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The Impact of Information and Communication Technology on the Technical Quality of Health Services "A Study at Al-Shatrah General Hospital - Dhi- Qar, Iraq"

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The Impact of Information and Communication Technology on the Technical Quality of Health Services "A Study at Al-Shatrah General Hospital – Dhi- Qar, Iraq"

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Abstract- The aim of this study was to reveal the impact of information and communications technology in improving the technical quality of health services provided at Al-Shatrah General Hospital. The study sample was the type of intention sample. As the questionnaire was adopted as a tool to measure the variables of the study, it was distributed electronically to 108 doctors working in the hospital and the number of respondents was 93 doctors. Data were collected by the Excel program, while statistical analyzes were performed using the SPSS version 23 program. This study is the first of its kind in the Iraqi health sector. The results revealed that information and communication technology affect the technical quality of health services. Whereas, Al-Shatrah General Hospital possesses competent and skilled doctors, but they do not have time for medical diagnosis, which affects the quality of the health services provided. This study made some recommendations, the most important of which is building an internal and external communication system and adopting health information security programs.

Keywords: ICT; technical quality; health services; reliability; the safety.

I. INTRODUCTION

The high- quality health service contributes to improving the health organization's reputation, and this helps it to survive and grow in a competitive environment. Al-Shatrah General Hospital is one of the governmental health organizations that provide health services for patients. Patients often review private sector hospitals instead of reviewing government sector hospitals. They perceive that private sector hospitals have health hardware, equipment, software, and human resources that help in accurate medical diagnosis. Therefore, the study of the impact of information and communication technology in improving the technical quality of health services with a view to diagnosing weaknesses and defects and providing solutions to increase patients' confidence in the health services provided in Al-Shatrah General Hospital.

Edlund et al (2003) conducted a study to analyze the relationship between satisfaction and technical quality of care for common mental disorders.

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The results of the study indicated an association between effect and quality between technical quality and patient satisfaction. The Al-Hassan et al. (2015) study was a statistical test to determine differences in health service perceptions from the service provider and the patient, as the study results showed that teaching patients to comply will help improve the technical quality of health services. Barr et al. (2017) study revealed that the success of information and communication technology depends on supporting social relations and technological organization. The goal of improving information and communication technology will improve the technical quality of health services. Omona and Odongo (2006) have studied the evaluation of the application of information and communications technology in accessing health information in Uganda, where it was interested in analyzing the current situation of information and communication technology applications and the cost of accessing medical information and literacy of information and communications technology. Healthy.

This study is the first of its kind in the Iraqi health sector as the effect of information and communication technology in improving the technical quality of health services have not been studied previously. Technical quality is one of the topics that has not been highlighted by researchers in the Iraqi environment, as it was studied for the first time in the field of Iraqi higher education by (Khaleel and Sayah, 2020), and this study is the second of its kind in terms of its study of the technical quality variable in general and the first in terms of its specialization In the Iraqi health sector.

II. LITERATURE REVIEW

a) Information and Communication Technology

Technology is a term consisting of two parts: the first Techno meaning practical application; The second is Logy, which means science, and therefore technology means "applied science" (Hasson, 2017). The interaction of technology with information was why the emergence of the term information and communication technology (acronym). It is intended to

use modern techniques of computer science and technical analysis in organizing the amount of data and information related to all aspects of life (Alshahrabally and Dawood, 2017).

Apulu and Latham (2011) indicated that information technology and communication is a tool that facilitates communication, processing, information transfer, and knowledge sharing through electronic means. Binuyo and Aregbeshola (2014) referred to it as a wide range of computerized technologies that allow communication, electronic information capture, processing, and transmission. They identified it (Hasan et al., 2016) as a study; Design; Development; Implementation of; Support and management of computer-based information systems, especially software and computer applications. Gargvanshi and Kumar (2020) defined it as a general term that includes the various technologies that deal with information, processing, and presenting it to the people concerned. Information and communications technology can be defined as the systems and tools supporting communication and cooperation between people and organizations efficiently and effectively.

b) *The importance of information and communications technology*

Information and communication technology is important in business strategies because it has a role in improving the competitive situation. It contributes at the industry level to changing its nature in which organizations compete through the integration of industry with computers and various other formations of flexible production. The emergence of information technology has created new opportunities for the top management of organizations. On the level of production economics, the organization's possession of information and communication technology contributes to reducing costs, reducing effort, and optimal use of available resources and highlights the importance of information and communication technology at the level of distribution and marketing activities. The organization's possession of information technology and a modern and advanced communications network enables it to control weaknesses in the market; helps her make the appropriate decisions in marketing (Hammadi et al., 2018; Saleem et al., 2020). Omona and Odongo (2006) pointed out that the importance of information and communication technology in health services lies in the following:

Provide high-quality, up-to-date information and data;

- Avoid geographical boundaries, as people from all over the world have access to information;
- To keep abreast of developments in the field of health globally;
- Enables faster access to relevant information sources;

Be able to improve knowledge of health services. It is an incentive to learn and research.

c) *Types of Information and Communication Technology*

Information and communication technologies in health services are classified into three types based on their role and use in the health field (Barr et al., 2017):

- *Information and Communication Technology for Health Information:* It is concerned with electronic health records that include data and information about medicines, laboratory results, etc. It has a prominent role for coordination between doctors who have common roles and responsibilities and is the basis in making medical decisions. It also contributes to building doctors' capabilities in managing patients and performing work efficiently and effectively without the need for field and direct communication between doctors, which reduces the burden on doctors with multiple tasks (Naik and Singh, 2010)
- *Information and Communication Technology for Telehealth services:* It specializes in providing tele health services using telecommunications techniques. Medical and health advice is provided to patients through information and communication technologies such as telephones and others. It also contributes to the process of communication between medical personnel on various categories of doctors and nurses. It also assists people suffering from chronic diseases through continuous communication with physicians treating them to follow up their health (Vermeulen et al., 2014)
- *Information and Communication Technology The source of learning:* This technology provides them with forums and electronic gatherings to exchange knowledge between doctors and may include patients in some cases. At the same time, this technology provides an opportunity to communicate health institutions and health professional unions (Barr et al., 2017).

d) *Factors affecting Information and Communication Technology*

Information and communications technology in health services is affected by the occupational or career conflict of roles, responsibilities, and cultures. As the absence of explicit rules governing behavior in how and when the communication process is conducted, information and communication technology can exacerbate the differences between cultures. The skills that the medical staff possess are one of the factors affecting information and communication technology, in which health institutions must adopt a continuing education curriculum; and create an appropriate job climate compatible with information and communication technology applications (Barr et al., 2017). Yassir and

Dakhil (2016) They mentioned a group of factors that affect information and communication technology, as follows:

- **Administrative decision:** The administrative decision affects the role of information and communications technology and to facilitate the user's needs (customer, organization) of data.
- **Computing:** Computing is the factory of information technology and its developer.

Political, economic, and security factors: These factors may affect study or training plans (related to information technology) that are set by countries. For example, fees or cancellations of many training programs are imposed due to economic conditions, which makes information technology weak and does not rise to the level of performance.

e) *Dimensions of Information and Communication Technology*

Most researchers agreed that (hardware, equipment, software, communication networks, human resources) represent the components of information and communications technology that depend on them for data collection, processing, and conversion into information that is published, distributed, stored, updated, and retrieved (Hammadi et al., 2018). Accordingly, the current study will address the components of information and communications technology as a measurement model that includes dimensions according to the following:

- **Hardware and Equipment:** This dimension focuses on the hardware and equipment needed to run the software. The computer may be the most obvious part of this dimension, and this dimension includes medical devices, imaging devices, data projectors, and data entry devices such as mouse and keyboard (Sittig and Singh, 2015).
- **Software:** Represents drivers guide the hardware components of hardware and equipment (Hammadi et al., 2018). This dimension includes system drivers and application software and is responsible for processing, storing, retrieving, and transmitting health data as needed (Sittig and Singh, 2015).
- **Communication Networks:** Communication technology is important and has a valuable content in information and communication technology and represents a group of computers and surrounding devices connected to allow users to exchange information (Abdul Hadi and Hadi, 2018).
- **Human Resources:** The most important aspect of information and communication technology because they that it is the decision-maker in determining the usefulness of information for adoption in the decision-making process, and they are the people who operate and manage

information and communication technology (Hammadi et al., 2018).

f) *Technical Quality of Health Services*

The American Joint Commission on Accreditation of Hospitals (JCAH) defines the quality of the health service as the level of adherence to standards approved for good practice and the expected results of the health service or diagnosis or medical problem (Al Jazari et al., 2011). Quality should be available in the health services provided to patients according to pre-defined specifications and standards and presented at the required times in a manner that achieves patient satisfaction (Musleh, 2017).

Technical quality seeks to achieve customer satisfaction and gain and maintain their loyalty. The technical quality of health services depends on good diagnostic methods, information systems, and infrastructure and the skills of service providers (Mittal and Lassar, 1998). The technical quality of health services is defined as the knowledge and technology side. It represents the knowledge, skills, and experiences and the degree of scientific and technological progress available for medical care, techniques, and methods used in medical care (Al Jazari et al., 2011). While (Ghebremichael, 2019) defined it as customer perception of quality about the final (actual) result of the service. Al Hassan et al. (2015) defined technical quality in health services as the extent to which health services meet the standards Predetermined. Accordingly, the technical quality of health services can be defined as the final and actual result that patients receive. Al hassan et al., (2015) referred that the quality of health services is divided into two types, namely technical quality, and perceived quality. While (Edlund et al., 2003) referred that the quality of health services is classified into:

- **Technical Quality:** Relates to the extent to which the health service conforms to the standards previously determined by the service provider.
- **Personal Quality:** which represents the quality of medical personnel
- **Patient comfort:** It relates to the amenities that affect patients regarding the level of service.

It can be said personal quality represents the functional quality of health services as it relates to how to provide services to patients and the relationships that arise between service providers and patients receiving the health service. As for the patient's comfort, it represents the mental image of the patient's quality level, which corresponds to the perceived quality.

Technical quality in health services includes medical knowledge; Physical examination; Arrange tests when needed; Making the correct diagnosis; He described the appropriate treatment. Patients, especially the elderly, may not distinguish between the technical

quality of health services and other aspects related to the technical quality of a doctor's performance. The technical quality of health services is closely related to communication skills; Interpersonal skills; Trustworthiness (Rao et al., 2006). While (AlHassan et al., 2015) indicated that the results of the technical quality assessment without taking into account the experiences and opinions of patients might not enhance the quality from the customer/patient perspective, which is required. The Safe Care Initiative, in collaboration with the Pharm Access Foundation, the Southern Africa Health Services Accreditation Council (Southern Africa - COHSASA), and the Joint Commission International (JCI), has proposed evaluation criteria categorized as: (Leadership and Accountability; Competent Workforce Capacity; Safe Environment for Employees and Patient Auditors; Clinical Care For patients; improving quality and safety).

g) *The Importance of Technical Quality of Health Services*

Technical quality represents the degree to which the service can meet the requirements correctly. "It is measured according to technical standards; it represents the equivalent of service to quality specifications. The absence of complications when treating patients is an example of the technical quality of health services. The importance of technical quality of services is highlighted. Health focuses on medical and health tools and means and medical diagnosis (Fiala et al., 2012). Chakraborty and Frick (2002) were referring that the technical quality of health services determines the level of application of WHO standards. In addition to that, the technical quality works to diagnose the nature and quality of the problems related to the technical aspects of health services. It can be said that the technical quality highlights its importance in improving the mental image of patients about health services.

h) *Factors Affecting the Technical Quality of Health Services*

Quality of health service is affected by factors including analyzing patient expectations; Design quality of service; The performance of health and administrative staff; And other factors represented in the financial capabilities of the health institution (Al-Asadi, 2019). Similarly, the technical quality of health services is also affected by several factors that can be summarized according to the following (Chakraborty and Frick., 2002):

- **Performance:** The technical quality of health services is affected by the performance of medical personnel, which requires them to possess the knowledge and skill necessary to provide the minimum performance by accepted health standards that lead to customer satisfaction. For these health organizations work to develop the

performance of their cadres through specialized training programs.

- **Medical devices and equipment:** The lack of available devices, equipment, and tools for medical diagnosis affects the technical quality of the health service.
 - **Excessive prescribing of the drug without regard to the social and economic condition of patients.**
- i) *The Dimensions of The Technical Quality of Health Services*

The technical quality in the health service is the extent to which the health services conform to the pre-established standards. To measure the technical quality in health services, the dimensions indicated by (Keramidou and Triantafyllopoulos, 2018) have been adopted with the addition of a safety dimension because of its importance in measuring the technical quality of health services in our current field of study. Below are dimensions the technical quality of health services:

- **Reliability:** represents the health institution's ability to provide a service that matches the pre-determined criteria. It is the degree of dependence on providing the required service with the accuracy and the right time (Al Jazari et al., 2011).
- **The efficiency of performance:** means having the skills and knowledge required to perform the service. The efficiency of performance includes both the knowledge and skills of service providers at their various levels and specialties and the research capacity of the organization (Parasuraman et al., 1985). It is the skills, technical capabilities and consistent, correct, and actual performance of the health institution providing the services (Al-Zubaidi and Al-Shujairy, 2018).
- **Safety:** means that health services are free from errors, risks, and skepticism (Al Jazari et al., 2011).

III. HYPOTHESES

For the purpose of upgrading the health service provided, health organizations strive to improve their services for the survival and growth that are linked to patient satisfaction, and since patient satisfaction is affected by the technical quality of health services obtained from health organizations. The importance of this study was highlighted by knowing the effect of information and communication technology on the technical quality of the health service provided at Al-Shatrah General Hospital. What kind of relationships do they have. The hypotheses stated as follows:

H1: There is a significant correlation between the ICT variable and the technical quality variable.

H2: There is a significant correlation between the Hardware and Equipment dimension and technical quality.

H3: There is a significant correlation between Software and Technical Quality.
H4: There is a significant correlation between communication networks and technical quality.
H5: There is a significant correlation between human resources and technical quality.
H6: There is a significant effect of the ICT variable on the technical quality variable.

H7: There is a significant effect of Hardware and Equipment dimension on the technical quality variable.
H8: There is a significant effect of Software dimension on technical quality.
H9: There is a significant effect of the dimension of Communication Networks on technical quality.
H10: There is a significant effect of the Human Resources dimension on technical quality. Below is a hypothesized model for the study

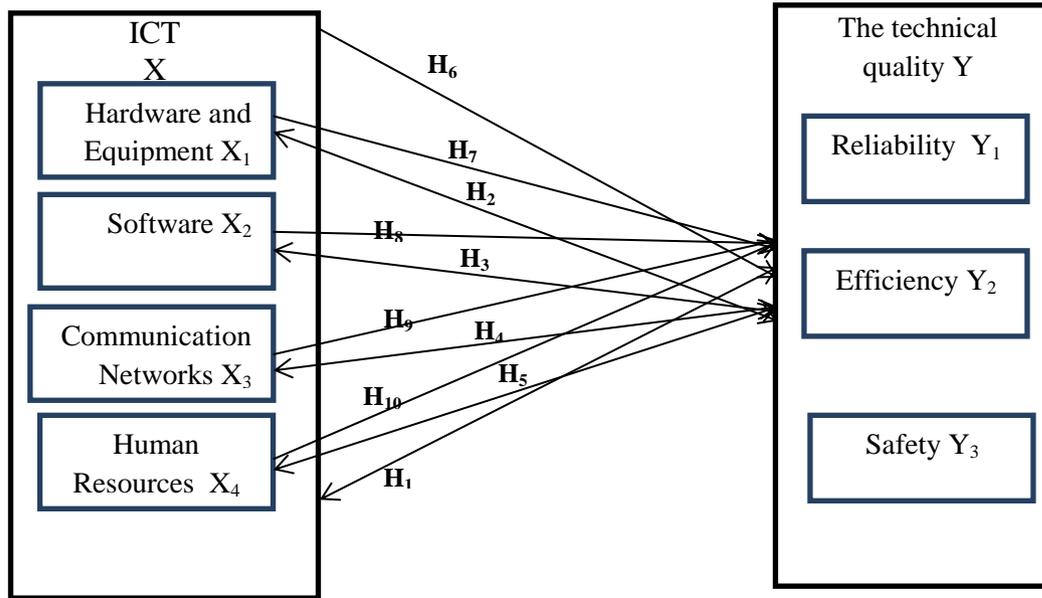


Figure 1: A hypothesized model for the study

IV. SAMPLE AND DATA COLLECTION

The sampling method used in the present study is an intentional sampling. To represent this community for study realistically, all the doctors working in Al-Shatrah General Hospital were chosen. The questionnaire was distributed electronically to 108 doctors from different specialties, and 93 usable answers, or 86.1%, were received.

Respondents included 67 (72.05%) male from doctor and 26 (27.95%) female doctor. Most of the educational qualifications of the respondents were MA 40 and Ph.D. 35 with a percentage of (43% and 37.6%), respectively while the number of respondents with a bachelor's degree was 18 doctors with a percentage (19.4%). The majority of respondents had work experience from 20 - less than 25 years (39.6 %) followed by 15 - less than 20 years (25.2%) and 10 - less than 15 years (15.3%) and less than 5 years (10.8%) and five - less than ten years (8.1%) 25 years and over (0.9%).

V. MEASUREMENT OF SEARCH VARIABLES

To measure the variable of information and communication technology, the questionnaire used by (Abdul Hadi and Hadi, 2018) was approved after making

adjustments and developments in proportion to the field of study. The ICT questionnaire has four dimensions: hardware and equipment; and software; Communication networks; and human resources. The questionnaire was organized from 15 indicators to measure the four dimensions of information and communication technology. The technical quality of health services was measured using a questionnaire. Because the questionnaire consisted of 3 dimensions, the reliability and efficiency measurements were relied on from the study (Keramidou and Triantafyllopoulos2018). Still after safety, it was designed to fit the field of study. The indicators for measuring the technical quality of health services, according to the questionnaire reached 14 indicators.

The questionnaire was designed according to the Likert pentatonic scale 1 "I strongly disagree" and 5 "Strongly agree." Then the validity of the questionnaire was tested by distributing it to a pilot sample of 30 doctors. The Cronbach's Alpha value was obtained, which was 0.94, which is greater than 0.6, and thus, the designed resolution is suitable for exploring the research. A data distribution test was also conducted to determine the type of data distribution, whether it was normal or abnormal. The Kolmogorov-Smirnov was

obtained from the results of Table 1, the value of a Kolmogorov-Smirnov for the information and communication technology variable was 0.069 and for the technical quality variable for health services 0.080.

Since the value of sig values in Table 1 is greater than the significance level of 0.05, this indicates that the distribution is normal and that it is possible to perform statistical tests.

Table 1: Tests of Normality

Tests of Normality Kolmogorov-Smirnov ^a			
variable	Kolmogorov-Smirnov ^a		
	Statistic	df	Sig.
The information and communication technology	.069	111	0.200*
The technical quality	.080	111	0.081

VI. DESCRIPTIVE STATISTICS AND CORRELATIONS

The collected data were processed using the SPSS V.23. In Table 2, the results refer that the mean for

the ICT variable was 3, 2426, with a standard deviation of 0.77625. The dimension of human resources got the highest relative importance, as it reached 66.546%, while the dimension of communication networks got the least relative importance, which reached 61.712%.

Table 2: Descriptive statistics of the variable of information and communication technology

The independent variable and its dimensions	Mean	Std. Deviation	%
Hardware and Equipment X ₁	3.2680	1.05460	65.36%
Software X ₂	3.3108	0.75845	66.216%
Communication Networks X ₃	3.0856	0.80869	61.712%
Human Resources X ₄	3.3273	0.97647	66.546%
Information and Communication Technology X	3.2426	0.77625	

In Table 3, the results refer that the mean value of the technical quality variable for health services was 3.4180, with a standard deviation of 0.75296. While the dimension of efficiency obtained the highest relative

importance, which amounted to 71.352%. While dimension reliability got the least relative importance, which was 68.36%.

Table 3: Descriptive statistics of the variable of the technical quality

Dependent variable and its dimensions	Mean	Std. Deviation	%
Reliability Y ₁	3.4180	0.75296	68.36%
Efficiency Y ₂	3.5676	0.69536	71.352%
Safety Y ₃	3.5045	0.71048	70.09%
The technical quality Y	3.4180	0.75296	

In Table 4, the results indicate the correlation relationships between the ICT dimension and its variable

and the technical quality dimension and its dimensions. As the positive correlations.

Table 4: Spearman Correlation Coefficient between Information and Communication Technology and technical quality

Independent variable and its dimensions	Dependent variable and its dimensions			
	technical quality	Reliability	Efficiency	Safety
Correlation Coefficient (Information and Communication Technology)	.798**			
Sig	0.000			

Correlation Coefficient (Hardware and Equipment)	0.618**	0.640**	0.535**	0.339**
Sig	0.000	0.000	0.000	0.000
Correlation Coefficient (Software)	0.740**	0.713**	0.675**	0.381**
Sig	0.000	0.000	0.000	0.000
Correlation Coefficient (Communication Networks)	0.681**	0.620**	0.645**	0.358**
Sig	0.000	0.000	0.000	0.000
Correlation Coefficient (Human Resources)	0.748**	0.759**	0.666**	0.386**
Sig	0.000	0.000	0.000	0.000
**Correlation is significant at the 0.01 level (2-tailed).				
*Correlation is significant at the 0.05 level (2-tailed).				

Regression analysis was performed to determine the impact of information and communication technology on the technical quality of health services. As the results of Table 5 indicate an effect of the ICT variable and its dimensions on the technical quality variable. As the Hardware and Equipment affects the technical quality, as it has a value of ($\beta = 0.386$). At the same time, the Software dimension affected technical

quality of ($\beta = 0.637$). As for the Communication Networks dimension, its effect on technical quality is ($\beta = 0.543$). As for the Human Resources dimension, it had an effect on the technical quality by ($\beta = 0.463$), and according to what was mentioned, the variable of information and communication technology affects the technical quality variable by ($\beta = 0.656$). The regression line equation can be mentioned as follows:

$$Y = (2.238 + 0.386 X1) + (1.391 + 0.637 X2) + (1.824 + 0.543 X3) + (1.960 + 0.463 X4) + (1.373 + 0.656 X)$$

Table5: Regression analysis between the ICT variable and the technical quality variable

Dependent variable and its dimensions	Sig	R ²	T	F	β	a	Independent variable and its dimensions
Technical quality	0.000	0.688	9.726	240.07	0.656	1.373	Information and Communication Technology
	0.000	0.440	15.621	85.677	0.386	2.238	Hardware and Equipment
	0.000	0.619	8.577	177.14	0.637	1.391	Software
	0.000	0.512	11.254	114.23	0.543	1.824	Communication Networks
	0.000	0.542	13.868	129.03	0.463	1.960	Human Resources

VII. RESULT AND DISCUSSION

The aim of the research is to investigate the impact of information and communication technology on the technical quality of health services. Where descriptive statistics reveal, as shown in Table 2, that the mean to Hardware and Equipment has reached (3.2680), which indicates that the health institution suffers from weaknesses in the maintenance programs for devices and equipment for information and communication technology. While the mean to a dimension of Software (3.3108) indicates that the health organization is not interested in developing the software used in the performance of its health work continuously. As for the value of the mean to the Communication Networks dimension, it reached (3.0856), and this indicates that the health organization is using the internal and external communications network poorly, in

addition to weakness in health information security techniques. As for the Human Resources dimension, the mean reached (3.3273), which indicates the lack of interest of the health organization in allocating a financial budget for human resources training.

Descriptive statistics related to technical quality, as shown in Table 3, reveal that the mean to a dimension of Reliability has reached (3.4180), which indicates that the health institution abides somewhat poorly by its promises to patients in providing health services and providing the appropriate environment as expected by patients. The mean to a dimension of Efficiency (3.5676) indicates that the health organization has doctors with competence, and skill in medical diagnosis and they show interest to patients during treatment. Still they do not have enough time to make a diagnosis. The average value of the Safety dimension is (3.5045), which indicates a weakness in the system for

guaranteeing the rights of patients in the event of a medical error. The health organization does not rely entirely on international standards for safety in health services, and this is what made the patients' lack of confidence in the health services provided in Al-Shatra General Hospital.

Table 4 reveals the correlation relationships between the independent variable ICT and the dependent technical quality variable. Whereas, the correlation relationships for the variable of information and communication technology and all its dimensions with the variable of technical quality and all its dimensions were positive relations and statistically significant because the sig values were less than the value of the significance level at (0.05). Thus we accept the correlation Hypotheses.

Table 5 reveals the results of the relationship of ICT impact and all its dimensions on the technical quality. Where the results reveal that Information and Communication Technology; Hardware and Equipment; Software; Communication Networks Human Resources have a statistically significant effect on technical quality since the sig values were below the significance level at (0.05). Thus we accept hypotheses of impact. This indicates that attention to information technology and communications, improvement and development will positively affect the level of technical quality of health services. Therefore attention must be paid to information and communications technology to improve the quality of health services.

VIII. CONCLUSIONS

The results showed a positive relationship between information and communication technology and technical quality. Information and communication technology also affects the technical quality, which means that Al-Shatrah General Hospital must pay attention to information and communications technology and work to improve and develop it. This leads to improving the technical quality of the health service.

The results indicated that Al-Shatrah General Hospital includes qualified and skilled doctors who care for patients during the treatment period. Still, they suffer from the limited time required for the medical diagnosis process. This means that the Al-Shatrah General Hospital suffers from a shortage of doctors. The administration of Al-Shatrah General Hospital must develop a plan to attract doctors to hide the workload from existing doctors.

The results also showed that the internal and external communications system in Al-Shatrah General Hospital is poor. Also, there is no strong information security system, which the hospital administration must take care of with such systems because this helps them to improve the performance of their health work.

IX. LIMITATIONS AND FUTURE RESEARCH

This study was conducted only in Al-Shatrah General Hospital - Dhi Qar - Iraq. The study relied on taking the intentional sample. The future researcher can expand the scope of the study by taking several government hospitals or conducting a comparative study between government and private sector hospitals.

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