Validating Delone and Mclean Success Model in Hospitals of United Arab Emirates

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Abstract

The UAE is well-known country in providing a high-quality technology-based healthcare. Almost all hospitals in the UAE deploy HIS in public and private hospitals, but this progress is not free from obstacles and challenges. A lack of expertise is the major problem to successfully deploying HIS by hospitals. Despite the ongoing expansion of healthcare technologies in the UAE, there is an absence of a framework that explain how the quality attributes of HIS (system quality, information quality, and service quality) contribute to patients' satisfaction and boost the intention to use the system on regular bases. Determining the significance of these relationships is crucial to evaluate the framework that correlated them together towards better healthcare service. The aim of this study is to validate the Delone and McLean success model in healthcare domain, in particular the adoption of HIS in Al-Sharjah public hospitals Hence, quantitative methodology based on SEM was adopted to achieve this aim. A number of 428 questionnaires out of 500 distributed copies were used for data analysis. The result revealed that system quality, information quality, and service quality have significant effect on patient satisfaction and the intention to use HIS on regular bases.

Keywords: System Quality, Information Quality, Service Quality, Intention To Use, Hospital Information System, Patient Satisfaction

Introduction

Information systems at the present time become part of the healthcare service in developed countries, whereas the focus on the satisfaction of patients is the main concern of hospitals in the United Arab Emirates (UAE). Patients are seeking greater involvement in their healthcare through online service and expect their medical

history can be accessed anywhere and at any time with high degree of quality in terms of service, information, and system (Al-Damen, 2017). According to Kisekka and Giboney (2018), information systems such as electronic medical record systems, patient health record systems, and hospital information systems (HIS) are now very popular to provide the patient with online medical services. As a result, deploying efficient HIS is a vital requirement for modern hospitals to gain patients satisfaction and boost the intention to use these systems (Sangjae & Kun, 2020). As HIS are critical for healthcare delivery all around the world, including the UAE. HIS allows patients, doctors, physicians, and other users from outside the hospital to enjoy medical service without visiting the hospital, and potentially improving healthcare communication with hospital staff (Ismail et al., 2020). Thus, improving the quality of HIS can solve lots of issues and challenges facing the doctors and nurses. Thus the leaders and managers in hospitals must focus on patient satisfaction, improve clinical effectiveness, and promote HIS (Teshome et al., 2019). In this regard, the successful implementation of HIS necessitates the consideration of quality attributes of this system (Zaineldeen et al., 2020). Furthermore, HIS help the hospitals to save cost and time for the patients and increase the demand for enhanced medical quality driven by HIS (Kuo et al., 2018). Whereas HIS automates administrative tasks at the hospital, e.g., patient profile information, accurate records, appointment scheduling, and fast retrieve of patient history, as well as provide clinical documents in short time such as clinical reminders, computerized prescriptions, online laboratory results, digital radiological imaging, and clinical referrals. In other words, HIS has made a great impact on clinical services by minimizing or eliminate paperwork (Salgado et al., 2020). These dramatic changes promote cost-effective medical service, resource-efficient, and patients' satisfaction (Sherifali et al., 2017). Therefore, understanding how HIS quality attributes contribute to the success of information system in healthcare domain, in addition the impact of these attributes (system quality, information quality, and service quality) on the intention to use HIS and the satisfaction of users (patients). Determining the significance of these relationships is crucial to evaluate the framework that correlated them together towards better healthcare service.

HIS in UAE hospitals

The UAE is well-known country in providing a high-quality technology-based healthcare. Almost all hospitals in the UAE deploy HIS in public and private hospitals. UAE is recognized for promoting exceptional healthcare service delivery in order to compete with international branded hospitals (Li et al., 2015). Hence, it is an important factor to make the best selection of HIS models because its features determine how the users accept the system and why they might frequently use it (Bleustein et al., 2014). However, the healthcare progress in this field is not free from obstacles and challenges. According to Shaikha (2014), some hospitals in the UAE experience failure in some clinical services due to some reasons, including inadequate training of HIS workers and poor implementation. While Moghaddasi et al. (2018)

found that a lack of expertise is the major hurdles to successfully deploying HIS in the UAE and other Middle Eastern countries. They suggested to adopt successful experiences in this field from other countries that have been used HIS for a fair period of time, as well as the formulation of a comprehensive plan for HIS adoption to avoid wasting financial and efforts. It has been reported that HIS failures in the UAE as a result of spending on HIS without effective plan for deploying HIS properly, e.g., poor HIS management and execution has been attributed to complexity of the system. The benefit from HIS does not seem an easy task (Abouzahra, 2011; Al-Damen, 2017). Patients undergoing serious and minor medical treatment should become accustomed to using technology and information systems to track their medical development. Despite the ongoing expansion of healthcare technologies in the UAE, there is an absence of a framework that may explain how the success of HIS contribute to patients' satisfaction and boost the intention to use the system on regular bases. By rigorously analyzing the impact of HIS on-healthcare services in UAE hospitals, the administrators and executives in public hospitals maybe able to recognize the attributes of HIS that mostly satisfy patients (Teshome et al., 2019). Hospitals in the UAE must take action to educate the administrators and doctors why HIS promote the satisfaction of patients who want to use the system for a long time for tracking their medical history (Teshome et al., 2019). In other words, the effectiveness of HIS is one of the variables that determines patients' satisfaction; any deficiencies in these systems may decrease patients' intention to use HIS on regular bases. However, the topic of how the quality of HIS affect's patient satisfaction with online medical services is critical for public hospitals in UAE. But to date, there is a scarcity of empirical research to assess the impact of HIS quality features on patients in UAE hospitals, especially those who registered for long-term medical care, particularly in public hospitals. As a result, this study project will investigate and assess the impact of quality attributes (system, information, and service) on patient satisfaction and their intention to continuously use the system.

Theoretical background

DeLone and McLean (D&M) are two scientists in information technology have developed a theoretical model for information systems and entitled a D&M success model of information system in 1992. This model has been applied in many industries to explain how the quality attributes of an information system contribute to the intention of users and their satisfaction (Radhi & Mustakim, 2018). D&M model (1992) initially identified six variables in their original model that construct a success model of information system, which include system quality, information quality, service quality, user's satisfaction, intention to use, and organizational benefits. As described above, Since the introduction of first D&M model, researchers used this model and confirmed its effectiveness in understanding the factors that affect the behavior of users. After about 10 years, in updating the original model (1992), the final version of D&M success model in 2003 composed of the following constructs.

System quality

It is a significant feature of an information system that reflects certain attributes of the systems, e.g., flexibility, reliability, usability, responsiveness, ease of use, and ease of learning. System quality according to Nordaliela et al. (2013) is a system criteria that affect user's impressions after using the system. For example, the timely access to the resources of the system, interface design, navigation, and error recovery.

Information quality

The completeness and relevancy of content supplied by an information system is referred to as information quality (DeLone & McLean, 2003). In addition, it is the desirable feature of the system outcomes in terms of richness of the contents and reports. Information quality is measured through content specific features, such as understandability, accuracy, completeness, and relevancy. In other words, information quality express the quality of the content provided by the information system. It reflects the fitness of output information (Miller, 2011).

Service quality

Delone and McLean (2003) defines service quality as the degree of support from an information system to the user who need certain facilities from the system. In other words, the quality of services gained by users who need information service is measured through technical competence, responsiveness, consistency, and communication. Therefore, service quality is a system tool that could be used for serving the people who need specific information from the system (Benmoussa et al., 2018). Improved service quality can lead to increase the behavioral intention to use information systems (Nguyen et al., 2014).

User satisfaction

User satisfaction is a critical indicator of information system acceptance (DeLone & McLean, 2003). Also, it is the degree of users' gratification to the service they get from the system. For example, the attitudes of users toward a particular information system, users' expectations, and involvement in using the system. According to Doll and Torkzadeh (1988) user satisfaction is defined as the perspective and opinion of system's user. Some scholars suggested that users experience is important to gain satisfaction from using information system (Wynne & Matthew, 2010).

Intention to use HIS

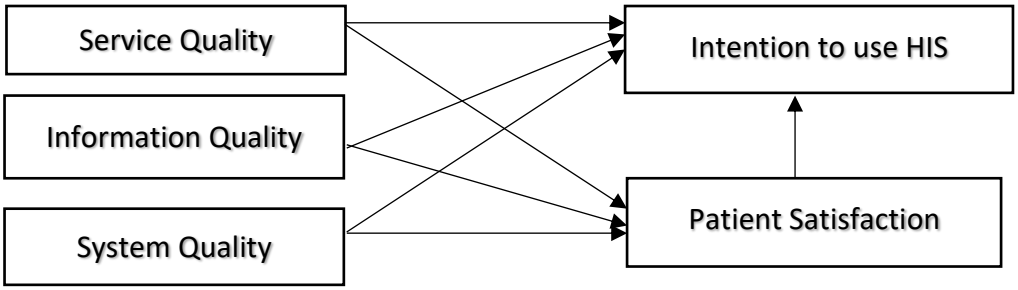
The users of information systems intend to behave differently, the users of information systems have certain way to measure the benefits of the systems before they show their approval or acceptance (Fishbein & Ajzen, 1977). Intention to use a system is reflects how people assess the benefits of information systems. It could be measured through appropriateness of use, extent of use, amount of use, frequency of use, nature of use, and purpose of use. Yung and Ming (2014) suggested that user's intention can be changed depending on certain factors. They found that the intention

to use information system is an important factor that determines the level of usage and continuous usage, and it is highly correlated with quality attributes of information systems.

Although the D&M success model was a good outcome of several developments to provide a combined view that provide comparisons between different researches, the validation of this model was not giving the same results in various industries and sometimes differ between countries. D&M success model has been examined in e-Government (Wang &Liao, 2008), education (Balaban et al., 2013), e-commerce (Park et al., 2011), construction (Lee et Yu, 2012), and healthcare (Bossen et al., 2013; Petter & Fruhling, 2011). This study is new attempt in this regard in the healthcare sector. As discussed earlier, the updated D&M success model (2003) focuses on the impacts of quality attributes and measures their effect on users' behaviors such as satisfaction and intention to use information system (Lin, 2008). Dwivedi et al. (2013) suggested that future research should investigate the influence of D&M success model (2003) in healthcare context, for example how patients behave with regard to information if quality measures have been implemented in the system. They urged researchers to focus on understanding the acceptance and willingness to frequently use information systems without a specific industry.

According to Petter and McLean (2009) HIS has received less interest by scholars who researched D&M success model. As HIS is required an in-depth validation, this study focuses on the quality attributes of HIS, specifically, system quality, information quality, and service quality, and all these attributes have a substantial association with patient satisfaction and intention. Based on these claims, the HIS framework that will be examined in this research is shown in Figure-1.

Figure-1: The Delone and McLean success model in healthcare industry



Methodology

The aim of this study is to validate the D&M success model in healthcare domain, in particular the adoption of HIS in Al-Sharjah public hospitals. Al-Sharjah has two public hospitals, i.e., Al Qassimi Hospital and Kuwait Hospital. Hence, quantitative methodology based on SEM was adopted achieve this aim. The population in this study is all patients registered in the HIS systems of these two universities. The average number of patients attending these two hospitals each month is around

50,000. Data from the study sample was collected using simple random sampling. A number of 428 questionnaires out of 500 distributed copies were used for data analysis.

Results and discussions

The assessment of the output data from AMOS software after conducting SEM analysis indicates that fit-indices of the structural framework shown in Figure-2 is satisfactory enough to consider the D&M success model is valid and fit with the empirical data collected from Al-Sharjah hospitals. As shown in this figure, the values of fit-indices are well-matched with the cut-off points. Starting with PCLOSE = 1.00 (should be greater than 0.05), RMSEA = 0.032 (≤ 00.08) which report a high degree of model-fit with the data. In addition, CMIN/DF = 1.430 (≤ 2.00), and TLI = 0.953 (≥ 00.80), finally GFI =0.900 (≥ 0.80). These magnitudes are typical (Hair et al., 2020) and shows that D&M model in HIS domain is valid. These are the standard fit-indices in SEM standards that should be used to assess the validity of a theoretical model with an empirical data (Dash & Paul, 2021). In sum. the result indicates a sufficient degree of model-fit in the D&M framework to report the strength and significance of quality factors of HIS on patient satisfaction and intention to use the system as shown in Figure-2.

In addition, the path analysis and the squared multiple correlations are shown in Table-1. Unstandardized coefficients is used to assess the significance of relationships between the variables, i.e., system quality, information quality, service quality, patient satisfaction, and intention to use HIS. It is evident that the degree of associations between the five variables are positive and acceptable to consider these relationships significant. To test the significance of the relationship, there are two criteria used of this purpose, first is the Critical Ration (C.R), second is the significance level of regression coefficients. If C.R ≥ 1.96 for a specific relationship and Sig. ≤ 0.05 (Garnier-Villarreal & Jorgensen, 2020); then the relationship is significant at shown in Table-1. In other words, the quality attributes of HIS (system quality, information quality, and service quality) has significant effect on patient satisfaction as well as the intention to use HIS. While patient satisfaction also has a significant effect towards intention to use HIS.

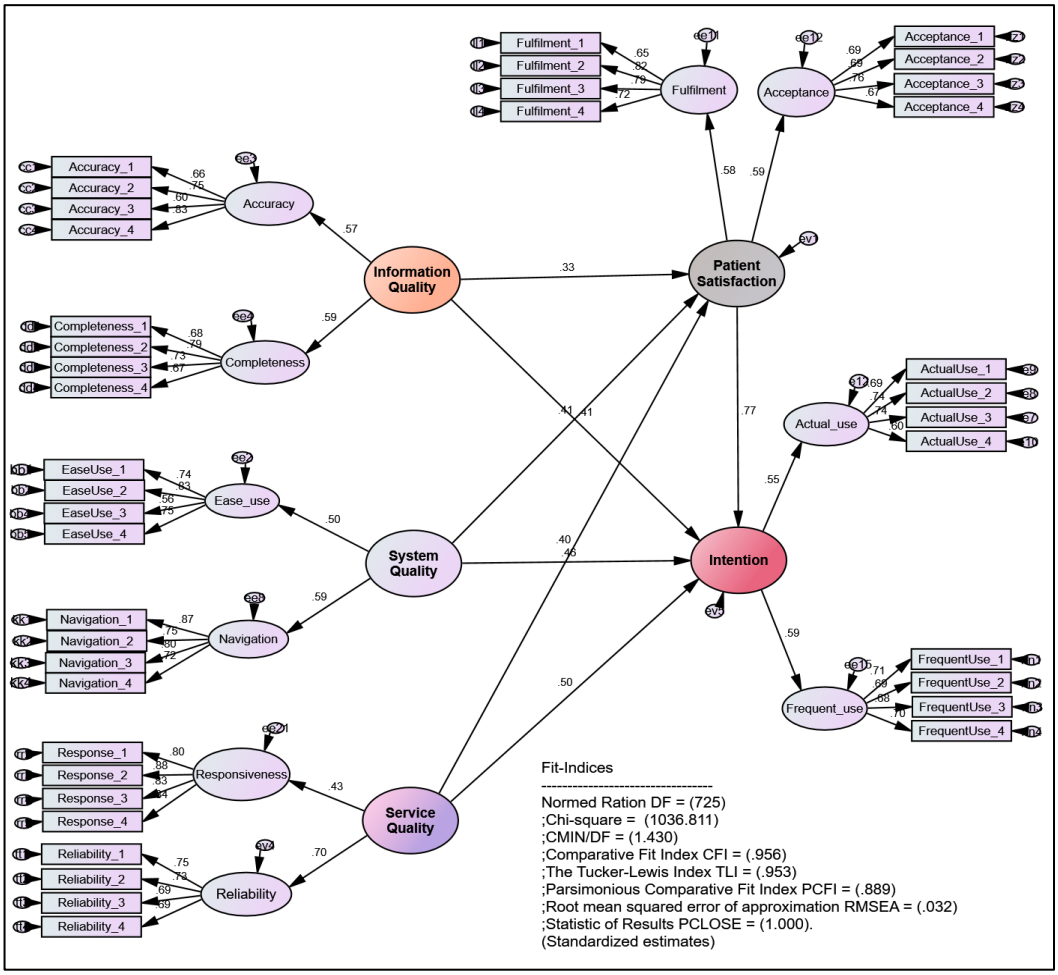


Figure-2: The output data and strength of relationships in D&M success model of HIS.

Several studies in the past have also demonstrating an affirmative connection between information quality and patient satisfaction (Yanuar & Ari, 2018; Shichao et al., 2020). While the enhancement in system quality of HIS will raise the level of satisfaction of the patients. This finding is identical with previous empirical results in other industries which indicate a strong association between these two variables (Ho et al., 2019). Furthermore, quality of service is positive and significant towards the user satisfaction because it helps the user take lots of advantages from HIS is a well-organized way, e.g., responsiveness, timing of reaching the information, and fast communication with hospital staff and the assigned doctor (Mahendra et al., 2021; Sopalatu et al., 2021; Rachmat et al., 2022). It is approved that when users rely on an information system, they expect standard quality requirements (Santavirta et al., 2021), such as the ease of use, friendly navigation, clarity of information, and easy interface, and responsiveness. Hence, the users will have the desire and strong

willingness to reuse the system if they find such quality attributes in HIS, so that will become a loyal user because of the net benefits and satisfied (Park & Lee, 2021; Kim et al., 2021; Beatrix, 2022)

Table-1: Standardized regression weights and squared multiple correlations

Direction of effects	Beta coefficient	Square multiple correlation	C.R	p-value (Sig.)
Service Quality → Patient Satisfaction	0.396	0.130	2.962	0.00
System Quality → Patient Satisfaction	0.409	0.165	2.694	0.00
Information Quality → Patient Satisfaction	0.331	0.171	2.981	0.00
Information Quality → Intention to use HIS	0.406	0.213	2.640	0.00
Service Quality → Intention to use HIS	0.498	**0.182**	2.790	0.00
System Quality → Intention to use HIS	0.462	**0.216**	2.803	0.00
Patient Satisfaction → Intention to use HIS	0.767	**0.313**	3.136	0.00

Conclusions

The literature shows that HIS helped hospitals to communicate with the patients in an efficient way and ensure frequent use to the system so that patient save time and cost while continuing their medical treatment in the hospitals. Thus, in UAE hospitals are increasingly relying on HIS capabilities for diagnostic, administrative, and improving the medical service. As the UAE becomes a destination for both local and international patients. The UAE's public hospitals are eager to implement HIS and use it as a long-term online portal that can be used by the patients on a regular basis. HIS has significantly altered how hospitals in UAE engage with patients and add value to healthcare service. This study found HIS can be evaluated based on quality attributes (system quality, information quality, and service quality) as proposed in Delone and McLean success model. This study examined the impact of HIS quality attributes on patient satisfaction and intention to use HIS in in Al-Sharjah public hospitals by validating this model. The findings show that the quality criteria listed have a considerable impact on patient satisfaction. In other words, patients prefer to utilize HIS because it meets their needs in terms of system quality (e.g., user friendliness, navigation), service quality (e.g., responsiveness, dependability), and information quality (e.g., content accuracy, completeness). Notably, these attributes are critical

indicators of the success of any information system. As a result, HIS should be properly implemented to provide these qualities to gain acceptance by the users.

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