

# Using TRIZ-based Method to Improve Health Service Quality: A Case Study on Hospital

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**Abstract.** The service quality of healthcare is highly related to the health and satisfaction of the patient, hence, how to enhance the service quality of healthcare and how to reduce patient's complaint is always very important topic. To improve the service quality of healthcare, contradictory phenomenon is usually encountered in traditional problem solving process, hence, TRIZ has been successfully applied in the engineering and management fields through innovative thinking, through the setup of contradiction matrix and through systematic solving of specific problem.

However, there are very few studies in applying TRIZ in the improvement of the service quality of healthcare, in this study, through the use of TRIZ, solution for the improvement of the service quality of healthcare has been developed for individual case. The result shows that TRIZ can indeed solve the special problem of the individual case through the development of generalized solving procedure by aiming at the special problem of the individual case, hence, it can provide a very important reference for solving problems for people providing healthcare service.

**Keywords:** TRIZ, Service Quality, Contradiction Matrix

## 1. Introduction

As the quality of life has been enhanced, people have more demand on the service quality of healthcare, Healthcare service provider cannot just emphasize on the hospital operation efficiency and cost reduction, instead, it has to enhance the satisfaction of the patient and the family. However, innovative project usually has to face contradictory dilemma, which usually leads to the difficulty of implementation or pending of the innovative thinking or project.

The main condition for TRIZ to solve problem is to improve one or more features without damaging other features. In other words, if it is only tradeoff among mutually contradictory attributes causing the problems, it is not really a solution for the problem.

Currently, the researches of TRIZ are mostly focusing on finding innovative solutions in physics and technological fields for engineering project [1,2]. Some scholars applied it in developing innovative management solutions for e-commerce and traveling service [3,4], and there are very few researches focusing on healthcare quality improvement. <sup>+</sup>

## 2. Literature Review

### 2.1. TRIZ

TRIZ is the abbreviation of the first letter of Russian Theoria Resheneyva Isobretatelskehuh Zadach, which means Theory of Innovative Problem Solving (TIPS) [5]. This is a methodology that that can create systematic innovation and improve the designer's thinking process. In the period from 1956 to 1971, 39 parameters and 40 principles are summarized, and the theoretical basis of TRIZ was then well settled down. This method is widely used in technical field to solve innovative problem. In recent year, some scholars

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introduced the concept of this method to the non-technical field, for example, politics, social and commercial management fields [2]. TRIZ was always a methodology that takes care of both generalization and delicate science. Anyone who has received such training will be able to create new idea.

## 2.2. Service Quality Management

Generally speaking, quality means product or service characteristic can meet customer’s expectation, and the “service quality model” proposed by Parasuraman, Zeithaml, and Berry [6] was most widely accepted. PZB not only used ten items such as reliability, speed and guarantee to define service quality, so as to enhance the quality and to satisfy the customer’s need. Therefore, in the subsequent empirical analysis, investigation is going to focus on this point.

## 2.3. Indexes Related to the Service Quality of Healthcare

To sum up the content in the related literature, this study has summarized all the attributes mentioned in the literature as in table 1.

Table 1 List of how the service quality of healthcare affects the attributes

Attribute	Definition	Reference No.
Courtesy	Politeness, respect, consideration, and friendliness of physicians and medical staff.	[7,8,9,10,11]
Access	Approachability and ease of contact.	[7,8,11]
Communication	Keeping patients informed in the language they can understand and listening to them.	[7,8,9,10,11]
Understanding	Making the effort to know patients and their obligations.	[7,8,9]
Empathy	Caring, individualized attention provided to patients.	[7,8,9,10,11]
Reliability	Ability to perform the promised service dependably and accurately	[7,8,9,10,11]
Tangibles	Appearance of physical facilities, equipment, staff, and communication material.	[7,8,9,10,11]
Responsiveness	Willingness to help patients and provide prompt service.	[7,8,10]
Competence	Possession of the required skills and knowledge to perform the service.	[7,11]
Assurance	Knowledge and courtesy of physicians and their ability to convey trust and confidence.	[7,11]

## 3. Research Methods

### 3.1. Research Steps

The research steps are described as in the followings:

- Step 1: First, the research scope is defined, that is, the service quality of healthcare industry is used as the analysis target.
- Step 2: The attribute summarized in the literature survey is fitted to the technical attribute of TRIZ.
- Step 3: Discussion is made to five experts in the healthcare industry aiming at the fitting result.
- Step 4: Statistical method is used to confirm and test the final fitting result, and contradiction matrix applicable to service quality of healthcare is constructed.
- Step 5: Case study is used to study the application of innovative principle in the matrix.
- Step 6: Project for improving the service quality of healthcare is proposed.

### 3.2. Fitting between TRIZ Attribute and Attributes Affecting the Service Quality of Healthcare

In this study, in order to apply the concept of this matrix to the quality field of healthcare service industry, attribute that will affect the service quality will be found out first so as to investigate the situation

when any two of the attributes are in contradiction, how to use the newly constructed contradiction matrix to solve the problem.

In this study, 39 parameters in the TRIZ contradiction matrix and attributes affecting customer's satisfaction on service quality will be fitted, and the fitting result is shown in table 2.

Table 2 Fitting between TRIZ attribute and attributes affecting healthcare service quality

	Attribute	TRIZ Parameter
1	Courtesy	30.Harmful factors acting on subsystem
2	Access	33.Convenience of use
3	Communication	28.Accuracy of measurement
4	Understanding	29.Accuracy of manufacturing
5	Empathy	35.Adaptability
6	Reliability	27.Reliability
7	Tangibles	12.Shape
8	Responsiveness	25.Waste of time 9.Speed
9	Competence	14.Strength
10	Assurance	39.Productivity

### 3.3. Establishing Contradiction Matrix

According to the above fitted 10 attributes, the number in the crossing grid of TRIZ contradiction matrix is used to construct contradiction matrix for this study that is applicable to the service quality of healthcare, which is as shown in table 3.

Table 3 Contradiction matrix of the service quality of healthcare

Improving parameters	Worsening parameters	Inventive Principles
(33) Access	(19)Energy Spent by a moving object	01, 13, 24
(28) Communication	(25)Loss of time	24, 34, 28, 32
(29) Understanding	(09)Speed	10, 28, 32
(35) Empathy	(09)Speed (25)Loss of time	35, 10, 14 ; 35, 28
(27) Reliability	(36)Complexity of a device	13, 35, 01
(12) Tangibles	(26)Amount of substance	36, 22
(25) Responsiveness-Time	(27)Reliability (29)Accuracy of manufacturing	10, 30, 04 ; 24, 26, 28, 18
(09)Responsiveness-Speed	(28)Accuracy of measurement (29)Accuracy of manufacturing	28, 32, 01, 24 10, 28, 32, 25
(14) Competence	(36)Complexity of a device	02, 13, 25, 28
(39) Assurance	(34)Repairability	01, 32, 10, 25

### 4. Case Analysis

In order to enhance the service quality and reduce complaint, complains occurred in D hospital from 2010 to 2011 are in the following order: service personnel attitude: It includes parameters such as empathy and communication; the second is environment and facility: It includes traffic facility, parking space, chair and toilet, etc.; the third one is the process and system: This item is related to waiting time and disorder.

During the process of solving the problem, any complaint items possibly generated within the service process should be generally considered instead of just solving single item.

#### **4.1. Invention Principle and Solutions**

For these complaints, through the invention principle corresponds to contradiction matrix of table 3, the following solutions are developed for those principles appear more than twice.

##### **Principle 1.Segmentation**

Based on segmentation principle, it is recommended to separate the registration and price making desk. Separate the first visit and return visit patient because first visit patient usually will need longer diagnosis time and check, then the diagnosis can be finished quickly, and the diagnostic time can then be shortened greatly.

##### **Principle 10.Prior action**

We can also develop application software for the registration of smart phone user, or the automatic registration machine can be set up in the lobby of the hospital to reduce effectively the head counts in the on-site registration, and the waiting time of the registration can then be shortened greatly.

##### **Principle 13.Do it in reverse**

Some patients in D hospital need cross-department clinic, hence, through the application of reverse operation principle, the attending doctor can make the diagnosis first, then the video conference device can be opened, and doctor from other department can then make the on-site co-diagnosis and issue the prescription, patient's efforts for cross-department visit can then be greatly reduced.

##### **Principle 24.Mediator**

For patient with communication difficulty (old person with hearing difficulty, disabled person, or foreigner, etc.), communication can be achieved through nursing person with language training.

##### **Principle 25.Self-service**

The patient can use self-service principle, with the payment machine set up at each floor, hence, after the doctor has issued the medical prescription, the patient can then present the prescription to the payment machine, then enter the prescription number to display the medicine price, then through money remittance, cash or credit card, the payment process can then be finished.

##### **Principle 28.Replacement of mechanical system**

Through the use of the principle of "Replacement of mechanical system", smart notification system will be used to notify and remind the clinical visit date to the patient actively through the use of text message of the mobile phone, and through the reply of the confirmation of clinical visit from the patient through the mobile phone, the clinical visit head count at that date can then be confirmed.

##### **Principle 32.Changing the color**

Through the color changing principle, male and female space partition can be well distinguished, for example, blue is used for the male, and pink is used for the female, which can avoid the occurrence of error due to unclear labeling.

##### **Principle 35.Transformation of properties**

It can provide a space for leisure time spending, it can provide a restaurant with elegant atmosphere, it can be a commercial center equipped with wireless internet surfing, and it can also be a fitness center for the adult; therefore, through the change of the hospital property, the service quality of healthcare can then be enhanced.

### **5. Discussions**

In this article, it was thought that the solution of each inventive principle can be integrated and included into a larger solution, in other words, not a single solution is used as the only solution to the solving of a specific problem, instead, integrated solution for enhancing the entire service quality is found out.

From the results, it can be seen that in the integrated solution of individual case, TRIZ develops solution in different angles so that hospital can develop solution for the solving of the enhancement of specific service quality based on the hospital's characteristic, instead of the difficulty of selection from different alternative solutions. hence, subsequent researches are needed to be performed to make performance assessment on the improvement solutions and current situations.

## 6. Conclusion

This article has proposed a systematic and innovative method for enhancing the service quality of healthcare based on the basis of TRIZ, and it can provide help for the practical job in the hospital to solve specific problem, meanwhile, it also helps us to understand that TRIZ can, in addition to traditional problem solving method, provide a new method and new thinking to solve the problem.

The main topic to be investigated in this article is to enhance the service quality of healthcare, in the future, the application feasibility of TRIZ in other topics of healthcare, for example, healthcare technique, nursing and rehabilitation will also be studied, and contradiction matrix will be set up to enhance the quality of the entire medical, nursing and management.

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