

Assessment of Hospital Information System Quality in Multi Specialty Hospitals

G. V. R. K. Acharyulu

Abstract—The rapid advance of information technology in health settings has accentuated the importance of addressing the shortcomings of current health information system practices. Hospital Information Systems (HIS) play a significant role in providing quality healthcare services. However, HIS lag behind their industrial counterparts in providing quality (i.e., timely, accurate, complete) information and have been the target of many criticisms for alleged shortcomings. The aim of this research is to identify the requirements for HIS to assist in providing quality healthcare service. To this end, questionnaires were designed to assess the level of satisfaction of different HIS users. In addition, this research introduces the concept of loss function and relates it to repercussions of HIS customer dissatisfaction.

Index Terms—Information System (IS), technology, Hospital Information System (HIS), customer satisfaction.

I. INTRODUCTION

Hospital Information System can be defined as a massive, integrated system that support the comprehensive information requirements of hospitals, including patient, clinical, ancillary and financial management [1] [2] [3] [4]. Hospitals are extremely complex institutions with large departments and units coordinate care for patients. Hospitals are becoming more reliant on the ability of hospital information system (HIS) to assist in the diagnosis, management and education for better and improved services and practices [5].

The term “quality” of information systems has been categorized by six major dimensions of IS success [6]: System Quality, Information Quality, Use, User Satisfaction, Individual Impact and Organizational Impact. But HIS now incorporate a significant service component which should be added to the six dimensions. Indeed, HIS customers expect the HIS department to assist them with a myriad of tasks, such as hardware and software selection, installation, problem resolution, integration with other networks, system modifications or development, education, conversion of data to information meaningful for decision making, etc. [7]. Information systems applications have contributed to better health service management and delivery of care by creating an environment conducive to increased access and quality of patient care and by supporting the knowledge base required for clinical and administrative decision making.

There has been a major paradigm shift in healthcare information processing, corresponding to changes in the goals of the organization. The traditional emphasis on data

has now given way to emphasis on information. Central control has now evolved to empowerment. Healthcare organizations are now much more concerned with each other and how they can exchange services, and necessarily patient information. This has forced information systems to leave the traditional

Healthcare institutions’ physical boundaries. Now, more than ever, healthcare enterprises wield HIS to provide strategic, connected information to reduce costs, improve patient care, and increase service levels to their customers.

With the changes occurring in the context of the health sector reform processes information systems must have the ability to:

- Capture and deliver data at the point of service
- Support concurrent and multi-centric clinical and administrative information utilization and exchange
- Support intensive data manipulation
- Provide facilities to support synchronous, as opposed to retrospective, decision making

Health information systems (HIS) comprise the entire infrastructure, organisation, workforce and components for the collection, processing, storage, transmission, display, dissemination and disposition of information in the healthcare industry¹. In many clinical and hospitals settings, HIS tend to consist of enormous silos of paper-based or electronic data that are fragmented or of poor quality, exposing systems to risk of infraction. Rapid advances in information technology (IT) enablers and mobile devices such as personal digital assistants (PDA), or combination personal computer (PC)/phone devices, has done little to diminish these threats.

Hospital Information System (HIS) has evolved as an integration system of order entry systems, an administrative system, and departmental subsystems within a hospital. It has become more and more necessary for every health care staff in a hospital to use a computer terminal at almost every day’s works. Under this circumstances, HIS is expected to provide the staffs with various, world-wide information for decision making and better communication environment which can be used just on the computer terminals for everyday’s works. Furthermore, tele-communication between a central hospital and a satellite clinic/hospital has become more and more necessary especially when a physician consult with domain experts in other hospitals concerning his/her patients’ care.

Hospital information systems (HIS) are just one instance of health information systems, with a hospital as health care environment. A HIS is a comprehensive and integrated information system designed to store, manipulate, retrieve information of the administrative and clinical aspects [8].

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II. OBJECTIVES

The objective of the study is to assess customer satisfaction of HIS to identify the status of information quality in hospitals and develop a integrated information system model by taking inputs from users of HIS for quality improvement.

III. METHODOLOGY

The research instrument was a questionnaire adapted from Barley and Pearson (1983) and Ribière et al. (1999) (cited in [9]) but has been modified to suit the purpose of this study. HIS customers can be identified as internal or external. Internal customers are Doctors, Nurses, Laboratory technologists, Pharmacists, Quality department, and others within a healthcare facility that interact with the essential processes. External customers are: Patients, Patients’ families, Insurance Providers, Suppliers, Health Services Researchers, etc. This research study focuses on internal HIS users (or customers) only

The research design is qualitative and consists of three leading multispecialty corporate hospitals (above 500 bedded) in Hyderabad. The names of the corporate hospitals are masked to avoid inter conflict of opinion among the hospitals in the competitive environment. Population consists of Doctors, Nurses, Administrative staff and other users.

The questionnaires were distributed to 180 HIS users from three different hospitals 60 from each hospital that uses the same HIS system. These respondents were selected through purposive sampling. The assessment of variables measured using Likert’s five point scale viz. 1.Strongly Disagree 2. Disagree 3. Neither Agree nor Disagree 4. Agree 5. Strongly Agree.

IV. RESULTS AND ANALYSIS

A. Descriptive Statistics

Table 1 shows the descriptive statistics of the sample. The customers have given higher average score i.e. 4.16 for the assessment variable no.11: the present information system needs modifications and improvement for efficient and effective patient care. Similarly, there is agreement among users that HIS will improve quality of decision making i.e. the average score is 4.11 for the assessment variable no.2. The variables nearer to agreement are 8 and 10 indicate that information system can reduce waiting time in the care process and information delay was happened due to network connectivity. The users are disagreeing on the ability to communicate and exchange data among departments and some customization is required to the Information System.

TABLE I: DESCRIPTIVE STATISTICS (N = 180)

S. No	Assessment Variable	Mean	Std. deviation
1	Information System provides sufficient, accurate, understandable and timely information	3.03	1.160
2	HIS improve the quality of decisions by making information readily available	4.11	.957
3	The output is presented in a useful format in a well designed layout and graphics	2.70	.978
4	The Information System has ability to offer a chance to reverse and correct a mistake	3.06	1.195
5	The Information System is easy to use in terms of menus and customization	2.49	1.187
6	The Information System has ability to communicate and exchange data among departments	2.12	.744
7	The Information System provides complete and secured information	2.99	.609
8	The Information System can reduce waiting time	3.79	.971
9	Delayed from or prevented using the Information System due to password problems	3.08	.919
10	Delayed from or prevented using the Information System because network connectivity	3.80	1.103
11	Present information system needs modification or improvement for efficient and effective patient care.	4.16	.750
12	Database access problem when attending patient-related work	3.41	.576

B. Inferential Statistics

Data gathered was not normally distributed for all type of inferential analysis. This is based on the Shapiro and Wilk analysis. As the p-value is less than 0.05, the distribution is not normal. Thus Kruskal-Wallis test was used for the nonparametric analysis. The Cronbach's Alpha is 0.607 for the data collected for 12 items which indicates the reliability if data. The significance results were shown in Table 2.

- There is statistically significant difference in ‘HIS improve the quality of decisions by making information readily available’ score across three groups as the sig-value was 0.009 and less than alpha level 0.05, and an inspection the mean ranks of Doctors had the highest agreement followed with Nurses, Administrative and ‘others’.
- There is statistically significant difference in ‘The output is presented in a useful format in a well designed layout and graphics’ score across three groups as the sig-value was 0.015 and less than alpha level 0.05, and an inspection the mean ranks of Administrative and ‘others’ had the highest agreement followed with Nurses, and Doctors.

TABLE II: KRUSKAL-WALLIS TEST RESULTS (DF =2, ALFA =0.05)

Assessment Variable	category	N	Mean Rank	Chi-square Asymp significance
Information System provides sufficient, accurate, understandable and timely information	Doctors	60	89.78	0.902
	Nurses	60	88.90	
	Administrative and others	60	92.83	
	Total	180		
HIS improve the quality of decisions by making information readily available	Doctors	60	105.00	0.009
	Nurses	60	89.21	
	Administrative and others	60	77.29	
	Total	180		
The output is presented in a useful format in a well designed layout and graphics	Doctors	60	75.62	0.015
	Nurses	60	95.49	
	Administrative and others	60	100.39	
	Total	180		
The Information System has ability to offer a chance to reverse and correct a mistake	Doctors	60	81.03	0.200
	Nurses	60	94.33	
	Administrative and others	60	96.13	
	Total	180		
The Information System is easy to use in terms of menus and customization	Doctors	60	77.28	0.035
	Nurses	60	94.17	
	Administrative and others	60	100.05	
	Total	180		
The Information System has ability to communicate and exchange data among departments	Doctors	60	73.75	0.018
	Nurses	60	88.10	
	Administrative and others	60	109.65	
	Total	180		
The Information System provides complete and secured information	Doctors	60	92.81	0.045
	Nurses	60	85.31	
	Administrative and others	60	95.38	
	Total	180		
The Information System can reduce waiting time	Doctors	60	79.05	0.049
	Nurses	60	91.20	
	Administrative and others	60	101.25	
	Total	180		
Delayed from or prevented using the Information System due to password problems	Doctors	60	90.40	0.977
	Nurses	60	91.51	
	Administrative and others	60	89.59	
	Total	180		
Delayed from or prevented using the Information System because network connectivity	Doctors	60	79.19	0.003
	Nurses	60	92.28	
	Administrative and others	60	100.03	
	Total	180		
Present information system needs	Doctors	60	77.43	0.022
	Nurses	60	98.28	

modification or improvement for efficient and effective patient care.	Administrative and others	60	95.79	
	Total	180		
Database access problem when attending patient-related work	Doctors	60	89.35	0.747
	Nurses	60	94.10	
	Administrative and others	60	88.05	
	Total	180		

- There is statistically significant difference in ‘The Information System is easy to use in terms of menus and customization’ score across three groups as the sig-value was 0.035 and less than alpha level 0.05, and an inspection the mean ranks of Administrative and ‘others’ had the highest agreement followed with Nurses, and Doctors.
- There is statistically significant difference in ‘The Information System has ability to communicate and exchange data among departments’ score across three groups as the sig-value was 0.018 and less than alpha level 0.05, and an inspection the mean ranks of Administrative and ‘others’ had the highest agreement followed with Nurses, and Doctors.
- There is statistically significant difference in ‘The Information System provides complete and secured information’ score across three groups as the sig-value was 0.045 and less than alpha level 0.05, and an inspection the mean ranks of Administrative and ‘others’ had the highest agreement followed with Doctors and Nurses.
- There is statistically significant difference in ‘The Information System can reduce waiting time’ score across three groups as the sig-value was 0.049 and less than alpha level 0.05, and an inspection the mean ranks of Administrative and ‘others’ had the highest agreement followed with Nurses and Doctors.
- There is statistically significant difference in ‘Present information system needs modification or improvement for efficient and effective patient care.’ score across three groups as the sig-value was 0.022 and less than alpha level 0.05, and an inspection the mean ranks of Nurses had the highest agreement followed with Administrative and ‘others’ and Doctors

V. CHALLENGES FOR HEALTHCARE INFORMATION SYSTEMS

New requirements and technological advances occurring in healthcare, information systems, and information technology have influenced the evolving role of healthcare information systems and related technology [10]. Relevant aspects that took place in the evolution of systems and technology in order to appropriately support healthcare

organizations are:

- The diverse organizational healthcare environment of information systems, which need to be adapted to multiple types of healthcare organizations.
- Dynamic changes in the required role of information systems, following changes in the role and dynamics of all levels of healthcare delivery and management.
- The need for integration of information systems within healthcare organizations, which are also organized as networks.
- Technological advances in systems structure and communications, facilitating the implementation of integrated healthcare networks.

VI. INTEGRATED MODEL OF A HOSPITAL INFORMATION SYSTEM.

Health care industry is one of the most information intensive and technologically advanced in our society. Thus, the information should be accessible easily, timely, complete, accurate, reliable and relevant information in making important strategic or patient care decisions. Figure 1.1 shows the integration of business process viz. Administration & Registration, Clinical System, Pharmacy, Electronic Medical Records, Radiology, Laboratory, Accounting and Nursing [11]. To be more precise, the entire hospital system that is being practiced with the manual system has to be completely transformed into electronic by using the latest information technology.

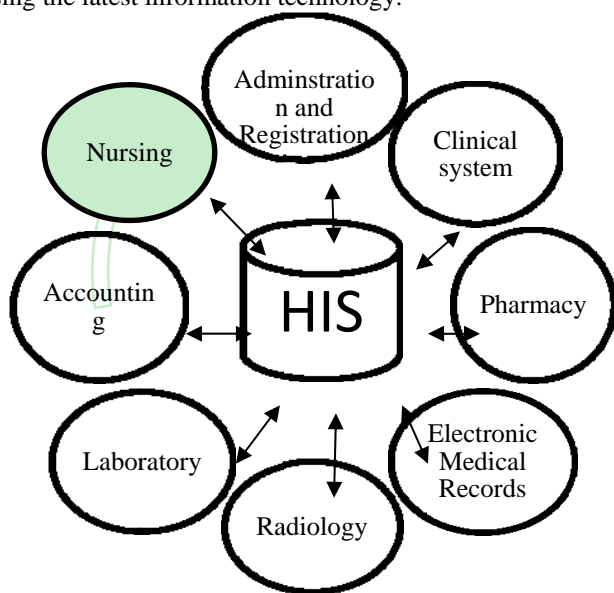


Fig.1. HIS integration model.

VII. CONCLUSION

From admission to diagnostic and medical support services, the modern healthcare centers rely on wide range of software applications. Proper implementation of HIS modules will definitely lead to improved quality of patient

care, communications, productivity and reduced costs, chances of errors. To track patient records, Electronic Medical Records (EMR) has emerged for improving quality of healthcare delivery. In the 21st century, patients will be able to choose the hospital that best meets their needs and satisfies their high standards for medical care requirements.

Hospitals must therefore be prepared to offer medical services tailored to patients' needs. It is also essential for the hospital management to conduct the assessment of HIS regularly by internal customers for incorporating continuous technology innovations and design requirements to satisfy external customers through seamless integration of HIS across all the departments in the hospital.

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