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Hospital information systems success: A study based on the model adjusted DeLone and McLean in UMSU hospitals

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ABSTRACT

In information systems, quality dimensions play an important role in determining their success. DeLone - McLean model, a thorough understanding of the information system provided successful and widely used as a comprehensive model for assessing information systems has been accepted. The aim of this study was assessment of HIS success in hospitals of Urmia university of medical sciences is based on the model Adjusted DeLone - McLean. This is a descriptive - cross sectional study which was inducted in 2014.The study population consists of 180 HIS users from Teaching Hospitals Affiliated to Urmia University of Medical Sciences. Data were collected using a self-structured questionnaire which was estimated as both reliable and valid. The data were analyzed by SPSS software descriptive statistics and analytical statistics (t-test and chi-square). HIS highest success rate based on three criteria related to the quality of system (3.11) and the lowest information quality (2.78) is. The tests result showed that none of the three criteria (system quality, information quality and service quality) were not satisfactory success rate HIS (P < 0.05). According to the survey results, it seems necessary to improve the system quality: user friendly, speed data entry, integration and exchange of information, usability and flexibility HIS pointed out. Improve the comprehensiveness, accuracy, and appropriateness to date reports could lead to increased information quality of HIS. Using hardware and advanced equipment, such as portable computers, smart sensors, useful applications optimized to reduce medical errors and support services, which will allow users to have complete satisfaction from the service quality of HIS.

Keywords: Hospital information systems, success, model Adjusted DeLone - McLean, system quality, information quality, service quality

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INTRODUCTION

Given the importance of information on the health system, the significant role of information systems is clearly evident [1]. In the current changing, competitive, and dynamic environment, hospitals seek to increase their efficiency and effectiveness [2]. To achieve this objective, information systems have dramatically been attended [3]. World Health Organization considers the goal of hospital information systems as to develop computerized information services so that they will result in effective information retrieval for patient care, statistics, research and training [4]. Since large investments are done for the development of such systems, evaluation of the success of

hospital information systems in order to understand their value and efficiency are quintessential [5-7]. Given the multiplicity of successful information systems (quantitative measures such as profitability or qualitative criteria such as effectiveness and improvement in decision making) and the existence of different stakeholders (managers, users and system designers) that each stakeholder has his own criteria for success, a comprehensive model covering all aspects of success has not so far been provided about the evaluation of information systems [8-10]. Aiming integrating research related to evaluation of information systems, Delon and MacLean tried to present a comprehensive model through the combination and organization of previous research on the issue [9]. In information systems, quality aspects play an important role in determining the success of information systems [11]. MacLean et.al model provides a comprehensive understanding on the success of an information system and has widely been accepted as a comprehensive model for assessing information systems [12]. The final form of this model is as follows in which system quality, information quality, service quality, use, user satisfaction and net benefits are included. In this model, the quality of the system evaluate the data-processing system and measures such as user-friendly, responsibility time, system reliability, completeness, system flexibility, and usability are offered. The quality of information evaluates the output of the information system and also criteria such as adequacy, granularity, currency and timeliness of data, validity and reliability, association with decision are measured. Service quality evaluates the match between service levels provided and customer expectations and criteria such as acceptance and frequency of system use, improvement in business processes and support services and maintenance are measured [10-13]. The aim of this study was assessment of HIS success in hospitals of Urmia university of medical sciences is based on the model Adjusted DeLone - McLean.

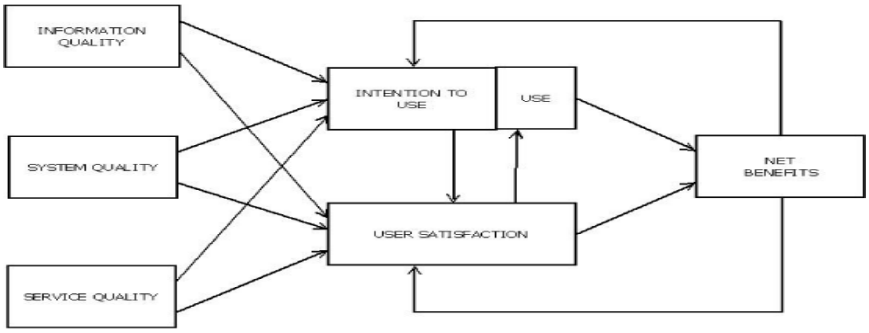

Figure 1: Updated IS Success Model of (DeLone and McLean, 2003)

MATERIALS AND METHODS

This is a descriptive-analysis study conducted cross-sectional in 2014.The studied population consisted of all HIS users in the Teaching Hospitals of Urmia University of Medical Sciences that among from them, by the method of multi-stage cluster sampling, 180 individuals in various job rankings (medicine, nursing, paramedical, health information management, pharmacy and accounting staffs) were selected. Data were collected through a self-structured questionnaire and through visiting centers. The first part of the questionnaire is dedicated to the respondents' demographic information including sex, age, educational level, occupation, work experience and level of computer skills and using it. Its second part includes the assessment of hospital information systems success that using available literature and conducted researches, it is in 3 main criteria: system quality (7 questions), information quality (7 questions) and service quality (7 questions). The HIS success was considered through Likert standard and in 5 choice types (very low = 1, low = 2, medium = 3, high = 4 and very much = 5) that given the response to the samples, by calculating the mean obtained total score (1 to 5), HIS success is determined. The validity of the questionnaire was determined based on concepts in the valid scientific texts and comments of experts (including health information management professionals, medical informatics and health services management).The reliability of the questionnaire was also assessed through calculating the internal consistency. In so doing, the designed questionnaire was given to15 cases of the research population and after collecting data, the value of Cronbach's alpha was estimated as 0.82.It was analyzed using SPSS software.

RESULTS AND DISCUSSION

Out of 180 distributed questionnaires, 150 ones (83.3%) were collected. 57.8% of respondents were female and their mean age and work experience were 34.3 and 9.4 years, respectively and most respondents' educational degree

(61.3%) was bachelor. The mean computer skill was 3.55 and its using rate at home and workplace were 3.83 and 2.94, respectively.

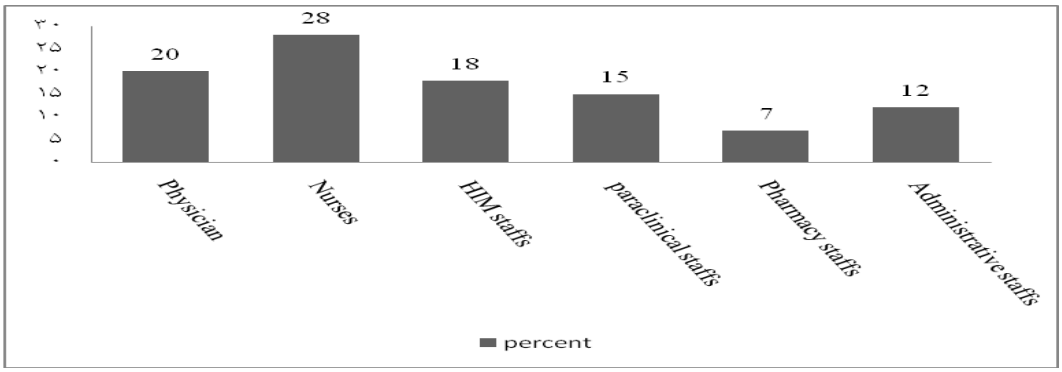

Diagram 1: Distribution of respondents according to job rankings

Based on the above diagram, in terms of job ranking, the maximum rate was related to nurses (28%) and physicians (20 %) and the minimum rate was related to pharmacy staffs (7%).

Table 1: Cases for rate of HIS success based 3 main Criteria quality (range of changes 1-5)

Four-fold stage	Related cases	Mean	SD
System quality	Adaptability to upcoming needs of users	3.43	0.79
	Meeting of security and privacy requirement	3.87	0.74
	System reliability and Free from error	3.33	0.88
	Integrity and interchange of information	2.84	0.77
	Usability and user-friendly of system	3.23	0.73
	Flexibility and customization	2.98	0.81
	Speed and response time	3.28	0.69
Information quality	Currency and up to dating	3.12	0.77
	Ease of understanding and clearness	3.18	0.73
	Completeness and Accuracy	2.83	0.68
	Relevance and appropriate to workflow	2.91	0.59
	Validity and reliability of information	3.27	0.71
	Ease of reporting	2.35	0.62
	Timely accessibility	3.03	0.69
Services quality	Hardware and software proportion	3.13	0.68
	Improvement of workflow	2.88	0.63
	Information backup	3.23	0.79
	Reduce of errors through reminders and alerts	2.12	0.66
	System manual	3.47	0.75
	Support and maintenance	3.28	0.77
	Increase satisfaction and quality of healthcare	2.61	0.81

According to the table above, at the criteria of system quality, the highest and lowest rate of successfully are related to Meeting of security and privacy requirement (3.87) and Flexibility and customization (2.84), respectively; whereas at the criteria of information quality, the highest rate is related to Validity and reliability of information (3.27) and lowest rate is related to Ease of reporting (2.35). At the criteria of service quality, the highest and lowest rate of successfully are related to Information backup (3.23) and Reduce of errors through reminders and alerts (2.12), respectively.

Table 2: The rate of HIS success based 3 main Criteria quality and determining the acceptable level

Stages	Mean	SD	P-value
System quality	3.28	0.77	0.001
Information quality	2.89	0.68	0.003
Services quality	2.96	0.73	0.005

According to the above table, in 3 main Criteria quality, the highest level of rate of HIS success related to System quality (3.28) and lowest level related to Information quality (2.89). In order to determine whether the level of rate

of HIS success based in each of the three main Criteria quality is acceptable or not, one-way one-sample Test was used. If at least 75% (score of 3.75 out of 5) is obtained in each item, the status will be considered appropriate and if a less grade is obtained, it will be considered as an inappropriate status. Given that P=0.00, this assumption (H: $\mu>3.75$) was rejected at the error level of $\alpha=0.05$ i.e. in none of the three main Criteria quality (System quality, Information quality and Services quality), rate of HIS success was satisfactory. In analyzing the relationship between background variables and rate of HIS success, no significant correlation was observed (P>0.05).

In their study entitled "The quality of information and perspective of the users of hospital information systems in teaching hospitals in Mashhad", Kimiyafar et al, stated that 53.2% of the users were to some extent satisfied with the quality of information, and hospital information systems [14]. Results of the study indicated that information quality was not desirable. In a study, Sadoughi and colleagues showed that HIS has not yet met the users' satisfaction in providing high quality services [15] which is consistent with the results of the present this study. in 2010, in an article entitled "evaluating and comparing the software of hospital information system in hospitals of Isfahan Based on the modified model of Delon and McLean", Saghaeiannejad et al, randomly selected 300 individuals from HIS users and distributed a questionnaire based on three criteria according to which the mean score of system quality, information quality and satisfaction in a variety of hospital information systems and among different hospitals had a significant difference ($p <0.05$). The overall means which were obtained include: system quality criteria (58.6%), the quality of information (60.8%) and satisfaction (61.2%), respectively [16]. Therefore, according to the findings of the current study, in terms of system quality in treatment centers, HIS has not been able to meet the expectations that these results are consistent with Hanmer study entitled " Assessment of Success of a Computerized Hospital Information System in a Public Sector Hospital in South Africa ". In his study, Hanmer concluded that in public hospitals in South Africa, in terms of system quality, information quality and service quality, HIS is relatively in a good level [17].

CONCLUSION

Given that the success rate of HIS in three quality measures were not desirable, it appears that to ensure the success of the system, healthcare managers should have detailed plan to improve quality in each of these three criteria. So that to improve quality of system increase response capacity of HIS system, standardization of the working environment and high-speed data entry, integration and data exchange with other information systems in the health care system, increase processing capability, ease of use and also the possibility of correcting the errors can be pointed out. To improve the comprehensiveness, accuracy, reliability, being up to date and utility reports can lead to increased quality of HIS data. Also, use of hardware and advanced equipment such as portable computers, smart sensors, the presence of useful applications on the system in order to reduce medical errors and optimal support services will lead users to be fully satisfied with HIS service quality.

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