EMR should focus on user interface design that is tailored with the doctors' workflow.*

## Keywords

*Information Quality, Electronic Medical Records, Perceived Usefulness, and Perceived Ease of Use.*

## 1.0 INTRODUCTION

Literatures identifies that Information Quality (IQ), Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are among the determinant factors of user satisfaction in using the information system. Lee et al. (2002) stated that IQ is critical in organization especially in the healthcare environment. Institute of Medical USA (IOM) also emphasized the important of IQ in the Electronic Medical Record (EMR) contexts where the information convey by the system must be valid, clear and able to reduce medical error (IOM, 2003).

Bailey and Pearson (1983) characterized IQ by nine factors: (1) Accurate—the correctness of the information; (2) Complete—the comprehensiveness of the information; (3) Current—the age of the information; (4) Understandable—the degree of comprehension that a user possesses about the information; (5) Sufficient—the amount and volume of information conveyed to the user; (6) Relevance—the degree of congruence between what the user wants or requires and what is provided by the information; (7) Security—the safeguarding of data from misappropriation or unauthorized alteration or loss; (8) Timely—the availability of information at a time suitable for its use; and (9) Format of output—the material design of the layout and display of the information.

These characterizations were supported by Segev (1996) Amberg et al. (2003) and Lee et al. (2002). McLeod (1994) and Bevan and Maguire (2002) believed that the IQ might justify users' productivity, data safety, and user satisfaction (US) of the system. The IQ reflects the context of use and provides the data as required by the organization. Therefore, the assessment of the IQ is crucial to justify the user acceptance of the system.

Other determinant factors of user satisfaction are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (Davis, 1989). PU refers to the degree to which a person believes that using a particular system would enhance his or her job. The PU constituted of six variables: (1) Accomplish task more quickly; (2) Improve Job Performance; (3) Increased Productivity; (4) Enhance job effectiveness; (5) Easy to do job; and (6) Useful in job. PEOU is the extent to which a user believes that using the system will be relatively free of effort. PEOU consists of five variables: (1) Easy to Learn; (2) Easy to do; (3) Clear and Understandable; (4) Flexible to interact; and (5) Easy to become skillful.

Therefore, the doctor's satisfaction of using EMR can be measured based on information quality, Perceived Usefulness and Perceived Ease of Use.

Hence, this study aims to identify the issues in using EMR by focusing on the doctors' perceived level of information quality, usefulness, and ease of use of the system.

## 2.0 METHODOLOGY

This study used the cross-sectional survey in an attempt to gain greater understanding of the factors that contribute to the satisfaction of Electronic Medical Record (EMR) in the Malaysian Hospitals. Two hospitals in Malaysia that have implemented the EMR were chosen as the site study to provide reasonable amount of variance and generalization. The functionalities of EMR that covered in the study were: (1) Health Data and Information Management (HDIM), (2) Result Management and Lab Test (RMLT) and (3) Order Entry Management

(OEM). Questionnaire was adapted from Bailey and Pearson (1983).

Target respondents were the doctors who have at least three months experience using the EMR in outpatient clinics. Doctors were chosen as the target of this study because they are the main user group of EMR. The data was analyzed using SPSS version 14.0.

## 3.0 RESULTS

The questionnaires were distributed to 200 doctors from Hospital A and 65 doctors from Hospital B. Respond rate from Hospital A was 65 percent and respond rate from Hospital B was 83 percent.

Table 1 shows the mean values of IQ in the two hospitals. The highest mean value for the three functions in Hospital A was the Format of Output. As for Hospital B, the highest mean values for HDIM and OEM were Sufficient and for RMLT was Timely.

Table 1 Mean Values for Information Quality

Variables	Hospital A			Hospital B		
	HDIM	RMLT	OEM	HDIM	RMLT	OEM
Accuracy	2.85	2.65	2.85	2.83	3.02	2.94
Current	3.17	2.66	3.06	3.38	3.33	3.29
Completeness	3.00	2.75	2.95	3.12	2.98	2.98
Sufficient	3.39	2.93	3.11	<b>3.49</b>	3.01	<b>3.39</b>
Relevant	3.26	2.74	3.07	3.11	2.96	3.27
Security	2.95	2.69	2.96	2.96	2.96	3.00
Understandable	3.27	3.31	2.94	3.17	3.12	3.08
Timely	3.45	3.10	3.08	3.46	<b>3.39</b>	3.04
Format of Output	<b>3.47</b>	<b>3.57</b>	<b>3.18</b>	3.31	3.23	3.26

Measurement scale: 1-Strongly Agree to 7-Strongly Disagree

Table 2 Mean Values for Perceived Usefulness

Variables	Hospital A	Hospital B
Accomplish Task	3.46	3.90
Job Performance	3.29	3.93
Productivity	<b>3.49</b>	<b>4.20</b>
Effectiveness	3.38	3.70
Ease to do job	3.36	3.50
Useful in Job	2.93	3.03

Measurement scale: 1-Strongly Agree to 7-Strongly Disagree

Table 2 shows the mean values for PU. The highest mean value of the PU in both hospitals was Productivity. The productivity of the EMR system was related to the system ability to complete the task in specific timed frame that was stated earlier by the top management that can increase the productivity of the health services. The results from open-ended question show that 66.67% of the respondents in Hospital A complaint about the reduction number of patient to consult, and 65.78%

of the same complaint in Hospital B. Table 3 shows that the highest mean value of the PEOU variables for both hospitals was Flexible to Interact. This factor related to the system's ability to adapt with the user task flow and level of experiences in using the system. The results of open-ended questions show the system characteristics that are related to user interface design which frequently complained by the users.

Table 3 Mean Values for Perceived Ease of Use Variables

Variables	Hospital A	Hospital B
Ease to learn	3.16	3.07
Ease to do as require	3.48	3.53
Clear and understandable	3.37	3.27
Flexible to interact	<b>3.77</b>	<b>3.60</b>
Ease to become skillful	3.22	3.17
Ease to use	3.22	3.13

Measurement scale: 1-Strongly Agree to 7-Strongly Disagree

#### 4.0 DISCUSSION

The results highlighted three main issues pertaining to IQ. The issues were Format of Output, Sufficiency, and Timeliness of information. The timeliness and sufficiency of the information required are highly depended on the data supplied by other users or departments. IQ of the EMR system was very much depended on the information keyed-in by the users. If other users keyed-in correct, complete, sufficient, timely, and understandable information or data then the doctors will be more satisfied when using EMR.

This finding also supported by the six principles highlighted by the Institute of Medicine (Institute of Medicine (IOM), 2001) which encounter timeliness and data safety as part of the principles to provide a guideline to redesign the American healthcare system. Data safety also related to the correctness, completeness, sufficient, and understandable of the data to support doctor decision making related to the information conveyed by the EMR system. The Medicare Quality Improvement Organization (MQIO), one of the IOM agencies, also stressed in the Quality Roadmap, issued in July 2005, the agency committed itself to the vision of achieving "the right care for every person every time" to tailor with aim of timeliness of the healthcare services stated by IOM (MQIO, 2006). The MQIO also

stressed that healthcare providers should be accountable for the validity, accuracy, timeliness of the quality measurement of the data submission that contribute to the accountability for system performance, hence influences the doctor satisfaction of the EMR system. The information quality factors as discussed in this study also stressed by Mohamad-Taha (2002) and Bakar (1995) as a guideline for healthcare information quality assurance for the healthcare organizations in Malaysia. Harrison & McDowell (2007) also found that the healthcare information quality factors, especially related to the timeliness and accuracy able to enhance the clinical processes and improve the quality of healthcare services.

Therefore, the information quality factors in the healthcare application specifically EMR is very important as one of the doctor's satisfaction indicators to deliver good services to the patients and the most importantly is to make good decision making to the patient healthcare conditions and solutions.

Instead of IQ, the doctor's acceptance of the EMR system is also important. The PU and PEOU are the two determinant factors for the doctor's acceptance of the system. This study shows that for PU, the productivity of the health services that are supported by EMR in both hospitals perceived a big

issue. This phenomenon happened because of the hardware performance that affected the system speed and reliability, increase the time to complete each consultation, and consequently reduced the number of patient to consult within the consultation hours in these hospitals. Fleming et al. (2006) also found that the productivity of the healthcare services is very important to justify the quality of the healthcare services in the organization.

The results of PEOU shows Flexible to Interact is the important issue raised by the doctors. This factor is related to the system's ability to adapt with user task flows and level of experiences in using the system. The user task flows must be coherent with the flow of the EMR system (IOM, 2003). Otherwise, the doctors are reluctant to use the system, hence reducing the satisfaction level of using the system (Berg, 2001).

The above discussion shows that the doctor's satisfaction is influenced by the healthcare information quality and PU, and PEOU.

## 5.0 CONCLUSION

As a conclusion, the issues of using EMR in this study are related to format of output, sufficiency, and timeliness of the information generated by the system. The doctors were also concerned with the flexibility to interact with the system that would consequently reduce their productivity when using EMR. The recommendation is to enhance the performance of the external IQ factors related to the correctness, completeness, sufficiency, timeliness, and understandable information of the data keyed-in by the doctor, and redesign user interface that tailored with doctor's task flow able to increase the doctor's satisfaction of the EMR in both hospitals.

## REFERENCES

Amberg, M., Hirschmeier, M., & Schobert, D. (2003). *DART- An Acceptance Model for the Analysis and Design of Innovative Technologies In: 7th Conference on Synergetics, Cybernetics and Informatics (SCI), 2003*, Orlando, Florida.

Bailey, J., E., and Pearson, & S., W. (1983). Development of a Tool for Measuring and Analyzing Computer User Satisfaction, *Management Science*, 23(5), 530-545.

Bakar, A. (1995). Quality Assurance, Keynote Address Delivered At The First Ministry of Health Conference, Kuala Lumpur.

Berg, M. (2001). Implementing information Systems in Health Care Organizations: Myths and Challenges, *International Journal of Medical Informatics*, 64, 143-156.

Bevan, N., & Maguire M. (2002). User Requirements Analysis: A Review of Supporting Methods. Usability: Gaining a Competitive edge. *Proceedings of IFIP 17th World Computer Congress*, Montreal, Canada, 25-30 August 2002. 133-148.

Fleming, N. S., Herrin, J., Robert, W., & Ballard, D. J. (2006). Patient-centeredness and timeliness in a primary care network: baseline analysis and power assessment for detection of the effect of an electronic health record. In Proc of Bayl Univ Med Cent, 19, 314-319.

Harrison, J. P. & McDowell, G. M. (2007). The Role of Laboratory Information Systems in Healthcare Quality Improvement, *International Journal of Health Care Quality Assurance*, 21(7), 679-691.

Institute of Medicine (IOM) (2001). Crossing the Quality Chasm: A New Health System for the 21<sup>st</sup> Century, USA: Institute of Medicine. [Online Book]

Lee, Y. W., Strong, D. M., Kahn, B. K., & Wang, R. Y. (2002b). AIMQ: a methodology for information quality assessment. *Information & Management*, 40, 133-146.

McLeod, M. (1994). Usability in Context: Improving Quality of Use. In Bradley, G., and Hendricks (Eds.) *Human Factors in Organizational Design and Management, Proceeding of the International Ergonomics Association and International Symposium on Human Factors in Organizational Design and Management*, Stockholm, May 29-June, 1, 1994. Amsterdam, Elsevier: North Holland.

Medicare Quality Improvement Organization (MQIO) (2006). Report to IOM, Improving the Medicare Quality Improvement Organization Program – Response to the Institute of Medicine Study. USA: Institute of Medicine.

Medicare Quality Improvement Organization (MQIO) (2005). Report to IOM, Quality Roadmap. USA: Institute of Medicine.

Mohamad-Taha, A., (2002). The Malaysian Health System of the Future in the Context of Globalization. *Jurnal Kesihatan Masyarakat Isu Khas*.

Segev, A. (1996). "On Information Quality and the WWW Impact: A Position Paper," In *Proceedings of the Conference on Information Quality (IQ'96)*, Massachusetts Institute of Technology, Sloan School of Management, Cambridge, MA, October 25-26, 1996.