



Using SERVQUAL Model to Assess Hospital Information System Service Quality

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Received 2018 December 01; Revised 2019 January 08; Accepted 2019 February 04.

Abstract

Background: Assessment of hospital information system (HIS) service quality helps to meet the needs of users and a strategy to expand the interaction between HIS developers and the users. SERVQUAL is an extensively used technique to measure the service quality of information systems.

Objectives: The purpose of this study was to assess HIS service quality by the SERVQUAL model in the teaching hospitals affiliated to Urmia University of Medical Sciences (UMSU).

Methods: This study is a descriptive analysis carried out in UMSU teaching hospitals in 2017. The sample was comprised of 270 users selected randomly via multi-stage cluster sampling. The modified SERVQUAL questionnaire, which included five dimensions, was used to collect data. The gap between the perceptions and the expectations of the users was calculated and the significance of scores was tested.

Results: The highest quality gaps in the five dimensions were related to responsiveness (-1.52) and reliability (-1.34) and also the lowest quality gap was related to tangibles (-0.95). There were significant differences between perceptions and expectations of the users in all SERVQUAL dimensions ($P < 0.001$). This implied that the quality of the delivered services was lower than what the users expected.

Conclusions: Given the greatest gap in responsiveness and reliability, it is essential that HIS vendors focus on providing HIS support and updating services and allocate IT staff with the right knowledge and skills to provide the trust needed to use HIS services in the users.

Keywords: Hospital Information Systems, SERVQUAL Model, Service Quality, Information Technology, Information Systems Assessment

1. Background

Hospitals are one of the most important facilities providing healthcare services all over the world (1). The quality and cost-effectiveness of healthcare delivered are major issues to be continuously improved in order to have higher patient satisfaction (2). This requires up-to-date, accurate, and timely information supplied by information systems implemented in hospitals for clinical and administrative decision making (3, 4).

The hospital information system (HIS) is a computerized system that has been designed to manage information and provide supportive services for performing hospital activities (5). The various researches indicate that the implementation of HIS has a wide range of benefits for hospitals. HIS can be useful and effective in improving the quality of patient care services and increasing hospital staff ef-

iciency. Also, it can reduce treatment costs and medical errors (6-8).

There are three main aspects of the success of information systems: Information quality, system quality, and service quality (9). The earlier studies conducted on the evaluation of HIS have focused on information and system qualities (10-12). Given the impact of HIS services quality on its success, it is essential that further research should be performed on HIS service quality assessment (9, 13).

The findings of previous studies have shown that HIS users are the customers of system, service, and information. Hence, the quality of HIS services should satisfy users' expectations and guarantee usage continuity (13-15). The vendors and developers of ISs should provide appropriate support services to ensure that users effectively and satisfactorily use their products (16-18).

Assessment of HIS services quality can be a require-

ment to meet the needs of the users and a strategy to expand the interaction between HIS developers and the users (14, 19, 20). It is imperative that HIS is continuously evaluated to reach such high-caliber services (15). Accordingly, a validated instrument is required to measure HIS service quality (6, 7, 17, 18).

A widely applied method of assessing service quality is the SERVQUAL or gap analysis model. This model measures the service quality as the gap between a customer's expectations of service and the customer's perceptions of the service delivered (21, 22).

The SERVQUAL tool was used for the first time through modification of the items in the specific context of information system service quality measurement (20). Over the past few years, SERVQUAL has been widely accepted and used as a valid instrument for measuring IS service quality such as the quality of website, software, and e-banking services (22-24). Studies have demonstrated that SERVQUAL can be an effective and appropriate tool for measuring the quality of information system services (20, 22-25).

2. Objectives

The use of HIS is spreading more and more in Iranian hospitals. Given the great cost invested in designing and implementation of HIS, it is necessary to evaluate the quality of the services provided by HIS. The purpose of this study was to assess HIS service quality by the SERVQUAL model in the university-related hospitals of Urmia, Iran.

3. Methods

The current study is a descriptive analysis conducted in 2017. Using a multi-stage sampling method, the study participants were selected randomly. They consisted of 270 users who used HIS for more than one year. Four university-related hospitals were clusters. The selection was done according to the number of the users from the different types of occupations that have been directly associated with HIS in each cluster. Those occupations were: Physicians, nurses, paramedical staffs, health information technology staffs, and administrative staffs.

SERVQUAL questionnaire was used to collect data. This model tries to measure the quality of service by comparing customers' expectations and their perceptions of actual performance from five dimensions (tangibles, reliability, responsiveness, assurance, and empathy) and 22 items (22). The first part of the questionnaire is dedicated to the respondents' demographic information such as gender, age, occupation, work experience, computer skills,

and use of HIS services. The second part measures the customer expectations concerning a service and the third part is the perception of the actual service delivered. The participants' responses were rated by a seven-point Likert scale ranging from strongly disagree (one) to strongly agree (seven).

The validity of the modified instrument was verified via valid scientific texts (26, 27) and comments of the experts in the health information management and the medical informatics fields. Internal consistency was used to test the reliability and the values of Cronbach's alpha were estimated to be 0.83.

The gap between the scores of perceptions and the expectations was simply calculated by subtracting them.

Data analyses were performed using descriptive statistics and analytical statistics using SPSS software.

4. Results

Of 270 surveys distributed, 165 were returned (overall response, 61.1%). The frequency of the female respondents were (59.4%) and their mean age and work experience were 37.3 and 11.4 years, respectively.

Most of the respondents were nurses (35.2%). The majority of HIS users (34.6%) had work experience between five and ten years. Most of them affirmed that their computer skills were intermediate (53.4%) and have used moderately (55.7%) HIS services (Table 1).

The mean scores of expectations in all of the items were higher than perceptions. The highest gap (-1.84) between users' perception and expectation was an item that belonged to the reliability dimension referred to provide accurate and error-free services from HIS vendors. The lowest gap (-0.69) was modern IT equipment and up-to-date software from the tangibles dimension (Table 2).

The highest and lowest quality gaps in all the items of five dimensions were related to responsiveness (-1.52) and tangibles (-0.95), respectively. There were significant differences between the perceptions and expectations of the users in all SERVQUAL dimensions ($P < 0.001$) (Table 3). These differences are shown by error bars in Figure 1.

5. Discussion

The results of this research showed that there are significant gaps between users' perception and expectation in all five SERVQUAL dimensions. These gaps are increased from tangibles (-0.95) to responsiveness (-1.52) dimensions in ascending order. The items with maximum gaps in all dimensions were: user-friendly and visually attractive HIS

Table 1. Demographic Characteristics of HIS Users (N =165)

Characteristics	No. (%)
Gender	
Male	67 (40.6)
Female	98 (59.4)
Age, y	
< 30	31 (18.8)
30 - 40	63 (38.2)
40 - 50	48 (29.1)
≥ 50	23 (13.9)
Occupation	
Physician	35 (21.2)
Nurse	58 (35.2)
Health information management	25 (15.1)
Paramedical staff	20 (12.1)
Administrative staff	27 (16.4)
Work experience	
< 5	23 (13.9)
5 - 10	57 (34.6)
10 - 15	49 (29.7)
≥ 15	36 (21.8)
Computer skills	
Fundamental	41 (24.8)
Intermediate	88 (53.4)
Advanced	36 (21.8)
Use of HIS services	
Low	28 (17)
Medium	92 (55.7)
High	45 (27.3)

(tangibles), providing accurate and error-free services (reliability), availability of IT staff when they were required by the users (responsiveness), suitable knowledge and skill of IT staff (assurance), and the proper attention to resolve users' problems (empathy). These items generally reveal that users of HIS are not satisfied with HIS services quality and system characteristics.

Chang et al. (13) found that HIS offers services that are intangible and negatively affect the work performance of the users. This is consistent with our results. Although the gap score of tangibility is less than other dimensions in the present study, the users significantly are dissatisfied with tangibility of HIS. Wibawa et al. (28) applied the SERVQUAL to evaluate a HIS in Indonesia. The system reliability and response time in their study had the highest gap score. These

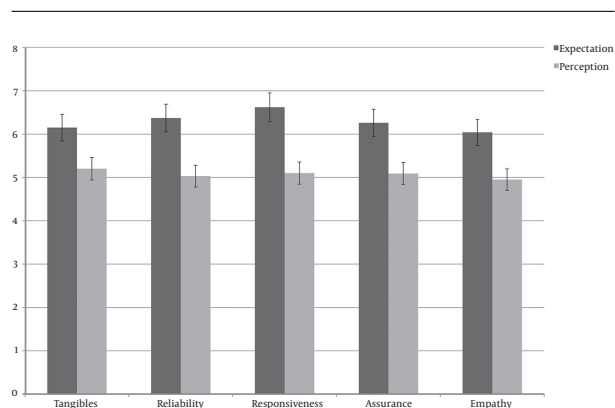


Figure 1. The general differences between users' perception and expectation in all items of five dimensions

dimensions were the most unsatisfactory among the users of HIS in the study of Chang et al. (13) and the highest gap in a research conducted by Amelia et al. (29) that assessed the quality of IS/IT services provided in higher education.

Among five dimensions of SERVQUAL, responsiveness and reliability, which are chiefly about the human aspects of service delivery (30) and also they are more objective (25), have the highest gap in our study and this confirms previous findings in the literature. The users can evaluate these aspects of HIS better than other dimensions (25, 30). Hence, the vendors should consider more the feedback of HIS users about reliability and responsiveness dimensions.

In the present study, the gap between perception and expectation of “modern IT equipment and up-to-date software” is the least among other items of tangibles. This shows that the infrastructure of the studied HIS is approximately acceptable but are not user-friendly and visually attractive nonetheless.

HIS that is user-friendly and has modern technologies can be used effectively by the users (31). Involving users during the design and implementation of HIS and receiving feedback from them are the key solutions to increase user-friendliness and attractiveness of HIS (32).

The findings of Khalifa and Alswailem (33) revealed that the pharmacists and physicians were the least satisfied with the user-friendliness of HIS. They believed that attractiveness and user-friendliness are the influential factors of technology acceptance.

The users of HIS in our study feel a less gap between their perception and expectation in “providing HIS services at the promised time” than other items in the reliability domain. Providing incorrect services at the promised time is definitely useless. In the first contact, HIS problems in our study are resolved by the hospitals' IT staff. They

Table 2. Mean Scores of Expectation, Perception, and Quality Gap of Services Provided by HIS^a

Items of Quality Dimensions	Expectation	Perception	Gap
Tangibles			
Modern IT equipment and up-to-date software	5.84 ± 1.35	5.15 ± 1.42	-0.69 ± 1.38
User-friendly and visually attractive HIS	6.17 ± 1.12	5.05 ± 1.45	-1.12 ± 1.29
Understandable HIS reports	6.26 ± 1.05	5.18 ± 1.40	-1.08 ± 1.22
Easy-to-use HIS	6.32 ± 0.77	5.44 ± 1.23	-0.88 ± 1.32
Reliability			
Providing services according to HIS vendor commitments	6.29 ± 0.83	5.15 ± 1.46	-1.14 ± 1.22
Real interest of HIS vendor to solve users' problems	6.37 ± 0.75	5.05 ± 1.55	-1.32 ± 1.15
Providing accurate and error-free services	6.75 ± 0.53	4.91 ± 1.74	-1.84 ± 1.13
Providing HIS services at the promised time	6.09 ± 0.86	5.02 ± 1.52	-1.07 ± 1.34
Responsiveness			
Maintain and update HIS services	6.77 ± 0.61	5.20 ± 1.33	-1.57 ± 1.09
Determining a schedule to do HIS services	6.23 ± 0.72	4.91 ± 1.86	-1.32 ± 1.35
HIS vendor priority for responding to users' requests	6.58 ± 0.69	5.13 ± 1.46	-1.35 ± 1.33
Providing HIS services quickly and accurately	6.86 ± 0.53	5.25 ± 1.42	-1.61 ± 1.05
Availability of IT staff when users required	6.69 ± 0.86	5.05 ± 1.51	-1.64 ± 0.97
Assurance			
Create confidence of users by IT staff to use HIS services	6.37 ± 0.75	5.05 ± 1.55	-1.32 ± 1.14
Comfortable feeling in communication with IT staff	6.09 ± 0.86	5.02 ± 1.52	-1.07 ± 1.36
Courteous interaction with HIS users	6.29 ± 0.83	5.15 ± 1.46	-1.14 ± 1.25
Suitable knowledge and skill of IT staff	6.75 ± 0.53	4.93 ± 1.84	-1.82 ± 0.79
Empathy			
Individual attention to users for customizing HIS services	6.11 ± 1.08	5.05 ± 1.55	-1.06 ± 1.31
Understand the specific needs of users	6.06 ± 1.10	5.05 ± 1.51	-1.11 ± 1.18
The tendency of IT staff for helping willingly to users	5.90 ± 1.25	4.78 ± 1.67	-1.12 ± 1.15
The proper attention to resolve users' problems	6.25 ± 1.02	5.02 ± 1.56	-1.23 ± 1.07
Respect for cultural values and user desires	5.88 ± 1.23	4.85 ± 1.62	-1.03 ± 1.29

^a Values are expressed as mean ± SD.

Table 3. Paired-Sample t-Test to Compare Users' Expectations and Perceptions of HIS Service Quality

Quality Dimensions	Expectation	Perception	Gap	T	P Value
Tangibles	6.15 ± 1.15	5.20 ± 0.85	-0.95 ± 1.30	-11.09	0.001
Reliability	6.37 ± 0.83	5.03 ± 0.96	-1.34 ± 1.21	-12.96	0.000
Responsiveness	6.62 ± 0.75	5.10 ± 0.89	-1.52 ± 1.16	-15.22	0.000
Assurance	6.26 ± 1.04	5.09 ± 0.93	-1.17 ± 1.15	-14.13	0.009
Empathy	6.04 ± 1.13	4.95 ± 1.04	-1.09 ± 1.20	-11.87	0.003

might easily be able to solve the problems at the promised time, but most of the time, the problems are not solved and are referred to the vendor that is located in the capital (Tehran).

The results of the present study show that among all items of the responsiveness domain, the users are the least satisfied with the availability of IT staff when they are faced with problems of the system. The staff of hospital's IT department is responsible for many other tasks in the hospital and many problems are referred to the staff of HIS vendor. These factors have led to the unavailability of IT staff

when required by the users.

Assurance domain is generally about knowledge of IT employees and their ability to create trust in HIS users (14). Empathy measures the personal attention and caring received by HIS users from IT staff (31). Both domains are more subjective than other domains (25). In our study, there is a less gap between expectation and perception of users about easy communication with IT staff in the domain of assurance. Nevertheless, the perception of HIS users has the highest gap with their expectation about creating confidence in the users by IT staff to use HIS services.

The hospital employees do not have good familiarity with information systems (13). They should be motivated by IT staff and their confidence kept at a good level for using the benefits of HIS. The substantial difference is observed between expectation and perception of HIS users about the proper attention of IT staff to resolve their problems. The examination of all items of empathy domain shows that the gap scores between expectation and perception are close to each other. This reveals that HIS users state a low deviation that IT staffs do not have enough empathy.

To the best of our knowledge, this study is the first about the assessment of HIS services of Iranian hospitals. However, the modification of SERVQUAL model based on cultures of our country could lead to better results.

5.1. Conclusions

This study showed that in the five domains of quality of HIS services, there was a negative gap between the users' expectations and perceptions. This implies that the quality of the delivered services was lower than what the users expected. Therefore, HIS vendors should seek to eliminate the gap between the users' expectations and perceptions.

Given that there were high gaps in responsiveness and reliability dimensions, it is recommended to consider the provision of accurate services, maintenance, and updating of HIS. Obviously, it is critical that IT staff should be available when is required by the users and they should create trust in users for the use of HIS services. Moreover, HIS vendors should allocate IT staffs that have suitable knowledge and skill to improve the responsiveness and assurance.

It is thus recommended that the health information management department of hospitals should have continuous communication with HIS vendors, in order to improve benefits and gain more achievements generated by hospital information systems.

Supplementary Material

Supplementary material(s) is available [here](#) [To read supplementary materials, please refer to the journal website and open PDF/HTML].

Acknowledgments

The authors acknowledge all HIS users in the educational hospitals of Urmia.

Footnotes

Authors' Contribution: Study concept and design: Mohamad Jebraeily. Analysis and interpretation of data: Mohamad Jebraeily, Hadi Lotfnezhad Afshar. Drafting of the manuscript: Hadi Lotfnezhad Afshar, Zahra Zare Fazlollahi, Bahlol Rahimi. Critical revision of the manuscript for important intellectual content: Zahra Zare Fazlollahi, Bahlol Rahimi. Statistical analysis: Mohamad Jebraeily, Hadi Lotfnezhad Afshar.

Conflict of Interests: The authors of this article declared no conflict of interests.

Ethical Considerations: This study was approved by the Ethics Committee of Urmia University of Medical Sciences (UMSU) numbered UMSU.REC.1395.497. Written informed consent was obtained from all the enrolled cases.

Funding/Support: This article resulted from research project No. 95-01-52-2735 funded by deputy of research, Urmia University of Medical Sciences.

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