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THE EFFECTS OF MANAGEMENT INFORMATION SYSTEMS ON QUALITY OF HEALTH SERVICES: AN EMPIRICAL ANALYSIS IN HOSPITALS IN SALAH AL-DIN

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Abstract

The effect of information management systems on service quality is frequently studied in the literature. With the Covid 19 pandemic process, health services have started to be prioritized all over the world. This study aims to show the effects of the management information system in achieving the quality of health service in hospitals in Salah al-Din Governorate - in the Republic of Iraq.

The research problem determined in accordance with the purpose of the research was analyzed using multiple regression analysis. The data used in the study was collected by survey. 194 employees who work as managerial or medical personnel participated in the research. The research results confirmed that management information systems' usage level positively affected health service quality.

Keywords: Management Information System, Health Services Quality, Management, Hospital, Iraq.

Jel Codes: M20, M15

YÖNETİM BİLGİ SİSTEMLERİNİN SAĞLIK HİZMETLERİNİN KALİTESİ ÜZERİNE ETKİLERİ: SALAH AL-DİN HASTANELERİNDE AMPİRİK BİR ANALİZ

Öz

Bilgi yönetim sistemlerinin hizmet kalitesine etkisi literatürde sıkça çalışılan bir konudur. Covid 19 pandemi süreci ile birlikte tüm dünyada sağlık hizmetlerine öncelik verilmeye başlanmıştır. Bu çalışma, Irak Cumhuriyeti'nde Salah al-Din Valiliği'ndeki hastanelerde sağlık hizmeti kalitesinin sağlanmasında yönetim bilgi sisteminin etkilerini göstermeyi amaçlamaktadır.

Araştırmanın amacına uygun olarak belirlenen araştırma problemi çoklu regresyon analizi kullanılarak analiz edilmiştir. Araştırmada kullanılan veriler anket yoluyla toplanmıştır. Araştırmaya yönetici veya sağlık personeli olarak görev yapan 194 çalışan katılmıştır. Araştırma sonuçları, yönetim bilgi sistemlerinin kullanım düzeyinin sağlık hizmetlerinin kalitesi üzerinde olumlu etkileri olduğunu doğrulamıştır.

Anahtar Kelimeler: Yönetim Bilgi Sistemi, Sağlık Hizmetleri Kalitesi, Yönetim, Hastane, Irak.

Jel Kodları: M20, M15

1.Introduction

With the Covid 19 epidemic, the importance of the health sector has increased all over the world. So, this study focuses on healthcare organizations. Iraq's healthcare system has undergone significant transformations in recent years. The rapidly increasing number of private health institutions increases competition. Health institutions have begun to attach more importance to service quality in such an environment to create and maintain a competitive advantage. As a result, service quality has become essential for healthcare providers. Healthcare quality is essential for healthcare providers, patients, and governments. Various studies have demonstrated the service quality perceived by the patients (Headly & Miller, 1993; Taylor, 1994; Gooding, 1995; Reidenbach & McClung, 1999, Donabedian, 2005).

On the other hand, a limited number of studies examine the quality of service for employees in health institutions. However, employees are one of the critical stakeholders of service quality. We could not find any study focused on countries where the health sector has developed recently, such as Iraq. In light of this information, our study focused on the hospitals in Iraq.

Service quality is the difference between customers' expectations and perceptions of the service received. Service quality is "the service the customer receives and is willing to pay for" rather than "the service provided to the customers." It covers the process of providing superior service to meet customer expectations. Dalgıç (2013) lists the factors affecting service quality in his study as follows; (I) Reliability, (II) Responsiveness, (III) Sufficiency, (IV) Accessibility, (V) Respect, (VI) Communication, (VII) Credibility and (VIII) Security. Service quality is the product of a process in which all the mentioned factors are considered together. Moreover, all stakeholders should be involved in developing a participatory process; stakeholders should need valuable information. As mentioned in the study of Prakash (2019), service quality literature reaches a consensus that information has a critical role in service quality.

Information systems are a network of components that meet and help design valuable information. Writers and researchers differed in the definition of an administrative information system. Although the term has been in use since the 1960s, there is no agreement on its definition. The available descriptions often reflect the writers' interests, academic backgrounds, and the angle they perceive. Therefore, most books on the information system deal with system analysis, file design, and other technical matters related to the automatic calculator (Al-Hussein, 1999). It is a collection of components, procedures, people, and devices that produce specific information. This system is not considered an information system unless it aims to serve at least one aspect of the administrative process, especially managerial decision-making (Benbya, Pachidi, & Jarvenpaa, 2021).

The literature review shows that management information systems positively affect service quality. In light of this information, the subject of the study is to determine if the usage level of management information systems impacts the perception of health service quality.

2. Literature Review and Hypothesis Development

Although many studies examine the relationship between service quality and information quality, very few studies focusing on health services have been found for Middle East countries. These studies generally focused on the information system and the health service quality separately. Under this heading, studies supporting the argument that information systems are essential for service quality are included.

Lee, Choi, Kang, Cho, & Chae (2002) aimed to evaluate the continuous application of quality improvement in Korean hospitals. The degree of quality was estimated through the continuous application of quality improvement through the National Malcolm Baldrige Award criteria. Elements associated with the continuous use of quality improvement include four components for this application, which are cultural, technical, strategic, and structural for hospitals separately. The most important findings of this study are several factors, the most important of which are:

high-quality production system capable of accurate and correct information. They pointed out the importance of information for service quality.

Al-Shurafa (2004) aimed to evaluate the information systems in the Ministry of Health Gaza Strip by evaluating the computerized systems and identifying the various factors that affect their use by their users. The study sample included (156) users distributed over four health institutions with computerized work procedures. The study's findings show that information systems positively affect managerial processes.

Polluste, Habicht, Kalda, & Lember (2007) aimed to assess the quality of the system of health institutions in Estonia using a tool provided by the World Health Organization (WHO). The results showed the positive and negative points of the Estonian health system and proven techniques for improving the quality of health services in Estonia. It was found that enhancing the coordination interaction of quality control is a crucial factor.

Badri, Attia , & Ustadi (2008)'s findings show that patients and their pleasure were the most important considerations in the planning, executing, and assessing service delivery and that satisfying patient requirements and developing healthcare standards were critical to achieving high quality.

Zineldin, Camgoz Akdag, & Belal (2012) explained the effect of information on service quality through total relationship management (TRM). TRM emphasizes the importance of quality and customer/patient service, as well as the impact of the external environment on business rules and performance, relationships and networks, communications, and interactions with various actors, collaborators, and employees in various departments/functions.

Purcărea, Gheorghe, & Petrescu (2013)'s primary objective is to apply the SERVQUAL model in public healthcare services in Romania. The most prominent conclusion is that the most significant gap was inferred for the tangibility dimension, followed by the response and reliability dimensions. They emphasized the need for

information to match patient expectations and perceptions and understand healthcare in a competitive market.

Muya & Kimando (2018) focused on the public hospital in our study. They assessed the effects of information systems on service quality in public hospitals in Kiambu County. In this study, the effect of information systems on leadership was determined as a path; and then the effect of leadership on service quality was investigated. They found that information systems and leadership affect the current service quality positively.

Andre (2019) studied on effects of information systems on medical service quality. She focused on doctors and patients. She found that information systems affected medical records quality. So, she mentioned that better information systems mean better medical service quality.

Prakash (2019) studied service quality using by literature review method. He examined the articles published from 1984 to 2017. This study shows that information systems are among the most influential factors in service quality.

Oppong, Hinson, Adeola, Muritala, & Kosiba (2021) assessed the information systems' effect on user satisfaction in Ghana. They found positive effects on satisfaction. They suggested that hospitals should use information systems effectively. The study results showed that satisfied patients also lead to lower hospital costs.

Ayele, ve diğerleri (2021) concentrated on the impact of health information systems on data quality. They did not take care of the health service quality. The analysis was done with data from 25 health institutions in Addis Ababa City. As a result of the analysis, it was concluded that the health information system is related to data quality. This finding supports the relationship between information systems and information quality.

Gadalla & Ahmed (2021) examined the information system's impact on patient healthcare quality at Benghazi Medical Center, Libya. The data were obtained from a survey and analyzed. In this study, examinations were made from the patient's point

of view. In conclusion, they mentioned that patients overlooked the importance of the health information system. The authors suggest investigating the effects of information systems in management in future studies.

Veronika & Jayathilaka (2021) also examined the impact of the information system on health care quality for patients (Gadalla & Ahmed, 2021). The data were obtained during the Covid-19 global pandemic situation in Sri Lanka. The authors used a questionnaire form to get data. The patients were pleased with using digital innovations and new applications. They also express that information systems have become more critical with the Covid-19 global pandemic healthcare companies.

According to the studies mentioned above, this study was conducted to understand further the effects of management information systems on the quality of health services for hospitals in Salah Al-Din. The main research problem is "*Does the usage level of management information systems affect the quality of health services?"* Regarding the research problem, one hypothesis was tested in this study.

H1: The management information system has a statistically significant effect on the quality of health services.

3. Methodology

3.1. Population, Sample, and Analysis Methods

The research was conducted on employees working in hospitals in Salah al-Din Governorate / Iraq. The population for this study consisted of individuals working as a manager or medical officials in three hospitals in Salah al-Din Governorate / Iraq: Tuz Khurmatu General Hospital, Dijla Hospital for Medical Rehabilitation, Salah El-Din, and Salah El Din General Hospital.

Because of the Covid 19 days, the research population was limited to three hospitals. Other hospitals did not want to join the survey—the population size of the three hospitals was254. The questionnaire form was prepared online and shared with employees on several platforms to obtain an adequate sample size in Covid-19 days;

All participants completed the survey anonymously and voluntarily. Totally 200 employees of 254 participated in the research. Among the 200 participants, six were excluded because of excessive missing data. The participation percentage of the questionnaire is approximately % 77.

Research data were obtained through an online questionnaire prepared following the purpose. The questionnaire form consists of three parts. In the first part, there were questions about participants' demographic information. The second part of the survey included questions about the usage level of management information systems in the hospital where participants work. In the third part of the survey, there were questions to evaluate the participant's health service quality. The survey form was adapted from the study of (Al-Taweel, Al-Jalili, & Wahhab, 2010). The survey form was prepared and answered in the Arabic language.

After the test for the reliability of the scales, multiple regression analyses were used to test the hypothesis.

3.2. Results

The results in this section are presented in five parts. In these parts, the findings relating to the sample demographics, descriptive statistics, validity and reliability analyses, and test of hypotheses are discussed, respectively.

3.2.1. Sample Demographics

The sample of this research was 194 employees who work in three hospitals in Salah al-Din Governorate / Iraq. Demographic results include gender, age groups, academic qualification, job title, and employees' length of experience.

According to Table 1, the number of male participants in the questionnaire reached (113), and the number of female participants (81). The vast majority of respondents are between the ages of 20 and 50. The survey participants were classified into three groups due to their educational level. The groups are post-graduate, bachelor's degree, and undergraduate. According to table 3, (8) participants had post-graduate, (114) participants had bachelor's degrees, and (72) participants had

undergraduate education levels. The largest percentage (30%) of respondents have 1-5 years of job experience. Most of the respondents have less than 15 years of experience.

Table 1. Distribution of Participants

Variables	Categories	Samples	Percentage
Gender	Male	113	58.3 %
	Female	81	41.7 %
Age	- 20	4	2.06%
	20-29	55	28.35%
	30 -39	69	35.56%
	40 -49	51	26.28%
	Over 50	15	7.73%
Education	Post-graduate	8	4.1%
	Bachelor's Degree	114	58.8%
	Under-graduate	72	37.1%
Experiences	1-5	58	29.9 %
	6-10	37	19.1 %
	11-15	46	23.7 %
	16-20	18	9.3 %
	More than 20	35	18.0 %
Job Position	Management	83	42.8 %
	Medical	111	57.2 %
TOTAL		194	

The survey participants were classified into two groups due to their job position. The groups are management employees and medical employees. According to table 4, (83) participants were management employees; (111) were medical employees.

3.2.2. Descriptive Statistics

Descriptive statistics, which include a preliminary analysis, should be given before hypothesis tests. Table 2 shows the minimum, maximum, mean, and std. Deviation, skewness, and kurtosis. In the questionnaire form, 1 represents "Strongly Agree," and 5 represents "Absolutely disagree."

According to Table 2, the overall usage level of management information system perception of the participants is very high (Mean=1.71). The item with the lowest mean regarding the usage level of management information system is "Management information system employees adapt quickly to changes" (Mean=2.11), and the item

with the highest mean is "The data will help identify problems and find solutions to them." (Mean=1.85).

Table 2 shows that the perception of the participant's overall health services quality is very high (Mean=1.49). The item with the lowest mean regarding the quality of health services quality is "The hospital adopts the database system in its work." (Mean=2.17), and the item with the highest mean is "Hospital staff behavior increases patient confidence." (Mean=1.56).

Table 2. Descriptive Statistics

Items	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
Managerial Information Systems			***1.71***	***0.56***	***0.05***	***-0.51***
Data and speed cooperation in administrative processes are being done in the hospital.	4	1	1.91	0.61	0.59	1.76
The data will help identify problems and find solutions to them.	4	1	1.85	0.56	0.67	3.16
The data in the hospital should be updated continuously	3	1	1.92	0.58	0.01	-.03
Database prevents stored data recurrence	4	1	2.04	0.80	0.64	.23
The hospital should update its equipment devices, and medical supplies should be used continuously	4	1	1.89	0.83	0.84	.39
Doctors and technical experts work in harmony	4	1	2.10	0.80	0.58	.11
Managers work in harmony with technical experts	5	1	2.01	0.78	0.94	1.75
Those who work in the management information system are experts in their jobs.	5	1	1.91	0.83	1.20	2.26
Management information system employees adapt quickly to changes	5	1	2.11	0.81	0.84	1.17
Management information experts have a high ability to deal with available software and material	5	1	2.10	0.92	0.93	0.88
Quality of Health Services			***1.49***	***0.58***	***0.74***	***-0.42***
Modern equipment has an impact on the quality of hospital services	4	1	1.64	0.67	1.17	2.40
Quick response to providing care for patients when necessary has an impact on the quality of service	3	1	1.68	0.55	0.06	-0.64
The hospital seeks to solve the problem of patients	5	1	1.96	0.93	1.20	1.43
Hospital staff have responded to patients' questions	5	1	1.97	0.88	1.34	2.63
The hospital adopts the database system in its work	5	1	2.17	0.85	0.67	0.53
Hospital management takes care of patients	5	1	1.83	0.73	1.29	3.52
Health workers have the information and knowledge needed to meet patients' needs	5	1	1.92	0.94	1.18	1.38
The staff work according to the needs of the hospitals	5	1	1.95	0.96	1.16	1.27
Take care of the patient in hospitals as much as possible and their needs	5	1	1.83	0.93	1.56	2.79
Hospital staff behavior increases patient confidence	5	1	1.56	0.79	2.00	5.65

3.2.3. Reliability Analysis

Cronbach's alpha is used to calculate reliability coefficients for survey tools that use Likert scale response groups, whether triangular, pentagonal, or heptagonal, where Cronbach's alpha estimates the reliability of the tool's responses (questionnaire) assessed by subjects referring to tool stability. Cronbach's alpha ranges from zero to one, with higher values indicating that the items measure the same dimension. In contrast, if Cronbach's alpha is low (near 0), some or all the elements do not count in the same size. There can also be negative numbers. A negative number indicates something is wrong with the data. Acceptable Cronbach's alpha values of 0.70 and above are good.

Cronbach's alpha also displays how well a set of points score in the given items for the expected score in the entire domain, even if that domain is heterogeneous. Cronbach's alpha is related to factor analysis, as Cronbach's alpha increases with the average correlation between the elements. Hence, an improvement tends to identify features with similar size correlations with most other aspects.

Table 3. Results of Reliability Analyses

Construct	Number of Items	Cronbach's alfa (α)
Management Information System (m)	10	0.985
Quality of Health Services (q)	10	0.982

Table 3 shows that the scales' reliability values (α) are above the threshold value of 0,70 – which means the scales used to collect data are reliable for obtaining accurate data. In other words, the reliability of the scales was ensured.

Table 4. Results of Item Total Statics – Management Information Systems

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
m1	17.974	43.797	.922	.984
m2	18.036	44.677	.880	.986
m3	17.963	44.325	.906	.985
m4	17.845	41.064	.967	.982
m5	17.994	41.166	.917	.984
m6	17.788	41.079	.959	.983
m7	17.876	41.321	.963	.982
m8	17.979	41.077	.928	.984
m9	17.778	41.034	.957	.983

m10	17.788	39.608	.959	.983

Table 5. Results of Item Total Statics – Quality of Health Services

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
q1	16.917	51.475	.894	.981
q2	16.886	53.210	.869	.983
q3	16.597	47.392	.955	.979
q4	16.587	48.119	.950	.979
q5	16.391	49.359	.878	.981
q6	16.732	50.332	.930	.980
q7	16.644	47.515	.944	.980
q8	16.613	46.829	.969	.979
q9	16.732	47.410	.956	.979
q10	17.000	50.176	.871	.982

Tables 4 and 5 show the total statics for management information systems and the quality of health services, respectively.

3.2.4. Tests of Hypothes

This study was conducted to understand further the effects of management information systems on the quality of health services. According to this information, the main hypothesis was "H1: The management information system has a statistically significant effect on the quality of health services." Multiple regression analysis was used to test the main hypothesis of the research.

The findings of the regression analyses carried out to determine the effect of management information systems on the quality of health services are presented in Table 6.

Table 6. Results of Regression Analyses

Variables	Dependent Variables	
	Quality of Health Services	
Control Variables	**Coefficients (β)**	**Significance Value (p)**
Constant	0.673*	0.004
Gender	0.199*	0.000
Age	0.053***	0.055
Education	0.096***	0.065
Experience	0.074*	0.000
Job Position	0.103	0.074
Independent Variable		
Management Information System	**0.658***	**0.000**
F Value	55.629*	0.000
R^2	0.801	
Adjusted R^2	0.629	
Durbin-Watson	0.176	

The regression analysis results show that management information systems had a statistically significant effect on the quality of health services (H1: β=0.658, $p<0.01$). It means that the H1 hypothesis was confirmed. The coefficient of the management information system variable was a positive number. It means that the hospital's management information system level positively affected the quality of health services.

In addition to this result, some control variables are gender (β=0.199, $p<0.01$), age (β=0.053, $p<0.10$), education (β=0.096, $p<0.10$), and experience(β=0.074, $p<0.01$) also had a statistically significant effect on the quality of health services. Contrarily, regression analysis results show that job position did not have any statistically significant impact on the quality of health services.

The R^2 value of the research model was calculated as 0.801 (%80), and the calculated adjusted R^2 value was 0.629 (%62.9). The F value of regression analysis was calculated as 55.629 and found to be statistically significant.

Conclusion

The main hypothesis of the research, "The management information system has a statistically significant effect on the quality of health services." was confirmed by multiple regression analysis for this research data. It shows that if hospitals increase

their usage level of management information systems, the hospital's health services quality would also increase dependently or vice versa. Based on this finding, it can be said that hospitals should invest in management information systems. Because as we know, health service quality makes a positive contribution to the profitability of the enterprise. This finding is consistent with Lee, Choi, Kang, Cho, & Chae (2002), Polluste, Habicht, Kalda, & Lember (2007), Zineldin, Camgoz Akdag, & Belal (2012), Muya & Kimando (2018), Andre (2019), Oppong, Hinson, Adeola, Muritala, & Kosiba (2021) and Veronika & Jayathilaka (2021). The common point of these studies' findings is that information Is crucial for service quality.

This study focused on hospital employees as managers or medical officials. So, the findings were generated depending on employees' perceptions. This point is one of the main differences from the studies mentioned above. Previous studies have generally been based on patients' quality perceptions which could be biased. They do not think about benefit-cost balance. In order to avoid the drawbacks of biased perception, this study focuses on the opinions of professionals. From this point of view, it has been determined that the people who carry out the work believe that information systems are important to increase the quality of health services.

The findings of this study contain messages worth considering for institutions providing health services. The opinion of the professionals is that in an increasingly competitive environment, health institutions that can improve their service quality can gain a significant competitive advantage. Especially in developing countries, this advantage can be considered more critical.

The research data was obtained from employees working in hospitals in Salah al-Din Governorate / Iraq. So, the findings should be evaluated with this limitation in mind. It is thought that future studies focusing on service quality in different sub-dimensions will complement this study.

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