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Technological Impact of Enterprise Resource Planning Systems in Healthcare Services

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ABSTRACT

Use of enterprise resource planning systems (ERPs) has a positive technological impact on healthcare services which plays an important role in the improvement of healthcare service quality. The purpose of this article is to evaluate the technological impact of Enterprise Resource Planning Systems (ERPs) in healthcare services and its relationship with healthcare service quality. A hypothetical framework has been presented which has two dimensions for technological impact i.e. Quality of Information and Quality of System. Both dimension (Quality of Information and Quality of System) are positively postulated to relate with the service quality of healthcare. All the scales used in this study have been adopted from the literature. Data has been collected through self-administrated questionnaires with total sample size of N=120. The results of this study revealed that the use of ERP has a positive significant technological impact which is directly associated with the service quality of the healthcare. This research has both theoretical and managerial contribution as it adds literature in current knowledge and helps healthcare professionals to better understand technological impact of ERP systems, its use in healthcare services and its relationship with healthcare service quality.

KEYWORDS: Enterprise Resource Planning Systems, Quality of Information, Quality of System, Technological Impact, Healthcare Quality Performance

INTRODUCTION

Enterprise Resource Planning system (ERPs) is customizable and comprehensive software that includes combined business solutions for the essential processes like planning, production, control management and the core administrative purposes like human resource management and accounting [1]. ERP enhances the performance of organization through end-to-end connectivity [2]. ERPs are the fastest growing and central development in information technology sector [3]. ERPs has an advantage over the non-integrated systems i.e. a single enterprise business view that covers all departmental functions and a unified database where all communications are entered, documented, handled, examined, and conveyed[2]. The integrated system increases the magnitude of interdepartmental coordination, cooperation, responsiveness and communication [4].

Healthcare Enterprise Resource Planning system can be defined as an integrative system that covers widespread information of healthcare unit including the patient statistics, clinical facts and management of finances [5]. Healthcare units are complex institutions that consist of large departments for patient care. ERPs in hospitals assists in attaining better-quality of healthcare practices and services [6]. The success of information system in healthcare depends upon several factors i.e. “quality of system”, “quality of information”, “use of software”, “satisfaction of user”, “impact on individual system” and organization [7]. The application of information system in healthcare has resulted in better management of health services, increased patient care quality and improved decision making in healthcare administration [8].

Healthcare units require integrated systems which permit the procedure planning to be applied on patients while instantaneously examining the necessary capacity [9]. Several studies have been carried out to analyse the use of ERPs on healthcare units [10, 11]. The success factors for the implementation of ERPs in small healthcare organization have been studied by Trimmer et al. [11] while McGinnis et al. [10] reported the case of a small hospital in rural area that had a successful implementation of ERPs. Healthcare organizations have a very complex system and have various functional areas that make difficult for ERPs to be implemented effectively [12]. Overall the purpose of this research paper is to assess the relationship between technological impact of ERPs use in healthcare services and “healthcare service quality”.

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LITERATURE REVIEW

ERPs is an Information System that aids the business in integration of its resources for enhancing competitiveness in the business and improvement in its operational performance [13]. The development of ERPs has been initiated with evolution in communication and information technologies which has resulted in higher efficiency of system, enhancement in the flow of information, reduction in the cost and increase in productivity[14]. Information system is a part of everyday human life and organizations invest a lot in information systems [7]. The expenditure on the information systems has reached up to thousand billion dollars yearly all over the globe, the system quality success is dependent on practice and research [15]. Many studies have reported the profits of ERPs like information system integration [16], benefits related to decision support [17] and improvement in organizational productivity [18, 19]. ERPs provide an organization to achieve competitive advantage and gain business goals by integrating all business aspects [20]. The adoption of information technology by an organization is based on its decision to acquire technology and to make it user available [21]. In the healthcare sector the adoption of information technology may be critical because it is related to human lives [22]. Hence this decision is impacted by many interests and different backgrounds [23]. The actors in healthcare sector influences the process of information system adoption and their role needs to be properly managed[18]. Information technology applications play significant role in managing large patient data accumulation. The implementation of information technology in health care system guarantees the precise and timely information exchange and a well-organized resource to be use in healthcare system [24]. Effective practice of information technology requires that how it can be used for meeting challenges faced by an organization [25]

The publicity of failure rate of ERPs had influenced company's decision to invest money and a big investment is required by company to implement Enterprise Resource Planning system [26]. Successful ERPs implementation is dependent on maturity level of an organization and the approach for implementing ERPs[27].

TECHNOLOGICAL IMPACT

Nowadays, the business environment is characterized by technological change, increased competition among companies, shortened life cycle of product, subcontracting, increased use of system and growing communication [12]. As a result of this situation the companies implement the ERPs to confront new threats and challenges of globalization [12]. ERPs bring multidimensional benefits to organization including intangible and tangible benefits [28]. The integration of information and data enables proper and up to date decision making. ERPs helps in business process reorganization and data centralization which results in cost reduction in business process [29]. Technological impact is categorized in to two types i.e. "Information Quality" and "System Quality".

- Information Quality
- System Quality

INFORMATION QUALITY

"Information Quality" is an analysis of the information system output quality and it is referred as the quality of output produced by the ERPs [7]. That dimensions include "consistency", "accuracy", "completeness" and "currency" [7]. Consistency means that the conflict does not exist in between the data sets, accuracy refers that an attribute is a real world entity as similar as a value preserved in other database [7]. Completeness means that all the required data is present and currency deals that all the information is up-to-date [7]. Currency, accuracy, information quality format and completeness dimensions have been used by [30]. Gorla et al. [31] included timeliness and ease of use in addition to these dimensions mentioned above. They included these dimensions as they are affected by the software or hardware system. They also included "information accuracy" as it is related to content of information. So the "information quality" broad categories include the information format and information content. Information format is the presentation style of information that it is provided in format that can be understood easily. Information content deals with the information that is presented in report to the user. Format, accuracy and content dimensions has been used by Rai et al. [32].

SYSTEM QUALITY

"System Quality" is an analysis of the information system performance from a design and technical perspective [7]. It includes components of data and software and is measurement of magnitude of how much a system is technically sound [31]. "System quality" deals with the issue that whether the bugs are present in system, user interface consistency, documentation quality, program quality maintainability and ease of use [31]. Certain attributes can measure system quality like integration, reliability, functionality, flexibility, data quality and ease of use [33].

Sedera and Gable [34] developed an instrument based on nine attributes for system quality customization, system accuracy, integration, system features, flexibility, sophistication, integration, ease of learning, ease of use and user requirements.

HEALTHCARE SERVICE QUALITY

Quality is a product which is achieved through services to attain customer satisfaction and managerially it can be defined as an excellence achieved in providing a service [35]. Cost effectiveness is very important in every perspective which means that good quality in health care should be affordable by health care customers and professionals. Quality should be achieved through defined standards [36]. Patient satisfaction is related to responsiveness, empathy, caring and reliability [37]. Other factors identified are efficiency, service availability, continuity, physician conduct, confidence and outcomes [38]. Other dimension in healthcare evaluation involves professional credibility, communications, core services, competence and customization [39].

Service quality has gained importance as it is a source for distinguishing between services and provides competitive advantage. Healthcare services are critical and important due to high risk involved [40]. This concept makes the measurement of customer service quality and satisfaction difficult in a heath care setting [41]. Quality in a health care sector will not improve until it is measured as the quality of service and intangibles [42]. Service quality and customer satisfaction remain a serious issue in health care. Ensuring service quality is advantageous for health care providers and health care consumers [43]. Customers express their intentions in a positive way like by preferring one service provider over another, praising the service provider and increased purchase [44].

THE RESEARCH MODEL AND HYPOTHESIS

The research model which has two independent variables i.e. “information quality” and “system quality” and one dependent variable is shown in the figure 1. “Information Quality” is referred to the quality of output produced by ERPs and “System Quality” is referred to the quality of ERPs from technical point of view. The dependent variable is referred as the quality of Healthcare Services given in the healthcare organizations. Detail of constructs for these variables are shown in survey instrument section.

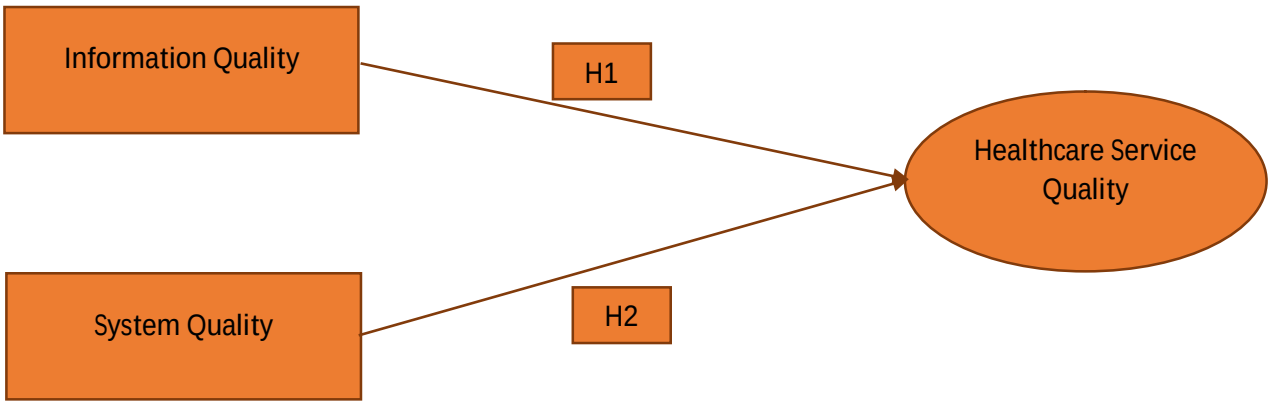

Figure 1: Research Model

Following hypothesis are postulated
H1: “Information Quality” is directly related to “Healthcare Service Quality”.
H2: “System Quality” is directly related to “Healthcare Service Quality”.

RESEARCH METHODOLOGY

DATA COLLECTION

The data is collected through self-administration of survey instrument to 210 healthcare professionals who are also the users of ERP systems in five health care organizations with response rate of 57%. Table 1 shows the demographic analysis.

Table 1: Demographics

	Category	Frequency	Percentage
Gender	Male	70	58.3
	Female	50	41.7
Age	20 to 25 Years	39	32.5
	26 to 30 Years	39	32.5
	31 to 35 years	31	25.8
	36 to 40 Years	8	6.7
	40 Years and above	3	2.5
Experience	Less than 3 Years	18	15.0
	3 to 5 Years	61	50.8
	6 Years or more	41	34.2

Figure 2 shows the gender wise graphical representation of respondents. 58% of our respondents are male while 42% of respondents are female.

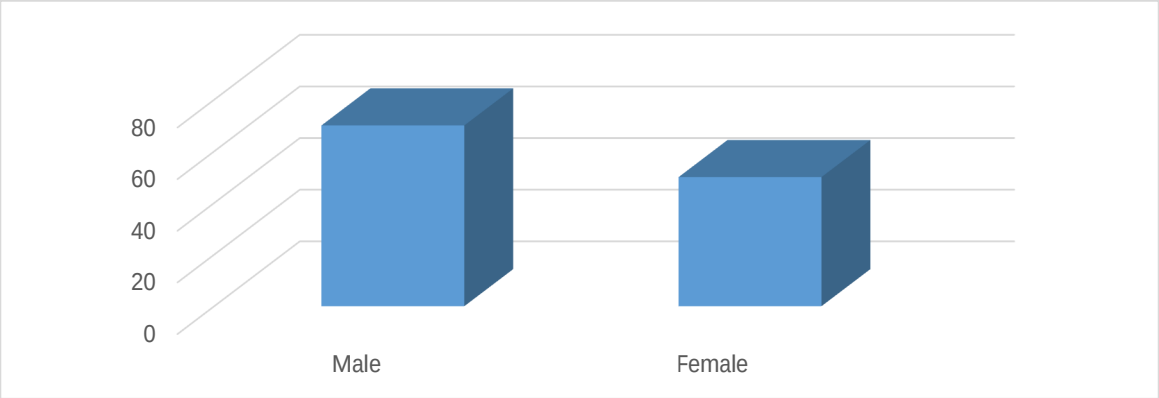

Figure 2 Graphical Representation of Demographics (Gender)

Similarly Figure 3 shows the "Age" wise graphical representation of respondents. Around 32% of our respondents are from age slabs of 20 to 25 and 26 to 30 years. 26% and 7% of our respondents are from age slab of 31 to 35 and 36 to 40 years respectively. Only 3 % of our respondents are from age slab of 40 years and above.

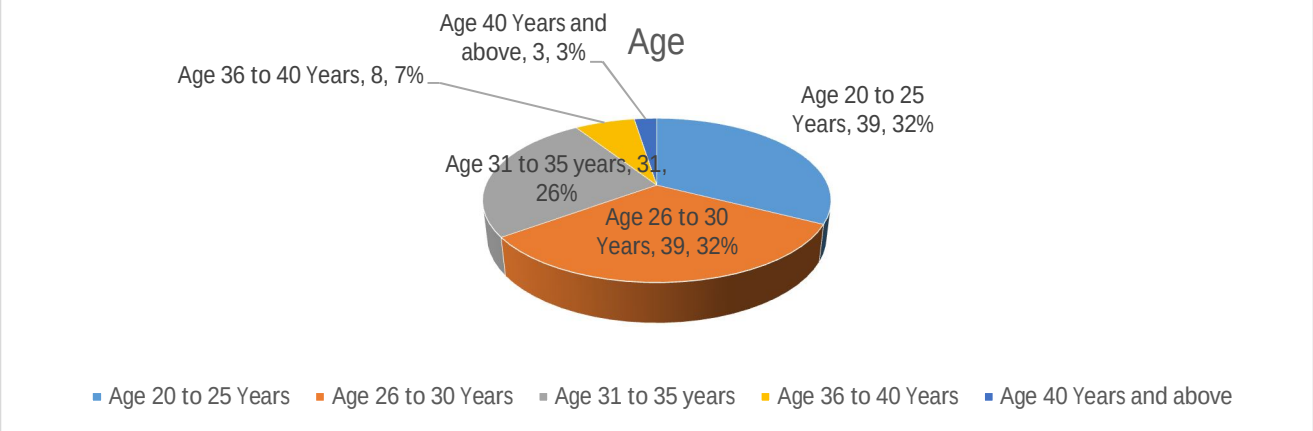

Figure 3 Graphical Representation of Demographics (Age)

Whereas Figure 4 shows the experience wise graphical representation of respondents as 15% of respondents have less than 3 years of experience. Similarly 51% and 34% respondents have 3 to 5 years and more than 5 Years of experience respectively.

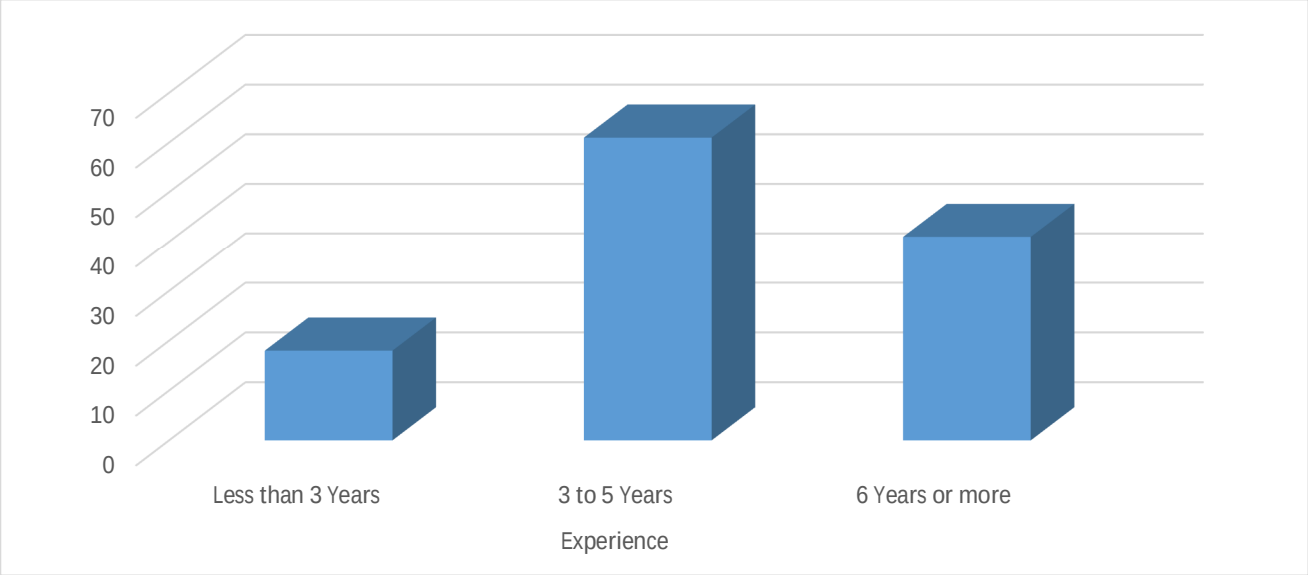

Figure 4 Graphical Representations of Demographics (Experience)

SURVEY INSTRUMENT

A survey instrument is used to test our hypothesis. This survey instrument has two parts i.e. variable measurement questions and other part is for demographics of respondents. The variable measurement part has two types of variables to be measured i.e. independent variable and dependent variable and is explained below.

INDEPENDENT VARIABLES

INFORMATION QUALITY

The information quality variable is measured through questions given by [7]. Total 10 questions are asked to measure information quality on five-point Likert-type scale ("1" is for "strongly disagree","2" is for "disagree","3" is for "neutral","4" is for "agree" and "5" is for "strongly agree").

SYSTEM QUALITY

The System Quality variable is also measured through questions given by [7] and measured through 12 questions. Respondents are asked to answer the question on five-point Likert-typeScale.i.e. "1" is for "strongly disagree","2" is for "disagree","3" is for "neutral","4" is for "agree" and "5" is for "strongly agree".

DEPENDENT VARIABLE

HEALTHCARE SERVICE QUALITY

In this research the four dimensions for Healthcare Service Quality are used as given by [45] i.e. reliability, empathy, assurance and responsiveness. Total 17 questions are asked from respondents on five-point Likertscale.i.e. "1" is for "strongly disagree","2" is for "disagree","3" is for "neutral","4" is for "agree" and "5" is for "strongly agree". These question are reproduced on SERVQUAL scale on the basis of healthcare dimensions given by Kim [46]

DATA ANALYSIS

The process of data analysis is started by checking the reliability of all dimensions. To check the reliability of the measures we have calculated Cronbach's Alpha value for our variables and finds appropriate reliability coefficients (ranging from 0.8.7 to 0.896).

Table 2: Descriptive Statistics, Cronbach's Alpha values and Correlations

	Mean	Standard Deviation	Alpha	Information Quality	System Quality	Healthcare Service Quality
Information Quality	3.94	0.809	0.896	1		
System Quality	4.05	0.58	0.838	.123**	1	
Healthcare Service Quality	4.01	0.49	0.807	.500**	.515**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows descriptive statistics, Cronbach's Alpha values and correlations value between the variables. The results of this study show that the use of ERP systems has a positive technological impact on healthcare services as the mean of both of the variables (Information Quality and System Quality) are 3.94 and 4.05 respectively. Additionally, table 2 shows a correlation analysis between the independent variables (Information Quality and System Quality) and dependent variable (Healthcare Service Quality). The results indicate that there is a positive relationship of Information Quality and System Quality with the healthcare service quality as values ranged from 0.500 to 0.515.

Table 3 shows the regression analysis. Both Information quality and system quality has significant relationship. Variance in Healthcare service quality is more due to system quality as compared to information quality.

Table 3: Regression Analysis

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	2.272	.268		8.466	.000
	Information_Quality	.162	.068	.267	2.386	.002
	System_Quality	.273	.095	.322	2.881	.004
a. Dependent Variable: Healthcare_Service_Quality						

CONCLUSION

The purpose of this research paper is to analyze the impact of Enterprise Resource Planning Systems use in healthcare services and its relation with the healthcare service quality. This study shows a positive technological impact of ERP use in healthcare services. Quality in information and system produced by the ERP systems results in better healthcare service quality. From theoretical point of view this study is contributed in literature by providing the relationship of factors for technological impact of ERP system use in healthcare services with healthcare service quality. Besides theoretical impact this study has also contributed managerially as it will help healthcare organizations to analyze the technological impact of ERP systems, its relationship with healthcare service quality and unable them to formulate strategy to improve healthcare service quality. This study also have some limitations as data is only collected from local healthcare organizations in Pakistan and results are based on data from five healthcare organizations and cannot be generalized. There may be some other impacts of ERP systems which may also have relationship with healthcare service quality so future studies can be made in finding these impact and their relationship with healthcare service quality which will help the healthcare organizations to improve their service quality.

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