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# Academia Open



*By Universitas Muhammadiyah Sidoarjo*

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## **Information and Communication Systems' Impact on Healthcare Quality: Insights from Medical City Complex Employees**

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### **Abstract**

This descriptive analytical study investigates the pivotal role of information and communication systems in enhancing the quality of medical services, drawing upon the perspectives of employees at Medical City Complex. Employing a semi-experimental approach with 40 participants from the Department of Medicine, the research delves into the understanding of information and communication systems and quality medical care. The study employs a three-section questionnaire, encompassing demographic information, dimensions of healthcare quality, and dimensions of information and communication systems. Validity and reliability of the questionnaire were rigorously established. The findings unveil significant trends, particularly in factors such as age and years of service, illustrating their links to healthcare quality and information and communication systems. Detailed analyses of healthcare quality dimensions (Tangibles, Reliability, and Assurance) and information system aspects (Management, Organization, and Information Technology) are presented. The study concludes by elucidating the impact of independent variables on dependent variables, providing invaluable insights for future research and decision-making in the healthcare sector, ultimately enhancing the quality of medical care and information systems.

### **Highlights:**

- Investigates the impact of information and communication systems on medical service quality.
- Utilizes a semi-experimental approach with 40 Department of Medicine employees.
- Highlights the influence of age and years of service on healthcare quality and information systems.

**Keywords:** Healthcare Quality, Information and Communication Systems, Employee Perspectives, Validity and Reliability, Healthcare Improvement

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## Introduction

In the last two decades, services have gained a high and increasing position of attention at various levels, and this has happened as a result of the emergence of data and the activation of effects due mainly to the huge scientific and technological progress, in addition to the surprising transformations in the international economic structure on the other hand, so services have become a prominent role. It contributes to the life of the individual and society and contributes to their well-being. Therefore, recent years have witnessed a great development in the field of providing services in its various forms[1]

Communication and information systems are the main sources that contributed to this rapid development through Internet networks and electronic programs that contributed to facilitating tasks in various fields, obtaining information easily and easily, and organizing all records and data, especially in the field of medical care. It has added a remarkable development through the ease of diagnosing diseases. , Performing operations with the latest equipment, archiving patient data to return to it at a later time, and other technological developments that are still to this day providing a lot in the areas of medical care to improve the performance of workers in this field and to provide the best health services to patients and contribute to their proper treatment[2]

### Definition of communication and information system:

An information system is a system that uses people, equipment, procedures, and operating policies to collect and process data and distribute information. In other words, information systems is a term that denotes a system that collects information (manually or automatically), organizes it, stores it, processes it, and displays it in its various forms (text, visual, and audio)[3].

In order to satisfy the demands and needs of the user, the system—which includes management information systems, geographic information systems, vital information systems, and many others—must conform to the qualities of excellent data. The rapid progress in information technology affected these systems, which led to benefiting from them in many important vital areas. The concept of globalization and the spread of information and the speed of its exchange have also affected all fields. A country that does not keep pace with this progress is considered a backward country[14].

### Types of information systems :

Information systems can be divided in terms of the concepts on which they are based and the degree of adoption or absorption of technological progress into:

#### 1. Legacy information systems

They are systems that depend mainly on manual methods and papers, in addition to some traditional machines and tools. They are systems that do not use electronic means in the process of processing data and information.

#### 2. Modern information systems

They are systems that rely on electronic data processing in addition to some advanced automated means. Or it is the use of information technologies that allow (by means of the computer) to collect huge amounts of data and perform processors on them with tremendous speed and extreme accuracy.

##### 2 .1 Information systems resources

1. A group of individuals.
2. Hardware.
- 3 . software.

#### 3. Integrated information systems

It is a relatively recent concept of information systems, meaning the presence of more than one system in the organization, and the purpose or goal is to avoid duplication of data collection, processing, and distribution of extracted reports, which leads to cost reduction, by using communication technology.

#### 4. Comprehensive information systems

They are comprehensive information systems for all the variables affecting and affected by them inside and outside the system environment. Its design must include various data sources and produce multi-purpose information using multimedia technology.



## Features of information systems:

## Disadvantages of information systems:

1. Answering inquiries.
2. Referral to sources of information.
3. Ongoing briefing.
4. Selective transmission of information.
5. Publishing and translation services.
6. Training and awareness of beneficiaries.
7. Provide better information both quantitatively and qualitatively.
8. Speed in data processing and retrieval.
9. Economy in time, effort and costs.
10. Fewer errors.
11. better decisions.
12. better control.
13. Reduce data storage space.
14. Hardware and software resource activity has ceased.
15. risk of system hacking.
16. The establishment changes the supplier.
17. Exposure to computer viruses.
18. Hardware damage due to an accident.
19. Storage media damage.
20. risk of software corruption.
21. User errors.
22. Network downtime due to hardware failure or just data or software failure.

## Information systems goals:

1. Collecting and organizing data and information specialized in the field of work of the concerned institution.
2. Providing appropriate and appropriate information to planners, researchers and decision makers at the required and appropriate time, with a high degree of accuracy, and in the required form and quantity.
3. Documenting and processing information by computer and other information technologies, and developing an appropriate system for storage, processing and retrieval.
4. Preparing and providing the latest information that helps in developing the infrastructure of the institution by assisting researchers in completing studies and research.
5. Coordinating efforts and cooperating with other systems to optimize the use of information.
6. Training and educating the beneficiaries of the system's services on the optimal use of information.

## Types of information systems:

**Conventional (TIS):** It is based on manual operation.

**Data rules management systems (DBMS):** It is a procedure that includes (model languages, query languages, data structures, and dealing mechanisms) that is used to extract, organize, and arrange data before storing it in a computer.

**Administrators (MIS):** It is developing a digital solution to help organizations do their tasks more efficiently. It comprises the following components as well: (Hardware \_ Equipment \_ Software \_ Data and Information \_ Procedures for Developing Individual Documents) It also blends management with computerized systems.

**Decision Support Systems (DSS):** These are systems connected to higher administrative levels that link data and complex analytical processes through data analysis tools to support the process of making decisions that can be classified as non-routine and strategic. The components of this process are as follows: (Inputs - evidence of knowledge and experience - outputs - courses - information retrieval systems).

**Geographical (GIS):** It is a computer-based system that is concerned with everything related to spatial information, and it also helps in the planning and decision-making process and supports it.

**Fact systems (FS):** This type of system is based on question and answer.

## Dimensions of Information Systems:

### Organizations :

Organizations are formal social units developed to the attainment of specific goals. The key elements of an organization are its people, structure, operating procedures, politics, culture, and functional specialties.

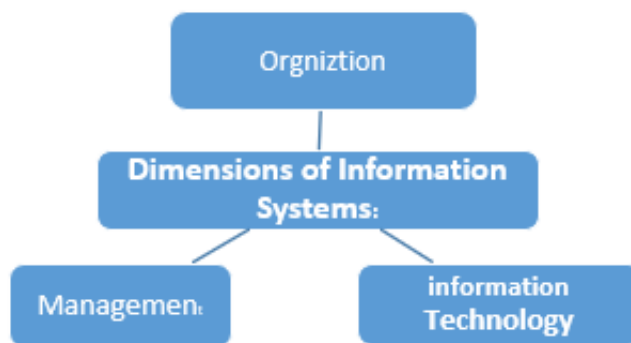


## Management :

Management's tasked with making choices and creating plans of action to address organizational issues. Decisions and responsibilities for managers varies depending on the organizational level. At the top of the hierarchy, senior managers are in charge of making long-term choices. center managers are tasked with implementing senior management's plans and objectives. They are positioned in the center of the organizational hierarchy. Operational managers keep an eye on the organization's daily operations.

## Information Technology :

Managers use information technology as a tool to deal with change. The technical dimension includes networking and telecommunications technologies, computer hardware, software, and data management systems.



**Figure 1.** *Figer 1: Dimensions of Information Systems*

## Fields of work in information systems

1. First, the administrative field.
2. Secondly, the geographical area.
3. Third, the health field.
4. Fourth, the educational field.

## The Meaning of Quality in Health

The quality of healthcare is one of the most frequently mentioned concepts in health policy principles[1]. Another definition An activity aimed at enhancing and encouraging the health level of individuals and groups in all physical and psychological aspects Or mental, professional and social, health care initially focuses on illness or injury The disease can be prevented through many inexpensive means, and whenever the disease strikes a person, care is needed Health services to treat it and its work or activity does not end at this point. It may intervene to rehabilitate it. Young patients do not completely recover from the disease

## Fields of quality of care :

1- **Tangibles:** Tangibles define the external appearance or form of facilities, employees and communication tools Copy within health institutions, and tangible materials provide a representation or picture about the service he will use physically.[5]

2- **Reliability:** Refer to the concept of reliability To: The ability to work in what has been pre-determined reliably and accurately, ie the degree of accreditation between On the ground, the required service, In order to be the subject of the next episode, he must have his own theme Other dimensions[6].

3-**Aassurance:** Assurance is considered one of the most important functions of the health care system It helps to make a decision, and for this information to be useful, it must be consistent with the objectives of the health unit that adopts it.

The computerized system, so that it is compatible with the current system of the company, and gives it an accurate and complete picture of its activities at the appropriate time, as well as System information must be available at all times and e protected from damage, loss, risk and theft[7].

## Quality Standards and Accreditation in Health Services

Quality standards are established by laws, regulations, and the advice of national and international health organizations. They can also arise independently from accreditation. The World Health Organization, for instance, has established guidelines for quality management for multidisciplinary health services, human resources training, and health promotion and prevention in hospitals[8].

In addition to the components and elements of excellent health care quality, this standard aims to provide standards for evaluating the quality of health services, as well as information on the necessary skills, hospital quality policies, and company health measures. It also covers the comprehensive quality management program in hospitals and clinics. Institutions typically run.

Among the quality standards in the management and management of direct administrative operations and the treatment of employees, including nurses, specialists, administrators, and cleaners, with patients and beyond, in addition to the performance of each individual in his work and his commitment to performing his duties with all honesty and proficiency, and the policies established in the administration with regard to the subject of health care and the extent to which they follow these. Instructions and their implementation, and we can evaluate the quality of health services by comprehensively examining these matters[9].

## Method

This semi-experimental study was conducted on a group of employees working in the Department of Medicine City, For non-probability sampling, we included 40 employees. The tool consists of three sections; section One Identifiable and social information was made up of 5 items (age, sex, academic qualification, years of service, marital status) and department. the second was about the dimensions of the quality of healthy life and included 13 questions.

The third section was the dimensions of information and communication systems and included 10 questions.

The validity of the questionnaire was determined by a group of experts and reliability was determined by calculating the alpha correlation coefficient.

## Results and Discussion

### Part one: Identification information for sample

Table (1) provides a summary of a research study that examines various variables among the sample study. First, variable column lists the different variables that were investigated in the study. The frequency of occurrences and percentage of each category within the variable were expressed[10].

Also, the table shows the mean value with its standard deviation for all the categories.

The statistical test (T-test or F-test) comparing different categories or groups within the variable is used. The p-value associated with the statistical test performed indicates the significance level of the test and helps determine whether the observed differences are statistically significant. "NS" likely stands for "Not Significant," "S" for "Significant," and "HS" for "Highly Significant."

We can investigate the differences for each variable and its categories as follows:

1. For sex variable, the study includes male and female participants. The mean value is 3.71 for males and 3.95 for females. The statistical t test shows that there is no statistically significant difference between the male and female since  $p = 0.172$  is greater than 0.05.

2. For age variable, the participants are categorized into 6 different age groups. Using ANOVA statistical test (F test), it shows that there is a statistically significant difference among different age groups since  $p = 0.042$  is less than 0.05.

3. For academic achievement variable, the sample are classified based on their academic achievements (Diploma, Master, PhD). The p-value suggests no statistically significant difference between these groups since  $p = 0.864$  is greater than 0.05.

4. For marital status variable participants are divided into unmarried and married categories. The p-value indicates no significant difference between the two groups since  $p = 0.582$  is greater than 0.05.

5. For years of service variable, Participants' years of service are categorized into different ranges. The p-value indicates a highly significant difference among different years of service groups since  $p = 0.006$  is less than 0.01.

Table 1. Descriptive statistics and statistical tests for variables.

**HS:** There is high significant difference (p value <0.01)

**S:** There is a significant difference (p value <0.05)

**NS:** The is no significant difference ( p value > 0.05)

## Part two : health care quality

Table (2) provides a summary of survey results related to healthcare quality. It represents a series of Likert scale questions where respondents were asked to rate different parts of healthcare quality. The table is prearranged into three parts, each corresponding to a different section of healthcare quality: "Tangibles," "Reliability," and "Assurance." Within each section, there are multiple questions[11].

The research study aims to assess and analyze respondents' perceptions of various aspects of healthcare quality, so we can understand the level of agreement/disagreement among respondents and to identify any statistically significant differences or patterns within the responses. Table 2 provides information about respondents' agreement levels, frequencies, means, standard deviations, and statistical analysis (p-values) for each question[12].

Health care quality	SDA	DA	N	A	SDA	Mean	SD	P value
<b>Tangibles</b>								
1. The institution needs to update the devices, equipment and medical supplies currently used	15	9	12	3	1	3.42	0.73	Sig.
2. The current patient rooms, waiting areas, reception, doctors' offices and various staff are in line with what you expect	13	8	14	3	2	3.53	0.89	Sig.
3. There is interest on the part of management and employees, and follow-up in the manner and form of work clothes with the level of service provided	18	10	9	2	1	4.12	0.63	Sig.
4. In your opinion, the management of the institution has provided the material conditions in paragraphs 1 and 3 within the limits of its provided and available capabilities, which are commensurate with your expectations.	14	10	11	3	2	3.83	0.99	Sig.
<b>Reliability</b>								
1. The institution's management is committed to its promises to patients in the field of providing health, treatment and hospital services, and providing an appropriate climate and environment	12	12	11	3	2	3.42	0.74	Sig.
2. The administration of the institution responds and sympathizes with patients when evaluating their complaints	12	9	13	4	2	3.74	0.69	Sig.
3. The administration of the institution is interested in providing health care in a timely, fast and accurate manner	17	10	10	3	0	3.25	0.62	Sig.
4. Patients place their trust in the competencies of the medical and paramedical profession with confidence and safety	12	11	12	4	1	3.18	0.91	Sig.
5. The administration of the institution is keenly interested in recording information about patients and their health conditions in records and electronic information devices	17	8	10	4	1	3.32	0.73	Sig.
<b>Assurance</b>								
1. In your opinion, patients should have full confidence in the hospital staff	16	9	9	5	1	3.17	0.79	Sig.
2. In your opinion, the patient should be reassured that he is in safe hands with the staff in the institution when dealing with them	17	9	11	1	2	3.62	0.65	Sig.
3. Do you feel the good treatment of the medical and paramedical staff in their treatment of patients with kindness and tact?	13	10	9	6	2	3.28	0.45	Sig.
4. The employees in the institution have competence, merit and credibility in performing their work, which necessitates the management of the institution to provide them with support for these employees	17	9	11	3	0	3.35	0.87	Sig.

**Figure 2.** Table 2. Descriptive statistics for health care quality

**SDA:** strongly disagree, **DA:** Disagree, **N:** Neutral, **A:** Agree, **SA:** Strongly agree.

**SD:** standard deviation,

**HS :** high significant( p value≤0.01), **S :** significant(0.01< p value<0.05), **NS :** non-significant(p value>0.05)

Figure (1) shows the relation between the health care quality with its parts

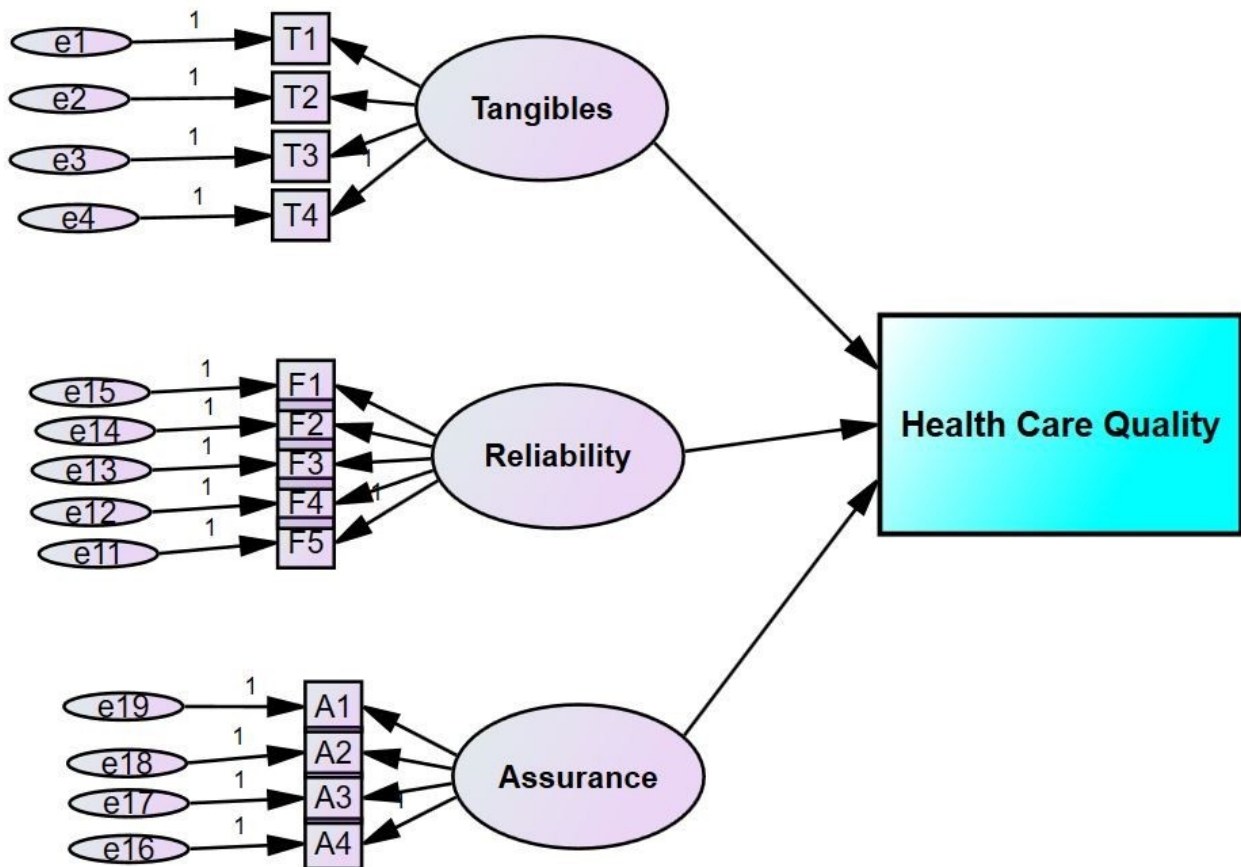


Figure 3. Figure 1. The relation between questions, parts and the main independent variable.

Figure 1. The relation between questions, parts and the main independent variable.

### Part three : Information and communication systems

Table (3) shows a summary of survey results related to information and communication systems. It represents a series of Likert scale questions where respondents were asked to rate different parts of information and communication systems[13]. The table is planned into three parts, each corresponding to a different part of information and communication systems: "Management," "Organization," and "Information Technology". Within each part, there are multiple questions. The research study aims to assess and analyze respondents' perceptions of various aspects of information and communication systems, so we can understand the level of agreement/disagreement among respondents and to identify any statistically significant differences or patterns within the responses. Table 3 provides information about respondents' agreement levels, frequencies, means, standard deviations, and statistical analysis (p-values), for each question[14].

Information and communication systems	SDA	DA	N	A	SDA	Mean	SD	P value
<b>Management</b>								
1. The management of the institution is interested in developing future and immediate plans on an ongoing basis to achieve its goals	15	11	10	3	1	3.32	0.83	Sig.
2. The administration verifies that its plans are implemented on the ground as planned through monitoring and follow-up	11	10	12	5	2	3.73	0.72	Sig.
3. Paying attention to selecting qualified employees to manage its units and divisions	17	10	10	3	0	3.75	0.93	Sig.
<b>Organization</b>								
1. The organization's management provides the needs and desires of the employees working in it and dealing with it	14	12	11	2	1	3.26	0.43	Sig.
2. The administration of the institution provides treatments and medicines in large quantities and with high quality	12	12	10	4	2	3.73	0.72	Sig.
3. The management of the institution is interested in the rights of its employees in terms of the incentive system, developing skills, setting up training programs and achieving their goals	16	11	12	0	1	3.65	0.63	Sig.
4. The administration of the institution is keenly interested in recording information about patients and their health conditions in records and electronic information devices	15	8	13	2	2	3.52	0.33	Sig.
<b>Information Technology</b>								
1. The administration of the institution is interested in maintaining the database and information of employees and patients	16	9	10	3	2	3.73	0.91	Sig.
2. Using modern technology to save information and easily refer to it when needed	12	9	13	5	1	3.73	0.84	Sig.
3. Human resources staff and programmers work continuously in order to be aware of information systems updates	15	12	11	2	0	3.65	0.69	Sig.

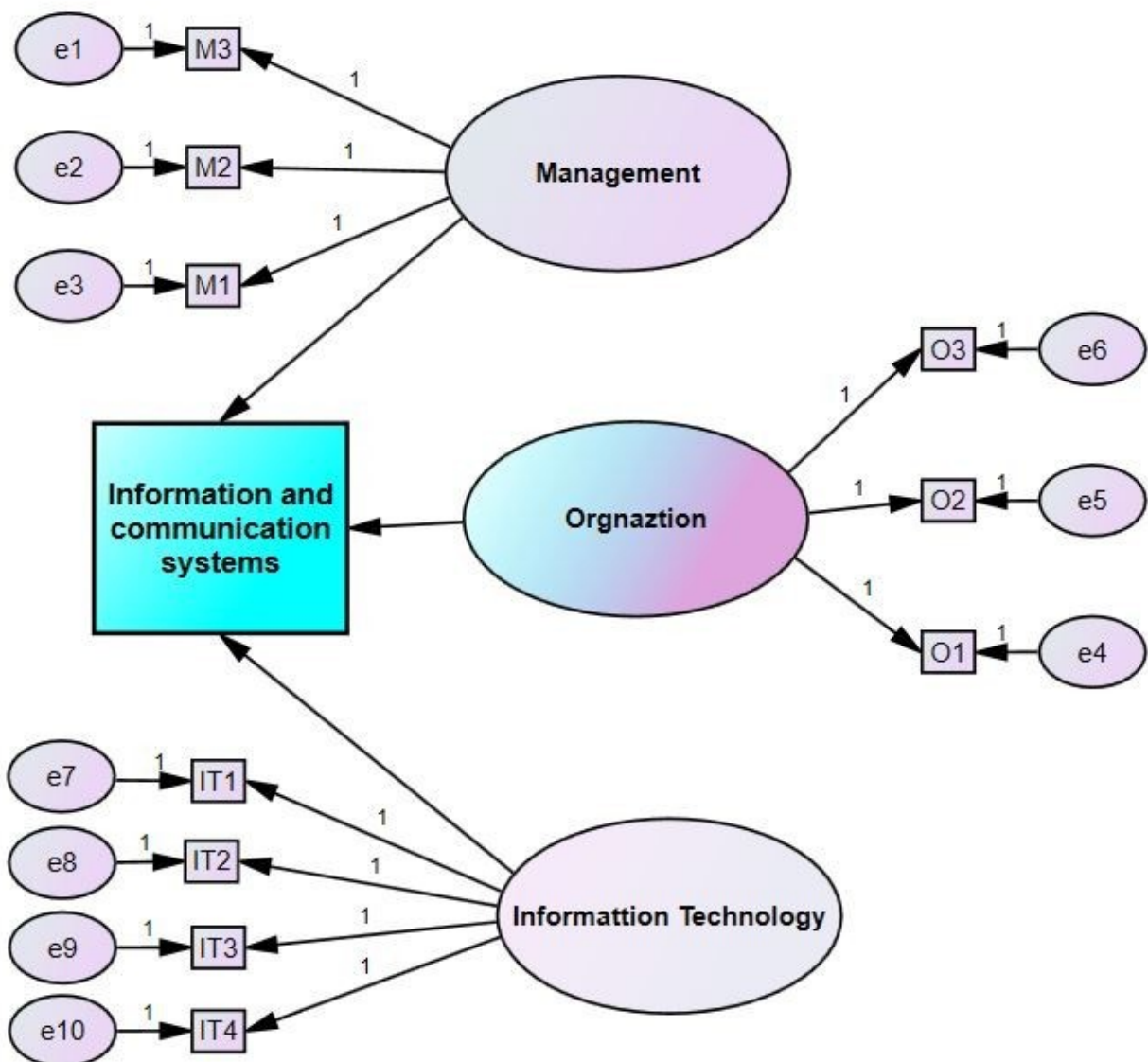
**Figure 4.** Table 3. Descriptive statistics for dependent variable

**SDA:** strongly disagree, **DA:** Disagree, **N:** Neutral, **A:** Agree, **SA:** Strongly agree.

**SD:** standard deviation,

**HS:** high significant(  $p \text{ value} \leq 0.01$ ), **S:** significant( $0.01 < p \text{ value} < 0.05$ ), **NS:** non-significant( $p \text{ value} > 0.05$ )





**Figure 5. Figure 2 . The relation between questions and parts in information and communication systems**

## Part Four : the effect for Health care quality on Information and communication systems

The following table ( table 4) illustrates the relationships between different variables and their effects on one another, based on the estimated coefficients, p-values, and significance levels. The table provides and shows the results of a statistical analysis that assesses the effects of various independent variables on dependent variables[15]. The table represents the estimates, standard errors, p-values, and labels associated with these effects. The p-value indicates the significance of the observed effect. Smaller p-values suggest stronger evidence against the null hypothesis. The assigns labels to the p-values to indicate whether the effect is statistically significant and to what degree[16]. "HS" stand for "Highly Significant," and "S" stand for "Significant." From the table we can conclude that

1. the effect of "Tangibles" on "Health Care Quality" is estimated to be 0.890. This effect is statistically significant ( $p = 0.012$ ) and is highly significant (HS).
2. The effect of "Reliability" on "Health Care Quality" is estimated to be 0.167. This effect is statistically significant ( $p = 0.014$ ) and significant (S).
3. The effect of "Assurance" on "Health Care Quality" is estimated to be 0.416. This effect is statistically significant ( $p = 0.028$ ) and significant (S).

4. The effect of "Management" on "Information and communication system" is estimated to be 0.397. This effect is statistically significant ( $p = 0.015$ ) and significant (S).
5. The effect of "Organization" on "Information and communication system" is estimated to be 0.511. This effect is statistically significant ( $p = 0.007$ ) and highly significant (HS).
6. The effect of "Information Technology" on "Information and communication system" is estimated to be 0.756. This effect is statistically significant ( $p = 0.005$ ) and highly significant (HS).

The effect of "Health Care Quality" on "Information and communication system" is significant and equal to 0.756 with standard error 0.178, and as can be sign the effect is significant since  $p$  value is 0.002 which is less than 0.01.

The effect			Estimate	S.E.	P	Label
Tangibles	→	Health Care Quality	0.890	0.358	0.012	HS
Reliability	→	Health Care Quality	0.367	0.116	0.014	S
Assurance	→	Health Care Quality	0.416	0.076	0.028	S
Management	→	Information and communication system	0.697	0.164	0.015	S
Organization	→	Information and communication system	0.511	0.191	0.007	HS
Information Technology	→	Information and communication system	0.629	0.283	0.004	HS
Health Care Quality	→	Information and communication system	0.756	0.178	0.002	HS

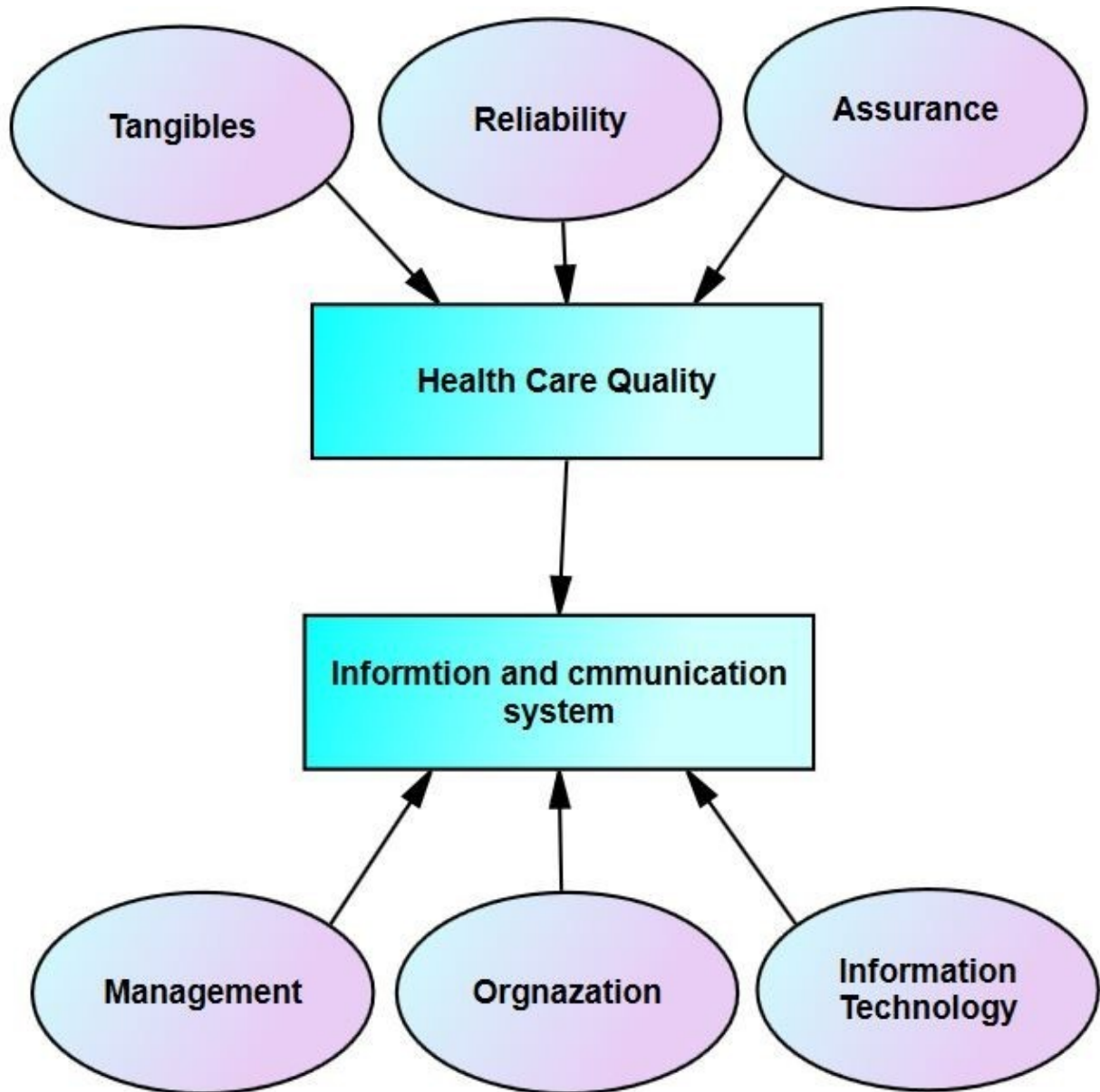
**Figure 6.** Table 4. The effect parts on independent and dependent variables

**HS:** There is high significant difference ( $p$  value  $< 0.01$ )

**S:** There is a significant difference ( $p$  value  $< 0.05$ )

**NS:** The is no significant difference (  $p$  value  $> 0.05$ )





**Figure 7. Figure 3 . The relation between main independent and dependent variable s**

## Conclusion

This study gives a thorough examination of its findings and insights in its conclusion. It explores into many sample variables in an effort to understand their links and effects on information and communication systems, healthcare quality, and both. The initial emphasis is on sample identification; descriptive statistics and statistical analyses are presented for various variables, demonstrating notable trends especially in factors like age and years of service.

Table 2 then explores the "Tangibles," "Reliability," and "Assurance" categories of healthcare quality aspects. The agreement levels, frequencies, means, and standard deviations for each question among respondents within each category give a deep insight of their viewpoints on several aspects of healthcare quality, capturing a spectrum of agreement and disagreement.

Information and communication systems are the focus of Table 3, which divides variables into "Management," "Organization," and "Information Technology." With the respondents' agreement levels, means, and standard deviations shown in this table, the context is further enhanced and a thorough understanding of their opinions on information and communication technologies in the healthcare industry is provided.

The final piece of the puzzle is Table 4, which provides a crucial understanding of the impact of independent

variables on dependent variables. The importance of these effects is shown by estimated coefficients, standard errors, and p-values. These cumulative results lead to a deeper understanding of how many factors influence the quality of healthcare as well as information and communication systems. Invaluable insights are provided by the detailed analysis and interpretation contained in the tables and figures, advancing future research, decision-making, and enhancem

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