RANKING THE MICRO LEVEL CRITICAL FACTORS OF ELECTRONIC MEDICAL RECORDS ADOPTION USING TOPSIS METHOD

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ABSTRACT

In many countries, the health care sector is entering into a time of unprecedented change. Electronic Medical Record (EMR) has been introduced into healthcare organizations in order to incorporate better use of technology, to aid decision making, and to facilitate the search for medical solution. This needs those professionals in healthcare organizations to be in the process of changing from the use of paper to maintain medical records into computerized medical recordkeeping opportunities. However, the adoption of these electronic medical records systems has been slow throughout the healthcare field. The critical users are physicians which play an important role to success of health information technology including Electronic Medical Record systems. As a result user adoption is necessary in order to understand the benefits of an EMR. Therefore, in the current paper, a model of ranking factors of micro-level in EMRs adoption was developed. Surveys distributed to physicians as this study's respondent in two private hospitals in Malaysia. The findings indicate that physicians have a high perception means for the technology and showed that EMR would increase physician's performance regarding to decision making. They have been and continue to be positively motivated to adopt and use the system. The relevant factors according to micro-level perspective prioritized and ranked by using the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). The aim of ranking and using this approach is to investigate which factors are more important in EMRs adoption from the micro-level perspectives. The results of performing TOPSIS is as a novelty which assist health information systems (HIS) success and also healthcare organizations to motivate their users in accepting of new technology.

KEYWORDS

EMRs, Adoption, TOPSIS, Micro-Level Adoption Factors

1. INTRODUCTION

The health care industry's growing adoption of Electronic Medical Records (EMR) is becoming a new perspective on the role of healthcare professionals. Information technology has been proved to be as an imperative element in the administration of healthcare [34]. In particular, some private hospitals in Malaysia are adopting information systems that offer more accurate and timely information concerning patient care [5]. By utilizing information technology hospitals are capable to retain documentation of their daily transactions such as in data storage, retrieving and communication. Currently, the midst of a landmark shift in record keeping, with driving for electronic medical records well in progress [6]. An EMR system was introduced as a way to make possible a centralized patient information repository. For many purposes EMR is utilized

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including administration, patient care, quality improvement, research, and reimbursement [35]. These applications need knowledge of the underlying quality of the data within the EMR so as to avoid misinterpretation [35]. EMRs would remedy the intrinsic flaws of the conventional paper system through improvements in accessibility, efficiency, quality of data capture and cost saving. As a result, an EMR system should be able to appropriately capturing, processing and storing information and also should be compatible with other related systems [6]. It affects the quality outputs in health care provider which users by using the patient information can be able to make decisions. By increasing the accuracy of patient information, it is possible to less likely that they face large differences in errors and consequently decreases the marginal revenue from quality growing [6].

In relation with EMR, the concept of clinical system places reduction of medical error into the wider context of quality of care and safety by giving a framework to evaluate and assess the structure, process and outcomes of care. The purpose of this paper is to describe the factors that have more priority in affecting EMR to adopt in private hospitals in Malaysia. The critical elements of this paper include HIS quality, use and net benefits with their sub-factors.

The remainder of this paper is structured as follows. Section 1 describes the EMR and gives an overview of this research. The section 2 introduces the proposed research model. In Section 3, we explain the research methodology step by step. Section 4 and 5 are allocated to the background mathematical of The Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) and data collection, respectively. Finally, we present the results of TOPSIS and conclusions in sections 6 and 7, respectively.

2. PROPOSED RESEARCH MODEL

The physician adoption model provides a conceptual model to identify the factors that have more influence on health information systems (HIS) success. It extends Info way Benefits Evaluation (BE) Framework [18] (adapted from the DeLone and McLean information system success model [9] which Thereafter, [12] in his study review developed Clinical Adoption (CA) framework based on three dimensions. The framework comprised of micro, meso and macro-level dimensions. Each dimension has its own factors and sub-factors which could affect physicians in EMR adoption. In this study it has been focused on micro-level factors. Physician adoption model at the micro-level explains HIS success related to HIS quality, use and net benefits. HIS quality divided in information, system and service quality respectively; use covers HIS usage and satisfaction; net benefits covers care quality, access, and productivity. The physician adoption model was developed with a range of HIS in mind, including EMRs. In this review, we examined EMR and its success in health centre thru the lens of the physician adoption model. EMR adoption has been described and influence on physician practice, according to evaluation measures utilized in the studies. In regarding of Factors that have been caused to this impact, it has been described as the reasons cited that could explain the adoption and effect. Hence, in this study we have concentrated on Micro level factors that affects on EMR adoption. At the end the proposed model has been developed and shown in Figure 1.

It has been required for system quality to sustain high quality health service delivery that meets the request of the people. System quality affects the quality of care by capturing, transferring, storing, managing and displaying medical information. In growing the quality of these processes, the system should give higher quality (12).

System quality factors included the availability of templates [2], interface design [6, 12], Newby [36] and technical performance (e.g. speed and reliability) [24, 35].

Information quality plays a critical role in hospital. The organization, accuracy, completeness and accessibility of the patient record are the sub factors of information quality [1, 6, 11, 12, 13, 24, 27].

Service quality is a comparison of expectations with performance. Health care provider with high service quality will meet patient needs whilst remaining economically competitive. Improved quality may increase economic competitiveness. If patients who have not been satisfied with preferred hospitals can deliver quality services, they would look for the services elsewhere. Thus it is imperative to inquire patients in a straight line about the perceived quality of services provided by the country's hospitals [31]. Service quality factors included training and technical support [32, 38] system backup and unexpected downtime [31].

Electronic medical records usage can differ depending on how they utilize it and who the user is. Electronic medical records would assist to advance the quality of medical care given to patients. Removing the traditional paper records are denied by Many doctors and office-based physicians [22]. Factors in EMR usage covers its intent (e.g. quality improvement versus record keeping) [21], actual strategies for optimal use, ease of use [11, 29] and usage patterns that appeared gradually [17]. The relevant factors of interaction included patient-physician encounters like patients' ability to schedule appointments [10], the kind of consult (e.g. psychological) [3, 22, 23], and consult room layout [22].

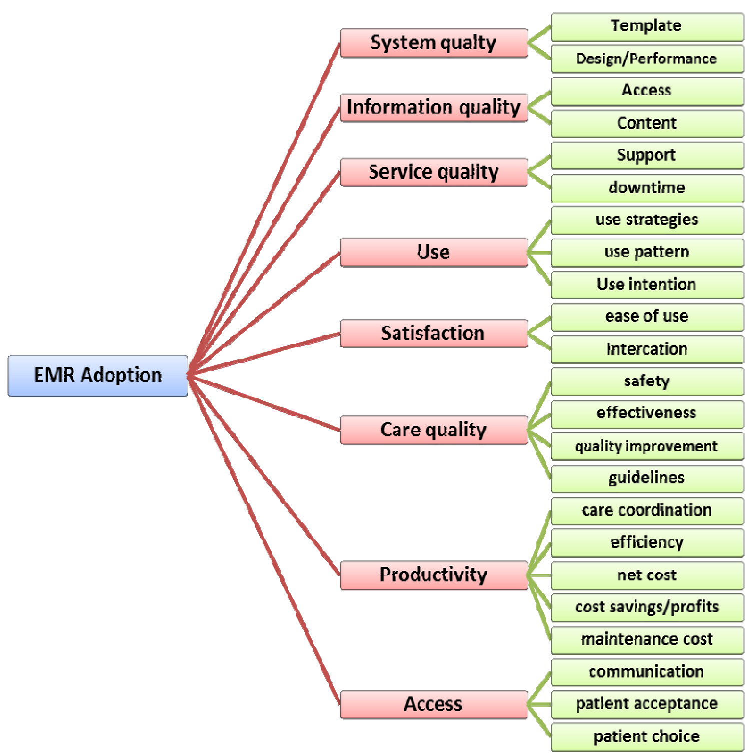

Figure 1. TOPSIS Framework of Physician Adoption Model in Micro-Level

Net benefits, care quality factors covered patient safety [14], care effectiveness [17], quality improvement [27] and guideline compliance [8, 36]. Productivity factors covered care efficiency [14, 33], coordination [35], and net cost including billing, staffing and maintenance costs [2, 27, 24, 31].

Micro-level factors that found in previous research which has an effect on EMR adoption and effect were shown (See Table 1).

Table 1.Micro -level factors that influenced EMR success

HIS quality	HIS quality sub-factors	References
System quality	Template	[2, 22]
	Design/performance	[6, 12, 21, 24, 28, , 30, 35, 37]
Information quality	Access	[6]
	Content	[1, 6, 11, 12, 13, 24, 27, 28, 33, 35, 37]
Service quality	Support	[32, 38, 39]
	Downtime	[31, 38]
HIS Use	HIS quality Sub-factors	References
Use	Use strategies	[3]
	Use pattern	[17]
	Use intention	[21]
Satisfaction	Ease of use	[11, 29]
	Interaction	[3, 6, 22, 23]
Net benefits	Net benefits Sub-factors	References
Care quality	Safety	[14]
	Effectiveness	[17]
	Quality improvement	[27]
	Guidelines	[8, 27, 36]
Productivity	Care coordination	[2, 35]
	Efficiency	[16, 4, 14, 33]
	Net cost	[2, 27]
	Cost Savings/Profits	[27]
	Maintenance cost	[31]
Access	Communication	[6]
	Patient acceptance	[4]
	Patient choice	[10]

3. RESEARCH METHODOLOGY

Researcher covered the topic of Electronic Medical Record adoptions shown that EMR are being accepted by private hospital of Malaysia. A quantitative, survey-based research study was performed and was analysed to explaining the factors that have an effect on EMR adoption. The two hospitals have been chosen to conduct this research. Survey distributed to 150 physicians who had experience using EMRs. 90 physicians fulfilled the questionnaire in this study and the rest did not complete the survey study because of their time constrain. The survey contains number of questions that were design to capture information about the constructs in the research model. The questions that measured were HIS quality, HIS use and net benefits besides their sub-factors. TOPSIS was use to obtain the ranking of these factors. Figure 2 contains a description of each step in this study.

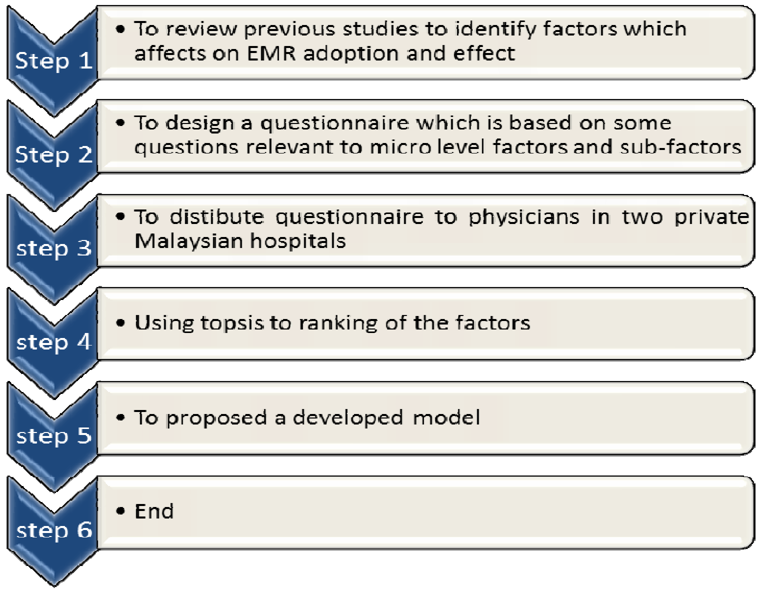

Figure 2. Research methodology

4. MATHEMATICAL BACKGROUND OF TOPSIS

TOPSIS is one of the famous classical Multi-Criteria Decision Making (MCDM) method, which was initiated for the first time by Hwang and Yoon [40] that shall be used with both normal numbers and fuzzy numbers [41, 42]. Furthermore, TOPSIS is more applicable in that limited subjective input is required from decision makers. The only subjective input required is weights. The TOPSIS procedure is shown in Figure 3 in five main steps.

Step 1: Construct normalized decision matrix

$$r_{ij} = x_{ij} / \sqrt{(x^2_{ij})} \quad \text{for} \quad i = 1, \ldots, m; \; j = 1, \ldots, n \quad (1)$$

where x_{ij} and r_{ij} are original and normalized score of decision matrix , respectively

Step 2: Construct the weighted normalized decision matrix

$$v_{ij} = w_j \, r_{ij} \qquad (2)$$

where w_j is the weight for j criterion

Step 3: Determine the positive ideal and negative ideal solutions.

$$A^* = \{ v_1^*, \ldots, v_n^* \}, \quad (3) \quad \text{Positive ideal solution}$$

where $v_j^* = \{ \max (v_{ij}) \text{ if } j \in J ; \; \min (v_{ij}) \text{ if } j \in J' \}$

$$A' = \{ v_1', \ldots, v_n' \}, \quad (4) \quad \text{Negative ideal solution}$$

where $v' = \{ \min (v_{ij}) \text{ if } j \in J ; \; \max (v_{ij}) \text{ if } j \in J' \}$

Step 4: Calculate the separation measures for each alternative.

The separation from positive ideal alternative is:

$S_i^* = [\; (v_j^* - v_{ij})^2]^{½} \; i = 1, \ldots, m(5)$

Similarly, the separation from the negative ideal alternative is:

$S'_i = [\; (v_j' - v_{ij})^2]^{½} \quad i = 1, \ldots, m \; (6)$

Step 5: Calculate the relative closeness to the ideal solution C_i^*

$$C_i^* = S'_i / (S_i^* + S'_i) \; , \quad (7) \quad 0 \quad Ci^* \quad 1$$

Select the Alternative with C_i^* closest to 1.

Figure 3. Procedure of TOPSIS method

Using entropy method, objective weights were calculated. The following equation calculates entropy measure of every index.

$$E_j = -K \sum_{i=1}^{m} \left[n_{ij} Ln(n_{ij}) \right] \Rightarrow \begin{Bmatrix} \forall\ j = 1,2,...n \\ K = \dfrac{1}{Ln(m)} \end{Bmatrix} \tag{1}$$

The degree of divergence d_j of the intrinsic information of each criterion C (j= 1, 2, …, n) may be calculated as

$$d_j = 1 - E_j \tag{2}$$

The value d_j represents the inherent contrast intensity of c_j. The higher the d_j is, the more important the criterion c_j is for the problem. The objective weight for each criterion can be obtained. Accordingly, the normalized weights of indexes may be calculated as

$$W_j = \frac{d_j}{\sum_{k=1}^{n} d_k} \tag{3}$$

5. DATA COLLECTION

The primary data in this study were collected through questionnaire that distributed to the physicians through web based questionnaire who have some experiences in using EMR. For this study, a number of respondents, were approximately 150 (n=150) physicians. Sixty percent (60%) of the respondents provided answers to all the questions in the instrument.

The first section comprise of information on respondent demographic profile, eightsections on the independent variable namely, system quality, information quality, service quality, use, satisfaction, care quality, productivity and access. Five options (index) ranked by 1-5 (1= very low important 2=low important 3=moderately important 4= high important 5= very high important) were used for the raised questions.

Table 2. The respondents' demographic profile

Aspects	Category	Respondents (n)	Respondents (%)
Gender	Male	75	75%
	Female	25	25%
Age	26-33	20	13.4%
	34-50	45	30%
	51-65	85	56.6%
Years of electronic medical records experience	1-5	54	56.8%
	6-10	15	15.8%
	Over 10	3	3.2%
Medical specialization	Generalist	68	67%
	Specialist	34	33%

Table 2 provides the respondents' demographic profile. About seventy five percent of physicians were male and twenty five percent were female, generalist and specialist physicians in with one to five years of experience with Electronic Medical Records technology.

6. RESULTS OF TOPSIS

In this section, we provide the results of TOPSIS for ranking the factors presented in the TOPSIS Framework of physician adoption model in micro-level. According to the Figure 1, the aim of applying TOPSIS is to rank the 23 factors to show the importance of these factors in EMRs adoption in micro-level.

In addition, based on five steps of TOPSIS shown in Figure 3 and formulas presented in equations 1, 2 and 3, we calculated the weights of five indices as following:

$$E_1 = -k\sum_{i=1}^{m}(n_{ij}\ln(n_{ij})) = -3.26 \qquad E_2 = -k\sum_{i=1}^{m}(n_{ij}\ln(n_{ij})) = -4.13 \qquad E_3 = -k\sum_{i=1}^{m}(n_{ij}\ln(n_{ij})) = -2.68$$

$$E_4 = -k\sum_{i=1}^{m}(n_{ij}\ln(n_{ij})) = -2.29 \qquad E5 = -k\sum_{i=1}^{m}(n_{ij}\ln(n_{ij})) = -3.25$$

Thus, using Entropy method, the weights are obtained as:

$w_1 = \boldsymbol{0.236}$

$w_2 = \boldsymbol{0.220}$

$w_1 = \boldsymbol{0.178}$

$w_4 = \boldsymbol{0.168}$

$w_5 = \boldsymbol{0.196}$

where

$$\sum w_i = 1 \Rightarrow w_1 + w_2 + w_3 + w_4 + w_5 = 1$$

$$
W = \begin{bmatrix} \mathbf{0.238} & 0 & 0 & 0 & 0 \\ 0 & \mathbf{0.222} & 0 & 0 & 0 \\ 0 & 0 & \mathbf{0.178} & 0 & 0 \\ 0 & 0 & 0 & \mathbf{0.169} & 0 \\ 0 & 0 & 0 & 0 & \mathbf{0.196} \end{bmatrix} \Rightarrow \quad V = N_d \times W_{n \times n} \begin{bmatrix} 0.071 & 0.200 & 0.057 & 0.114 & 0.014 \\ 0.000 & 0.089 & 0.057 & 0.204 & 0.055 \\ 0.071 & 0.089 & 0.057 & 0.013 & 0.221 \\ 0.071 & 0.089 & 0.057 & 0.050 & 0.123 \\ 0.071 & 0.089 & 0.057 & 0.114 & 0.055 \\ 0.000 & 0.089 & 0.229 & 0.050 & 0.055 \\ 0.000 & 0.355 & 0.057 & 0.000 & 0.221 \\ 0.071 & 0.089 & 0.057 & 0.114 & 0.055 \\ 0.000 & 0.022 & 0.229 & 0.204 & 0.014 \\ 0.000 & 0.022 & 0.057 & 0.320 & 0.055 \\ 0.071 & 0.022 & 0.229 & 0.013 & 0.123 \\ 0.000 & 0.022 & 0.014 & 0.204 & 0.221 \\ 0.000 & 0.089 & 0.057 & 0.050 & 0.221 \\ 0.000 & 0.089 & 0.057 & 0.050 & 0.221 \\ 0.071 & 0.022 & 0.014 & 0.114 & 0.221 \\ 0.071 & 0.089 & 0.057 & 0.114 & 0.055 \\ 0.071 & 0.089 & 0.057 & 0.050 & 0.123 \\ 0.071 & 0.089 & 0.057 & 0.114 & 0.055 \\ 0.000 & 0.089 & 0.229 & 0.050 & 0.055 \\ 0.071 & 0.022 & 0.229 & 0.013 & 0.123 \\ 0.000 & 0.022 & 0.014 & 0.204 & 0.221 \\ 0.000 & 0.089 & 0.229 & 0.050 & 0.055 \\ 0.000 & 0.355 & 0.057 & 0.000 & 0.221 \end{bmatrix}
$$

and where N_d denotes the normalized ratings of responses' participants and V denotes the non-scaled weight matrix.

According to the third step of TOPSIS shown in Figure 1, we calculated the positive and negative ideals as following:

Positive Ideal =A+ = $\{(\max V_{ij}), (\max V_{ij}), i=1,2,..,m\} = \{V_1+, V_2+, \ldots V_n+\}$	(4)

Table 3. Positive ideal

Max V_{i1}	**Max V_{i2}**	**Max V_{i3}**	**Max V_{i4}**	**Max V_{i5}**
0.071	0.355	0.229	0.204	0.221

Negative Ideal =A- = $\{(\min x V_{ij}), (\min V_{ij}), i=1,2,..,m\} = \{V_1-, V_2-, \ldots V_n-\}$ (5)

Table 4.Negative ideal

Min V_{i1}	**Min V_{i2}**	**Min V_{i3}**	**Min V_{i4}**	**Min V_{i5}**
0	0.022	0.014	0	0.014

As shown in the Table 3 and Table 4, we selected the maximum and the minimum of each column of matrix V as positive and negative ideals. Thus, A+ and A- denote all the maximum and minimum numbers of each column of matrix V.

For step 4 of TOPSIS procedure, we calculate the distance i from positive ideal as following:

$$\text{Distance i from positive Ideal} = \{\sum_{j=1} (v_{ij^-} - v_{j^+})^2\}^{1/2}$$

Table 5 presents the distance i from positive ideal for 23 factors. In this table, the square of difference between distance between max point and each point ideal are provided.

Table 5. Distance i from positive ideal

$(v_{ij^-} v_{j+})^2$	$(v_{ij^-} v_{j+})^2$	$(v_{ij^-} v_{j+})^2$	$(v_{ij^-} v_{j+})^2$	$(v_{ij^-} v_{j+})^2$
0.00000	0.02413	0.02965	0.00802	0.04299
0.00504	0.07089	0.02965	0.00000	0.02768
0.00000	0.07089	0.02965	0.03630	0.00000
0.00000	0.07089	0.02965	0.02357	0.00962
0.00000	0.07089	0.02965	0.00802	0.02768
0.00504	0.07089	0.00000	0.02357	0.02768
0.00504	0.00000	0.02965	0.04162	0.00000
0.00000	0.07089	0.02965	0.00802	0.02768
0.00504	0.11077	0.00000	0.00000	0.04299
0.00504	0.11077	0.02965	0.01339	0.02768
0.00000	0.11077	0.00000	0.03630	0.00962
0.00504	0.11077	0.04614	0.00000	0.00000
0.00504	0.07089	0.02965	0.02357	0.00000
0.00504	0.07089	0.02965	0.02357	0.00000
0.00000	0.11077	0.04614	0.00802	0.00000
0.00000	0.07089	0.02965	0.00802	0.02768
0.00000	0.07089	0.02965	0.02357	0.00962
0.00000	0.07089	0.02965	0.00802	0.02768
0.00504	0.07089	0.00000	0.02357	0.02768
0.00000	0.11077	0.00000	0.03630	0.00962
0.00504	0.11077	0.04614	0.00000	0.00000
0.00504	0.07089	0.00000	0.02357	0.02768
0.00000	0.00000	0.02965	0.04162	0.00000

Similar to distance i from positive ideal, we calculate the distance i from negative ideal as following:

$$\text{Distance i from negative Ideal} = \{\sum_{j=1}(v_{ij^-} - v_{j-})^2\}^{1/2}$$

Table 6 presents the distance i from negative ideal for 23 factors. In this table, the square of difference between distance between min point and each point are provided.

Table 6. Distance i from negative ideal

$(v_{ij^-} v_{j+})^2$	$(v_{ij^-} v_{j+})^2$	$(v_{ij^-} v_{j+})^2$	$(v_{ij^-} v_{j+})^2$	$(v_{ij^-} v_{j+})^2$
0.0051	0.0316	0.0018	0.0131	0.0000
0.0000	0.0045	0.0018	0.0415	0.0017
0.0051	0.0045	0.0018	0.0002	0.0426
0.0051	0.0045	0.0018	0.0025	0.0119
0.0051	0.0045	0.0018	0.0131	0.0017
0.0000	0.0045	0.0462	0.0025	0.0017
0.0000	0.1109	0.0018	0.0000	0.0426
0.0051	0.0045	0.0018	0.0131	0.0017
0.0000	0.0000	0.0462	0.0415	0.0000
0.0000	0.0000	0.0018	0.1022	0.0017
0.0051	0.0000	0.0462	0.0002	0.0119
0.0000	0.0000	0.0000	0.0415	0.0426
0.0000	0.0045	0.0018	0.0025	0.0426
0.0000	0.0045	0.0018	0.0025	0.0426
0.0051	0.0000	0.0000	0.0131	0.0426
0.0051	0.0045	0.0018	0.0131	0.0017
0.0051	0.0045	0.0018	0.0025	0.0119
0.0051	0.0045	0.0018	0.0131	0.0017
0.0000	0.0045	0.0462	0.0025	0.0017
0.0051	0.0000	0.0462	0.0002	0.0119
0.0000	0.0000	0.0000	0.0415	0.0426
0.0000	0.0045	0.0462	0.0025	0.0017
0.0000	0.1109	0.0018	0.0000	0.0426

In the next step of TOPSIS, we calculate the sum of id+ and id- as presented in Table 7.

Table 7. Sum of positive ideal and negative ideal

Sum $(v_{ij}-v_{j+})^2$	d i+	SQRT	Sum Of $(v_{ij}-v_{j-})^2$	d i-	SQRT	Sum of d i+ and d i-
0.10479	d 1+	0.32371	0.0516	d 1-	0.2272	0.15952
0.13326	d 2+	0.36505	0.0494	d 2-	0.2223	0.16234
0.13685	d 3+	0.36993	0.0542	d 3-	0.2329	0.18208
0.13372	d 4+	0.36568	0.0258	d 4-	0.1606	0.23171
0.13624	d 5+	0.36911	0.0261	d 5-	0.1617	0.16234
0.12718	d 6+	0.35662	0.0549	d 6-	0.2343	0.2465
0.07631	d 7+	0.27624	0.1554	d 7-	0.3941	0.29222
0.13624	d 8+	0.36911	0.0261	d 8-	0.1617	0.22009
0.15880	d 9+	0.39849	0.0877	d 9-	0.2961	0.24604
0.18652	d 10+	0.43188	0.1057	d 10-	0.3251	0.18065
0.15669	d 11+	0.39584	0.0634	d 11-	0.2518	0.18065
0.16194	d 12+	0.40242	0.0841	d 12-	0.2900	0.22573
0.12915	d 13+	0.35937	0.0515	d 13-	0.2269	0.16234
0.12915	d 14+	0.35937	0.0515	d 14-	0.2269	0.15952
0.16493	d 15+	0.40611	0.0608	d 15-	0.2467	0.16234
0.13624	d 16+	0.36911	0.0261	d 16-	0.1617	0.18208
0.13372	d 17+	0.36568	0.0258	d 17-	0.1606	0.22009
0.13624	d 18+	0.36911	0.0261	d 18-	0.1617	0.24604
0.12718	d 19+	0.35662	0.0549	d 19-	0.2343	0.18208
0.15669	d 20+	0.39584	0.0634	d 20-	0.2518	0.22667
0.16194	d 21+	0.40242	0.0841	d 21-	0.2900	0.15952
0.12718	d 22+	0.35662	0.0549	d 22-	0.2343	0.16234
0.07127	d 23+	0.26696	0.1554	d 23-	0.3941	0.18208

From the Table 7, di+ and di- stand for distance i from positive ideal and di- that stands for distance i from negative ideal, respectively. In the last step we rank 23 factors by calculating the distance between A_i and ideal solution as following:

$$cli = \frac{d_1^-}{d_1^- + d_1^+} 0 \le cli \le 1 \qquad i = 1,2,...m \tag{6}$$

Finally, in Table 8, we present the ranking of factors in the micro-level of ERMs adoption. The ranking in this table demonstrates that based on physicians' perception, ten important factors in micro level of electronic medical records adoption are patient choice, use strategies, ease of use, use intention, safety, communication, template, downtime and cost savings/profits. In addition, according to the ranking presented in Table 8, the patient choice is ranked with a high priority and this confirms the result of work developed by Dennison et al., 2006. They showed that enhanced patient choice of appointment date and time significantly enhances the electronic surgical referral system can improve efficiency. Thus, it is important for adopter of EMRs that patient choice can play important role in their goals, mission and vision.

Table 8. Final ranking of factors in the micro-level of ERMs adoption

Sub-Factor	$\frac{d_i^-}{d_i^- + d_i^+}$	Sorted	Priority
Patient choice	0.412409	0.596163737	1
Use strategies	0.37848	0.587910613	2
Ease of use	0.386344	0.429469735	3
Use intention	0.305161	0.426294649	4
Safety	0.304629	0.418820947	5
Communication	0.3965	0.418820947	6
Template	0.587911	0.41240856	7
Downtime	0.304629	0.396500372	8
Cost Savings/Profits	0.426295	0.396500372	9
Patient acceptance	0.42947	0.396500372	10
Interaction	0.388796	0.388796245	11
Maintenance cost	0.418821	0.388796245	12
Effectiveness	0.387023	0.387023044	13
Quality improvement	0.387023	0.387023044	14
Access	0.377905	0.386344409	15
Design/performance	0.304629	0.378479612	16
Guidelines	0.305161	0.37790475	17
Content	0.304629	0.305160751	18
Efficiency	0.3965	0.305160751	19
Support	0.388796	0.304628775	20
Use pattern	0.418821	0.304628775	21
Care coordination	0.3965	0.304628775	22
Net cost	0.596164	0.304628775	23

7. CONCLUSION

The current study was done to develop the body of research related to technology adoption inside a professional environment in context of hospitals in private sector which could be applied in regard to public sector. This study has focused on micro-level factors which influence on EMR adoption and effect which is based on [12]. The limitation of the study confined the physicians who have not yet adopted the EMR or stop using this technology. The findings of the present study were used to address the adoption and effect of electronic medical records technology within the physician community in private hospitals in Malaysian. Physicians had very high perception means for the technology and showed that EMR would increase physician's performance. They have been and continue to be positively motivated to adopt and use the system. The TOPSIS Framework of Physician Adoption Model in Micro-Level, factors, finding discussed in this research give the essential components to make sense of EMR in the private hospitals.

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