RESEARCH ARTICLE

Hospital Information System Satisfaction in Brazil: Background and Moderating Effects

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ABSTRACT

In the last years, hospitals in Brazil have made significant investments in adopting and implementing new hospital information system (HIS). Whether these investments will prove beneficial for these organizations depends on the support that will be provided to ensure the effective use of the information systems (IS) implemented and also on the satisfaction of its users.

The purpose of this study is to propose a conceptual model, appropriate for the intention to use HIS, by adopting the system, service, and information qualities covered in the Information System Success Model proposed by DeLone and Mclean.

In the present study, structural analysis applied to data from a sample of 393 HIS users showed the variables service quality, information quality, system quality and satisfaction to act as antecedents of HIS success. A novel finding of the study was the importance of the user's aptitude with respect to computer moderating the relationships of the model.

Managerial implications are provided accordingly. Suggestions for introducing healthcare information system are then provided as well.

Keywords: Health information management, Management information system, Hospital, Brazil.

INTRODUCTION

For many decades now, managers in the healthcare sector have tried to maximize the efficiency of hospitals without reducing the quality of healthcare provided to patients. In recent years, the problem has been exacerbated by insufficient public resources to meet an ever-increasing demand for healthcare service, which has in turn translated into a greater demand for information systems.[1]

Hospital information systems (HIS) have been defined as the sociotechnical subsystems of a hospital, comprising all information processing systems as well as the associated human or technical actors in their respective information-processing roles.[2] The HIS is designed to enable the execution of patient-care-related hospital functions, such as patient administration, hospital financial affairs, legal affairs, etc. Therefore, an HIS is an integrated information system that plays a key role in supporting hospital affairs through the use of appropriate hospital information technology.[3]

Hospitals, in Brazil, have received scant attention as healthcare organizations from either policy makers or researchers until recently.[4] Since the mid-1980s, the development of health policy in Brazil has focused on decentralizing service delivery, reducing financial disparities and achieving universal access to basic care. Issues of hospital performance, however defined, have been left mainly to the individual facility.[5]

Although, planning and control processes in Brazilian hospitals are accidental, involving more ad hoc actions and a profusion of goals,[6] the use of HIS is spreading more and more in public hospitals and, generally, in the healthcare sector in Brazil. The HIS of Brazil's Unified National System (SUS), the only one of its kind in Brazil with a national scope, is used to process payment for hospital admissions in public hospitals and private hospitals outsourced by the SUS, with the advantage of providing diagnostic, demographic and geographic information for each hospitalization.

It is widely accepted that the use of HIS offers huge development prospects and opportunities, mainly in improvements to the quality of patient care, increased staff efficiency and effectiveness and a significant decrease in their operational expenditure.[7]

Although individual studies have suggested a positive relationship between the level of IS investment and the productivity of healthcare services,[8] the overall results of IS investment profitability studies have been inconclusive.[9] Therefore, a rigorous evaluation of the HIS is recommended and the results of this could be of great importance for both the current decision makers and the future users.

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Many different methodologies have been developed for the evaluation of information systems, each one having its own unique characteristics. However, no one approach is considered as complete and generally applied for the evaluation of HIS.[10]

In the past, most researches on HIS were about the planning and discussion of hospitals as an entire unit[11] or about the brief introduction of healthcare information systems.[12] However, there are few studies analyzing HIS success from users point of view.[3,13]

The main purpose of this research is to determine whether an IS instrument that is commonly used as a surrogate measure for success, the Delone and McLean model,[14] can be applied in HIS and assessing the psychometric properties of a Brazil translation of the construct included in the D&M model. This study propose an evaluation model appropriate for HIS, in order to identify the cause and effect relationships between the relevant factors affecting HIS success and provide reference for hospitals to evaluate, improve and plan.

One of the principal novel contributions of the present study is its inclusion of users' aptitude for using computer as a variable that moderate the value-satisfaction relationship. In particular, the study tests for the first time whether aptitude which have been extensively analyzed in the literature[15-17] may influence the relationship between satisfaction and perceived quality.

The rest of the article is structured as follows. The following section discusses the IS success literature. The next section presents the hypotheses and the proposed model. Then the model's hypotheses are tested, followed by a discussion of the results and the principal implications for competitive strategies in the hospital sector.

Conceptual Framework

The role of IS in organizations has changed dramatically in the last decades, as have the key stakeholders and the expected benefits of the investments in IS. During this period, IS research has evolved to keep pace with the changing expectations regarding the success of IS.[18]

Many models were used to measure the success of different types of IS. However, we acknowledge that it is not easy to define the success of any IS since there are different stakeholders who assess IS success in an organization and each group assesses success from its perspective.[19]

In 1992, DeLone and McLean (D&M)[14] proposed a taxonomy of IS success consisting of six variables: System Quality, Information Quality, Use, User Satisfaction, Individual Impact and Organizational Impact. This model assumes that the quality of the system and the quality of the information, individually and/or in concert, affect the use and satisfaction of the user; it also considers that usage

and user satisfaction are interdependent. It proposes that usage and user satisfaction affect the managers' individual behavior, which, in turn, affects the behavior of the organization, i.e. the organizational performance.[14]

Some authors[20] argue that it is necessary to include IS service quality in the D&M model, and assert that system, information and service quality together have an impact on IS use and user satisfaction. Referring to these argument[21] proposed a revision of the D&M model, by adding the dimension of service quality. Information, system and service quality may separately or simultaneously affect the two interrelated dimensions of IS use and user satisfaction while these two dimensions directly affect net benefits.

Previous studies[22] have conducted literature reviews to examine if the results of empirical studies supported the relationships posited by the original success model. These reviews revealed that some relationships in the model had consistently received support while others have received only mixed support (some found significant results while others did not).

Seddon and Kiew (2007)[23] modified the construct, use, because they conjectured that the underlying success construct that researchers have been trying to tap is usefulness not use. Seddon and Kiew's concept of usefulness is equivalent to the idea of perceived usefulness in TAM by Davis.[24] We agree with them that, for voluntary systems, use is an appropriate measure; however, if system use is mandatory, usefulness is a better measure of IS success than use.

The D&M IS success model was used by many studies to evaluate the success of various types of IS, such as web portals,[19] government to citizen (G2C) e-government systems,[25] e-commerce,[26] knowledge management,[27] etc.

However, there is little research on the use of D&M IS success model to assess IS hospital success in improving job performance and especially in developing countries. In the hospital sector, several theoretically based models of HIS success (with success defined from the user's perspective) provide empirical support that specific elements can predict successful systems.[7,28-32] In a recent study,[33] reviews the electronic health information system (EHIS) models, identifying 21 health and 5 nonhealth models.

Proposed Model and Hypothesis

Based on a review of the IS success literature, we propose a structural model that relates service quality, information quality and system quality with user satisfaction and perceived usefulness. In this model, service quality, information quality and system quality have both a direct effect on perceived usefulness and an indirect effect through satisfaction. We include one moderating variable of the

service quality and satisfaction relationship aptitude for technology use (Fig. 1). In the following paragraphs, we examine each of the variables included in the model, and the relationships between them.

Service Quality

Service quality is related to the quality of the support that system users receive from the IS department and IT support personnel. For example: responsiveness, accuracy, reliability, technical competence and empathy of the personnel staff.[34]

The seminal work on service quality is that of[35] which culminated in the development of the SERVQUAL scale. Cronin and Taylor (1992)[36] presented the SERVPERF instrument, which measures only customer perception of quality, as a sufficient measure of value. Although, there is a debate on the validity of SERVQUAL as a service quality measure,[34,37] Jiang et al (2002) found that SERVQUAL is indeed a satisfactory instrument for measuring IS service quality. In the present study, service quality was measured by 5 formative indicators: reliability, responsiveness, assurance, tangibles and empathy, adopted from Pitt, Watson and Kavan (1995).[20]

Several studies have examined the relationship between service quality, user satisfaction and usefulness[38-40] however, the findings of these studies suggest mixed support for this relationship, probably, because researchers have measured service quality using multiple methods.[34]

H1: Service quality positively influences user satisfaction with hospital IS.

H2: Service quality positively influences perceived usefulness of a hospital IS.

Information Quality

Information quality is concerned with the desirable characteristics of the system outputs, for example: relevance,
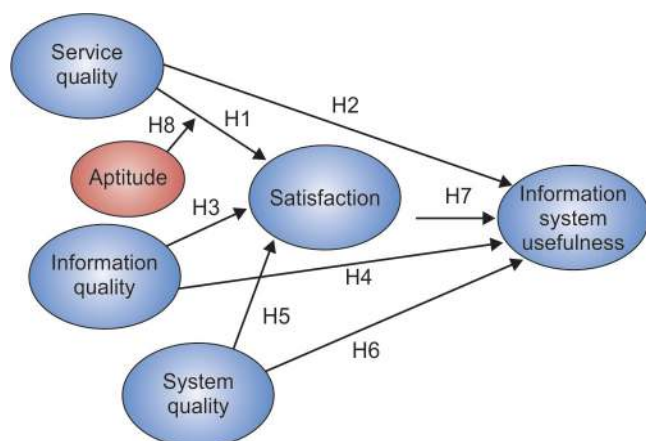

Fig. 1: General scheme of the investigation

understandability, accuracy, conciseness, completeness, understandability, currency, timeliness and usability.[18]

Information quality measurement is problematic for IS success studies, indeed in several studies this dimension is not distinguished as a unique construct but is measured as a component of user satisfaction.[41] However, several authors have developed generic scale of information quality using the literature that is relevant to the type of information system under study.[42,43] Our construct is comparable to those used by previous researchers.

The relationship between information quality and user satisfaction is strongly supported in the literature.[27,44] Studies have found a consistent relationship between information quality and user satisfaction at the individual unit of analysis.[18]

Several studies have analyzed the relationship between information quality and usefulness, suggesting that higher information quality implies higher usefulness.[45,46]

Based on this, We hypothesized in this study that: H3 — information quality positively influences user satisfaction with hospital IS; *H4* — information quality positively influences perceived usefulness of a hospital IS.

System Quality

System quality is concerned with whether or not there are 'bugs' in the system, the consistency of the user interface, ease of use, response rates in interactive systems, documentation and sometimes, quality and maintainability of the program code.[23]

Many studies that measure system quality as perceived ease of use have found positive relationships with behavioral intentions to use the system.[47,48]

Based on the above, a positive relationship between system quality and perceived usefulness is hypothesized in this study.

H5: System quality positively influences perceived usefulness of a hospital IS.

At the individual level of analysis, there is also strong support for the relationship between 'system quality' and 'user satisfaction'.[44] System quality was found to be strongly related to user satisfaction.[27,49,50] Based on previous research that found a strong support for the positive relationship between 'system quality' and 'user satisfaction', it is assumed that higher system quality of hospital IS leads to higher user satisfaction in the context of this research.

H6: System quality positively influences user satisfaction with hospital IS.

Satisfaction and Usefulness

The most widely used user satisfaction instruments End-User Computing Support (EUCS)[51] and User Information

Satisfaction (UIS)[52] contain items related to system quality, information quality, and service quality, rather than only measuring overall user satisfaction with the system. Because of this, some researchers[23] have chosen use a semantic differential scale. These authors proposed the four-item instrument used in our study that attempts to measure user satisfaction directly.

Usefulness is the degree to which a person believes that using a particular system would enhance his or her job performance. Seddon and Kiew (2007)[23] suggest that there is a two-way causal relationship between usefulness and satisfaction derived from the relationship between use and satisfaction proposed in the D&M model. However, while user satisfaction has been widely used as a surrogate for systems performance and IS success, critics have questioned its general applicability because of poor instruments that have been developed to measure satisfaction.[53]

Following previous research[23,53] and considering that the Hospital IS use is mandatory and not voluntary, usefulness is a better measure of IS success than use. We measure this construct using the four item scale suggested by Seddon and Kiew (2007). Therefore, we hypothesize:

H7: User satisfaction positively influences hospital IS usefulness.

Aptitude for the Use of Computers

Aptitude for the use of computers refers to the set of knowledge and skills that enable individuals to function effectively with a computer. Scales to measure this concept have arisen in last decades such as the Computer Self Efficacy (CSE) scale[54] which was subsequently redesigned.[55-57] In the present study, we updated the 17-item CSE scale, eliminating some of the items that are no longer relevant in view of the technology advances in the in recent years. The result was a construct measured using 12 items.

We consider that the aptitude for the use of Internet can be a moderating variable of the relationship between service quality and satisfaction given that users with greater technology knowledge and skills might value more highly the quality of the service they receive, and will base their degree of satisfaction with the IS on this valuation. We hence posit the following hypothesis:

H8: A user's aptitude for computer moderates the relationship between service quality and satisfaction.

Object of Study and Sample

Data for our study were collected using a questionnaire survey administered in 5 university hospital in the Northeast region of Brazil during the year 2012. Since the purpose of our inquiry is to explore hospital information systems user

satisfaction, we designed a survey to acquire information from those users. Before starting the study, we conducted a pretest consisting of interviews with hospital IS users and market research experts to ensure the relevance and clarity of the questionnaire. We obtained 393 correctly completed questionnaires. The technical specifications of the study are given in Table 1.

We assessed potential nonresponse bias by comparing the early *vs* late respondents. They were compared on several demographic characteristics. The t-test and chi-square analysis were used to examine the distributions between these two data sets. The results indicated that there are no statistically significant differences. This suggested that nonresponse bias was not a serious concern.

Data Analysis and Results

A structural equation analysis can be performed using two types of statistical techniques: methods based on the analysis of covariance (e.g. the analyses performed with the statistical program LISREL), and methods based on variance and its components (also known as partial least squares or PLS).

Following an analysis of the different methodological criteria distinguishing these two options, we chose to apply the PLS method using the program Smart PLS. The reasons were that this method is oriented at prediction, and allows one to easily incorporate formative latent variables, such as service quality.

The PLS technique is based on an combination of principal component analysis and regression analysis, with the main aim of explaining the variance of the constructs of the model.[58] Thus, the path coefficients and factor loadings of the items are estimated simultaneously in the context of the proposed model, thereby avoiding bias and inconsistency in the estimation of the parameters, allowing the interactions to be checked, and reducing the type II error.[59]

The measurement model was analyzed taking into account the reliability of the individual items and the discriminant validity of the constructs.[60] The item reliability of a reflective item was assessed by its factor loading onto the underlying construct. Hair et al[61] suggested that an item is significant if its factor loading is greater than 0.50. As shown in Table 2, the factor loadings of all reflective items in the measure ranged from 0.6 to 0.883. This exceeds

Table 1: Technical details of the study

Universe	43.873 Hospital IS users North-east region in Brazil
Geographical scope	Brazil
Data acquisition method	Survey
Sampling type	Stratified random sampling
Sample size	393 individuals
Fieldwork	January 2012

the threshold set by (Hair et al, 2009) and demonstrates convergent validity at the item level.

The reliability of the constructs was determined by analyzing the composite reliability.[62] One observes in Table 2 that the constructs were found to be reliable since the composite reliability exceeded 0.8.[63] Moreover, the values of the average variance extracted (AVE) were greater than 0.5, indicating the convergent validity of the model.[62]

A construct has discriminant validity if its AVE is greater than the square of the correlations of this construct with the others.[62] One observes in Table 3 that this criterion is satisfied for the discriminant validity of our model.

Figure 2 shows the results of the estimation of the structural model. The arrows indicate the causal order, the number beside each arrow is the corresponding standardized path coefficient, and in parentheses is the product of the standardized path coefficient and the correlation coefficient between the two constructs expressed as a percentage.[64] A bootstrap resampling technique, considering 500 subsamples, was used to determine the values of the t-test, and thus verify the significance of the causal order relationships.

The figure also shows the values of the Stone-Geisser Q² test of predictive relevance. That they are all positive guarantees the predictive relevance of the model. Satisfaction is the latent variable that most contributes to explaining IS Perceived Usefulness, followed by the variables information quality and service quality. Overall, 47.2% of the variance of the variable Perceived Usefulness is explained by the other latent variables in the model. Satisfaction is explained principally by information quality, but is also significantly related to the variable system quality, confirming the first seven hypotheses of the model.

Moderating Effect of the Aptitude

The moderating effect of the aptitude with respect to technology were tested following the multi-group analysis procedure suggested by Chain (2000),[65] which has been used by various authors.[66,67] In this procedure, a Student's t-test is calculated using Equation 1. This equation is derived from a Student's t distribution with $m + n - 2°$ of freedom, where Sp (Equation 2) is a pooled estimator for the variance of the standard errors, m and n are the sample sizes of each group (in this case 2), and SE is the standard error of each path coefficient of the structural model for each group. In the present case, the two groups were selected previously using a k-means cluster analysis (k = 2).

Equation 1: $t = \dfrac{\beta_a - \beta_b}{S_p \sqrt{\dfrac{1}{m} + \dfrac{1}{m}}}$

Equation 2: $S_p = \sqrt{\dfrac{(m-1)^2}{m+n-2} SE_a^2 + \dfrac{(n-1)^2}{m+n-2} SE_b^2}$

The test results (Table 4) showed that the differences between the two groups are significant for the variable aptitude, thus confirming the initial hypothesis (H8).

Table 2: Evaluation of the measurement model

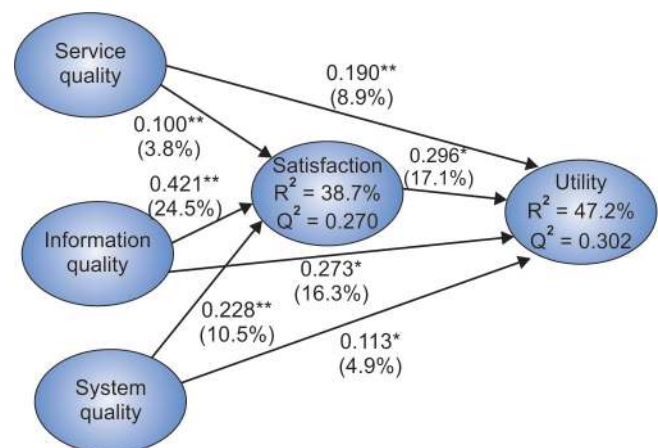| Construct	Factor loading/ weights	Cronbach´s Alpha	Composite reliability (Pc)	AVE
Service quality		N/A	N/A	N/A
SQ2	0.374			
SQ3	0.347			
SQ4	0.627			
Information quality		0.752	0.827	0.446
IQ1	0.740			
IQ2	0.619			
IQ3	0.633			
IQ4	0.734			
IQ5	0.668			
IQ6	0.600			
System quality		0.828	0.880	0.596
SQ1	0.809			
SQ2	0.656			
SQ3	0.789			
SQ4	0.814			
SQ5	0.780			
User satisfaction		0.863	0.907	0.708
Sat1	0.867			
Sat2	0.867			
Sat3	0.834			
Sat4	0.797			
Perceived usefulness		0.893	0.919	0.656
Use1	0.679			
Use2	0.883			
Use3	0.877			
Use4	0.834			
Use5	0.803			
Use6	0.764			

Fig. 2: Results of the structural model

Table 3: Discriminant validity

Construct	Service quality	Information quality	System quality	Satisfaction	Perceived usefulness
Service quality	NA				
Information quality	0.503	0.668			
System quality	0.278	0.485	0.702		
Satisfaction	0.375	0.582	0.460	0.842	
Perceived usefulness	0.470	0.596	0.434	0.578	0.810

Note: The diagonal elements are the square root of the AVE

Table 4: Moderating effect of the variable aptitude with respect to technology on the relationship between service quality and satisfaction

	Sp	βa-βb	T	Hypothesis
Aptitude (H8)	0.0639	0.220	33.831	Confirmed

Therefore, in the present case, the variable aptitude mode rates the relationship between service quality and satisfaction.

Conclusions and Implications

This study was conducted to empirically investigate issues that might be related to the key determinants of HIS success, to extend the generalizability of the D and M model by assessing the psychometric properties of a Brazil translation of the model and, finally, to provide additional insights into end-user satisfaction and usefulness by considering aptitude as moderator in the service quality-satisfaction relationship.

The findings indicate that the D and M model proposed is a valid and reliable instrument that can be used confidently by researchers in Brazil and elsewhere. However, a better understanding of the factors that can influence user satisfaction and HIS success needs to be developed in order for HIS applications to be used effectively. This study advances previous research by testing the moderator effect of attitude in the service quality-satisfaction relationship.

It represents the first comprehensive examination of D and M model in Brazil using multiple informant responses from end-users of HIS applications. Consistent with findings from several previous studies, the D and M model has been shown to be a valid predictor of IS success. Although the psychometric properties of the model appear to be robust across studies, continuing efforts should be made to validate and extend the proposed model.

Our study shows that the D and M model may be used to evaluate hospital information systems. The model provides not only an overall assessment of end-user satisfaction and usefulness but also the capability to identify the most problematic aspects of HIS implementation efforts. The magnitude of path coefficients provides useful insights into the relative importance of each subscale of the D and M model and, thus, the major areas of satisfaction or dissatisfaction with the use of a given HIS. Managers could focus on these factors as significant contributors to overall satisfaction to improve HIS system effectiveness.

The study proves that service quality of the HIS positively influences users' perceived usefulness, supporting H2. In addition, service quality also has a positive influence on users' satisfaction, supporting H1. When users feel more satisfied with the service quality of the HIS, their satisfaction and perceived usefulness will be higher. Therefore, hospitals should not only focus on these influential forces during the system introduction period, but also continuously improve their service qualities. All of these affect users' feelings about the information system. By continuously enhancing its service qualities, the system would be able to reach its potential full performance.

Further, information quality directly and indirectly positively affects IS success (H3 and H4), thus indicating that an increase in the quality of the information leads to an increase in user satisfaction and IS usefulness. The result is in line with previous studies. When the user's attitude toward the information quality is more positive, the perceived usefulness of information will be higher. As a result, this study asserts that while introducing HIS, we should emphasize the following aspects: making sufficient information available, having good interface design and ensuring on-time updating of information on the system.

System quality directly and indirectly contributes significantly to the observed explanatory power of HIS success (H5 and H6), thus implying that an increase in the quality of the system leads to an increase in HIS success. System quality incorporates system ease of use, speed, documentation, user interface and training. Thus, a net positive effect from these factors will result in a positive effect on HIS success.

The results also underline the need to design highly effective user documentation and provide additional and continuing training to end-users. Creating a supportive environment responsive to end-user concerns and needs, and working collaboratively with end-users in utilizing new software applications, can yield long-term benefits and increase the system's use and effectiveness. Technical difficulties, such as bugs in the software, problems interfacing with existing systems, system speed and hardware difficulties, can lead to increased user frustration and lower user

satisfaction. End-user computing satisfaction may be used to signal to management such mismatches and difficulties.

Although this study makes significant contributions to both academia and practice, there are several limitations which open up venues for further research. Firstly, its sample size is rather small, since only a particular subject group, the hospital personnel of 5 hospitals in Brazil who interact directly with the HIS, was targeted. In addition, only Brazilian University Hospitals were selected as samples to develop and test the proposed model. Future studies should further develop the proposed model and verify the proposed model with broader samples, such as medical centers, private hospitals and clinics.

Secondly, there are several factors not discussed that may influence the constructs in the proposed model. For example, speed of response may influence service quality, perceived ease of use may influence satisfaction, etc.

In addition, our research results can help planners and managers understand key considerations affecting HIS development and use, and may be used as a reference for system design, development and implementation. Although this study clearly demonstrates the antecedent role of service quality, information quality and system quality, it is important to identify additional variables that can improve our ability to more accurately predict HIS success by incorporating various perspectives from multidisciplinary personnel.

REFERENCES

1. Escobar-Rodriguez T, Bartual-Sopena L. The roles of users personal characteristics and organisational support in the attitude towards using ERP systems in a Spanish public hospital. The HIM Journal 2013;42(1):18-28.
2. Haux R, Winter A, Ammenwerth E, Brigl B. Strategic Information Management in Hospitals: An Introduction to Hospital Information Systems (2004. ed.). Springer-Verlag New York Inc 2004.
3. Chen RF, Hsiao JL. An investigation on physicians' acceptance of hospital information systems: a case study. International Journal of Medical Informatics 2012;81(12):810-820.
4. La Forgia GM, Harding A. Public-Private partnerships and public hospital performance in Sao Paulo, Brazil. Health Affairs 2009;28(4):1114-1126.
5. Forgia GML, Couttolenc BF. Hospital Performance in Brazil : The Search for Excellence 2008. Available at: https://open-knowledge.worldbank.org/handle/10986/6516.
6. Goncalves MA. A comparative study of hospital management in great britain and brazil : cost information use (phd). Aston University 2002. Available at: http://eprints.aston.ac.uk/10772/
7. Aggelidis VP, Chatzoglou PD. Hospital information systems: Measuring end user computing satisfaction (EUCS). Journal of Biomedical Informatics 2012;45(3):566-579.
8. Menon N, Lee B, Eldenberg L. Information Technology Productivity in the Health Care Industry. ICIS 1996 Proceedings 1996. Available at: http://aisel.aisnet.org/icis1996/56
9. Mitra S, Chaya AK. Analyzing cost-effectiveness of organizations: the impact of information technology spending. Journal Management Information Systems 1996;13(2):29-57.
10. Holden RJ, Karsh BT. The technology acceptance model: its past and its future in healthcare. Journal of Biomedical Informatics 2010;43(1):159-172.
11. Tsai YJ, Wu S, Chiang BC. Exploring factors affecting the performance of hospital information systems. Journal Information Management 2004;11(2):191-210.
12. Chang M, Lin JS, Chang Y, Lee TT. Applications of nursing information systems: sharing the experience of implementation in a hospital. Journal of Nursing 2008;55(3):75-80.
13. Pai FY, Huang KI. Applying the technology acceptance model to the introduction of healthcare information systems. Technological Forecasting and Social Change 2011;78(4):650-660.
14. DeLone WH, McLean ER. Information systems success: the quest for the dependent variable. Information Systems Research 1992;3(1):60-95.
15. Torkzadeh G, van Dyke TP. Development and validation of an Internet self-efficacy scale. Behaviour and Information Technology 2001;20(4):275-280.
16. Torkzadeh G, Van Dyke TP. Effects of training on Internet self-efficacy and computer user attitudes. Computers in Human Behavior 2002;18(5):479-494.
17. Torkzadeh G, Chang JCJ, Demirhan D. A contingency model of computer and Internet self-efficacy. Inf. Manage 2006;43(4): 541-550.
18. Petter S, DeLone W, McLean E. Measuring information systems success: models, dimensions, measures and interrelationships. European Journal of Information Systems 2008;17(3):236-263.
19. Al-Debei MM, Jalal D, Al-Lozi E. Measuring web portals success: a respecification and validation of the DeLone and McLean information systems success model. International Journal of Business Information Systems. 2013; Available at: http://works.bepress.com/mutaz_al-debei/32.
20. Pitt LF, Watson RT, Kavan CB. Service Quality: a measure of information systems effectiveness. MIS Quarterly 1995;19(2): 173-187.
21. Delone WH, McLean ER. The DeLone and McLean model of information systems success: a ten-year update. Journal Management Information Systems 2003;19(4):9-30.
22. Zviran M, Erlich Z. Measuring IS User satisfaction: Review and Implications. Communications of the Association for Information Systems 2003;12(1). Available at: http://aisel.aisnet.org/cais/vol12/iss1/5.
23. Seddon P, Kiew MY. A partial test and development of delone and Mclean's Model of IS Success. Australasian Journal of Information Systems 2007;4(1).
24. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly 1989;13(3): 319-340.
25. Wang YS, Liao YW. Assessing Government Systems Success: A Validation of the DeLone and McLean Model of Information Systems Success. Government Information Quarterly 2008; 25(4):717-733.
26. Zhu K, Kraemer KL. Post-adoption variations in usage and value of E-business by organizations: Cross-Country Evidence from the Retail Industry. Information Systems Research 2005;16(1): 61-84.

27. Wu JH, Wang YM. Measuring KMS success: a respecification of the DeLone and McLean's model. Information and Management 2006;43(6):728-739.

28. Jen WY, Chao CC. Measuring mobile patient safety information system success: an empirical study. International Journal of Medical Informatics 2008;77(10):689-697.

29. Lee TT, Mills ME, Bausell B, Lu MH. Two-stage evaluation of the impact of a nursing information system in Taiwan. International Journal of Medical Informatics 2008;77(10):698-707.

30. Tsiknakis M, Kouroubali A. Organizational factors affecting successful adoption of innovative eHealth services: a case study employing the FITT framework. International Journal of Medical Informatics 2009;78(1):39-52.

31. Tung FC, Chang SC, Chou CM. An extension of trust and TAM model with IDT in the adoption of the electronic logistics information system in HIS in the medical industry. International Journal of Medical Informatics 2008;77(5):324-335.

32. Yu P, Li H, Gagnon MP. Health IT acceptance factors in long-term care facilities: a cross-sectional survey. International Journal of Medical Informatics 2009;78(4):219-229.

33. Logan J. Electronic health information system implementation models: a review. Studies in health technology and informatics 2012;178:117-123.

34. Petter S, DeLone W, McLean E. The Past, Present and Future of «IS Success». Journal of the Association for Information Systems, 2012;13(5). Available at: http://aisel.aisnet.org/jais/vol13/iss5/2

35. Parasuraman A, Zeithaml V, Berry L. SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. Journal of Retailing 1988;64(1):12-40.

36. Cronin JJ, Taylor SA. Measuring service quality: a reexamination and extension. Journal of Marketing 1992;56(3):55.

37. Jiang JJ, Klein G, Carr CL. Measuring information systems service quality: SERVQUAL from the other side. MIS Quarterly 2002;26(2):145-166.

38. Choe JM. The relationships among performance of accounting information systems, influence factors and evolution level of information systems. Journal Management Information Systems 1996;12(4):215-239.

39. Gorla N. Information systems service quality, zone of tolerance, and user satisfaction. Journal of Organizational and End User Computing 2012;24(2):50-73.

40. Sun Y, Fang Y, Lim KH, Straub D. User Satisfaction with Information Technology Service Delivery: A Social Capital Perspective. Information Systems Research 2012;23(4):1195-1211.

41. Doll WJ, Torkzadeh G. Developing a multidimensional measure of system-use in an organizational context. Information and Management 1998;33(4):171-185.

42. Coombs C, Doherty N, Loan-Clarke J. The importance of user ownership and positive user attitudes in the successful adoption of Community Information Systems. 2001; Article. Available at: https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/1221

43. Wixom BH, Watson HJ. An empirical investigation of the factors affecting data warehousing success. MIS Quarterly 2001;25(1):17-32.

44. Iivari J. An empirical test of the DeLone-McLean model of information system success. SIGMIS Database 2005;36(2):8-27.

45. Kraemer KL, Danziger JN, Dunkle D, King JL. The usefulness of computer-based information to public managers. MIS Quarterly 1993;17:129-148.

46. Larcker DF, Lessig VP. Perceived Usefulness of Information: A Psychometric Examination. Decision Sciences 1980;11(1):121-134.

47. Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model: four longitudinal field studies. Management Science 2000;46(2):186-204.

48. Venkatesh V, Morris MG. Why Don't Men Ever Stop to Ask for Directions? Gender, Social influence, and their role in technology acceptance and usage behavior. MIS Quarterly 2000;24(1):115-139.

49. Kulkarni U, Ravindran S, Freeze R. A Knowledge Management Success Model: Theoretical Development and Empirical Validation. Journal Management Information Systems 2007;23(3):309-347.

50. Po-An Hsieh JJ, Wang W. Explaining employees' extended use of complex information systems. European Journal of Information Systems 2007;16(3):216-227.

51. Doll WJ, Xia W, Torkzadeh G. A confirmatory factor analysis of the end-user computing satisfaction instrument. MIS Q. 1994; 18(4):453-461.

52. Ives B, Olson MH, Baroudi JJ. The measurement of user information satisfaction. Communication ACM 1983;26(10):785-793.

53. Freeze RD, Alshare KA, Lane PL, Wen HJ. IS success model in E-Learning context based on students' perceptions. Journal of Information Systems Education 2010;21(2):173.

54. Murphy CA, Coover D, Owen SV. Development and validation of the computer self-efficacy Scale. Educational and Psychological Measurement 1989;49(4):893-899.

55. Durndell A, Haag Z, Laithwaite H. Computer self efficacy and gender: a cross cultural study of Scotland and Romania. Personality and Individual Differences 2000;28(6):1037-1044.

56. Torkzadeh G, Koufteros X. Factorial validity of a computer self-efficacy scale and the impact of computer training. Educational and Psychological Measurement 1994;54(3).

57. Torkzadeh R, Pflughoeft K, Hall L. Computer self-efficacy, training effectiveness and user attitudes: an empirical study. behaviour and information technology 1999;18(4):299-309.

58. Chin WW. The partial least squares approach for structural equation modeling. En Modern methods for business research. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers 1998; 295-336.

59. Chin WW, Marcolin BL, Newsted PR. A partial least squares latent variable modelling approach for measuring interaction effects: results from a monte carlo simulation study and an Electronic-Mail Emotion/Adoption Study. Information Systems Research 2003;14(2):189-217.

60. Hulland J. Use of partial least squares (PLS) in strategic management research: a review of four recent studies. Strategic Management Journal 1999;20(2):195-204.

61. Hair JFH, Black W, Babin BJ, Anderson RE. Multivariate Data Analysis (United States ed of 7th revised ed.). Prentice Hall 2009.

62. Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research 1981;18(1):39.

63. Nunnally JC. Psychometric theory. McGraw-Hill, New York 1978.

64. Falk RF, Miller NB. A primer for soft modeling. University of Akron Press 1992.

65. Chin W. Frequently asked questions—partial least squares and PLS-graph. 2000;Home Page [Online]. Available at: http://disc-nt. cba. uh. edu/chin/plsfaq. htm.

66. Keil M, Tan BCY, Wei KK, Saarinen T, Tuunainen V, Wassenaar A. A Cross-Cultural Study on Escalation of Commitment Behavior in Software Projects. MIS Quarterly 2000;24(2):299-325.

67. Sanchez-Franco MJ, Ramos AFV, Velicia FAM. The moderating effect of gender on relationship quality and loyalty toward Internet service providers. Information Management 2009;46(3): 196-202.

APPENDIX

Service Quality

HIS is easy to use.

HIS is user friendly.

Compared to other computer software, HIS is easy to learn.

I find it easy to get HIS to do what I want it to do.

It is easy for me to become skilful at using HIS.

Information Quality

HIS provide sufficient information

HIS provide the precise information you need

HIS provide accurate information

HIS provide up-to-date information

HIS provide reports in a useful format

HIS provide clear information

System Quality

HIS employees give prompt service to users

HIS has users' best interests at heart

HIS has up-to-date hardware and software

HIS is dependable

HIS employees have the knowledge to do their job well

User Satisfaction

HIS meets adequately my information processing needs

HIS is efficient

HIS is effective

Overall, I am satisfied with HIS

Perceived Usefulness

Using HIS in my job enables me to accomplish my tasks more quickly.

Using HIS improves my job performance.

Using HIS in my job increases my productivity.

Using HIS makes it easier to do my job.

Overall, I find HIS useful to my job.

Aptitude for Using Computer

I feel that I have a special talent using computers.

I could solve any problem with a computer.

I know what to do when a new situation appear in my computer.

I feel that I am quite capable to use any word processor

I am afraid of make a mistake when using my computer

I feel that I am quite capable of creating a Web page.

I feel that I am quite capable of downloading files from another computer.

I feel that I am quite capable of making a purchase on the Internet.

I feel that I am quite capable of interacting in a social network.

I feel that I am quite capable of filing my tax return or doing some legal paperwork with a Government Administration over the Internet.

I feel that I am quite capable of finding information on the World Wide Web.

I feel that I am quite capable of changing the configuration of my operation system.