

Application of Framework of New TQM to Healthcare

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Abstract

In late year, strictness of social environment of healthcare management of medical institution is changing, and medical institution should solve many Problems and Issues. In the previous study, we suggested the concept of new TQM. Also, in the previous study, we suggested the target domains and entities of product and process based on the TQM Matrix and view point of Three Dimensional Unification Value Models for managing quality of company. Furthermore, in the previous study, we suggest the Common Management Process for organizations. Based on the above suggestions, in this paper, we would like to propose the application of new TQM for Healthcare management from the view point of the criteria of new TQM based on the consideration of more precise definition of TQM Matrix and Three Dimensional Unification Value Model of Product and Process.

Introduction

In late year, strictness of social environment of healthcare management is changed rapidly, and Medical institution should solve many Problems and Issues. Therefore, applications of the good management to solve these Problems and Issues are required for healthcare. For the purpose of the high quality evaluation of the organizational management, TQM (Total Quality Management) is used all over the world and is recognized [1]. However, it is very difficult to establish all management scope of the TQM. Furthermore, the aim of TQM must cover both Product and Process based on the consideration of the basic concept of Quality Control.

On the other hand, we have been working on the development of ISO/IEC25000 (SQuaRE) series of standards for quality requirements and evaluation of the system and software product for a long time in ISO/IEC JTC1 (Joint Technical Committee of the International Organization for Standardization and the International Electro technical Commission) SC7/WG6 (software and systems engineering) [2-5]. As part of this project, we have worked on the developments of ISO/IEC25030, 25040, 25041, which are the standards to provide supporting technique for quantitative quality requirement definitions and evaluation of software and system product [3-5]. And, quantitative quality requirement and evaluation of system are executed from the view point of system and software product quality models defined in ISO/IEC9126-1 [2]. On the other hand, the definition of system is the combination of interacting elements organized to achieve one or more stated purposes defined in ISO/IEC15288: 2008 Systems and software engineering-System life cycle processes [6].

Therefore, an organization with specific purpose can be regarded

as a kind of system based on the definition of system of ISO/IEC15288. Based on the above assumptions, in the previous study [7] we suggested the Three Dimensional Unification Value Model for Product evaluation based on the consideration of enlarging system product quality model defined in ISO/IEC9126-1 (ISO/IEC9126-1 has revised by ISO/IEC25010:2011) [2]. Also, previous study we suggested the General framework of new TQM based on the framework of system quality requirement and evaluation defined in ISO/IEC 25040 and the original concept of TQM Matrix for assessment of management quality of company [8]. However, in the previous study we found the lack of Risk and Investment management in the criteria of conventional TQM [8]. Furthermore, in the previous study we suggested the Target Entities of Total Quality Management of company based on the new TQM and Three Dimensional Unification Value Models [9]. Also, in the previous study we suggested the Common Management Process Model based on the consideration of TQM Matrix and Three Dimensional Unification Value Models [10]. Therefore, in this paper, we would like to suggest the Management of Healthcare based on the more precise definition of new TQM as shown in figure 3. Furthermore, in this paper, we report the result of confirmation of application possibility of new TQM for the purpose of Healthcare management.

Basic Concept of Quality Control

Figure 1 shows the basic concept of Quality Control that shows the relationships between Product and Process, and concept of the CPD (Check, Plan, Do) cycle. From figure 1, every kind of activities of healthcare includes the Product and Process based on the consideration of basic concept of Quality Control. Quality control activity is the repetition of Product and Process, which

include a sequence of Product - Process - Product - Process and Product during a CPD cycles as shown in figure 1.

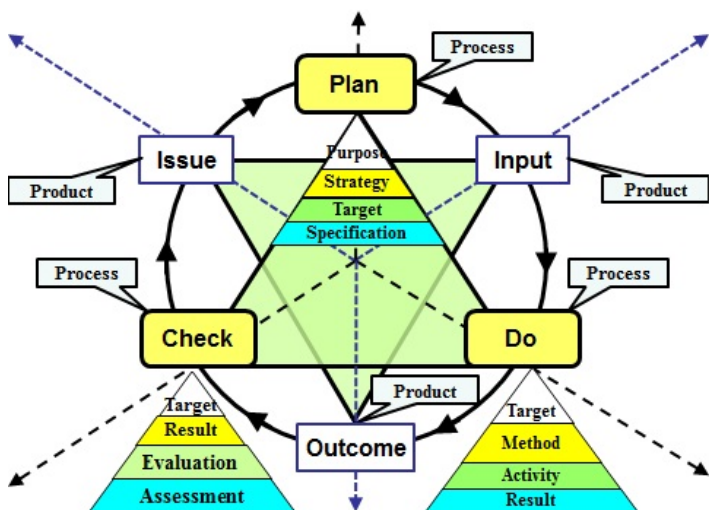


Figure 1: Basic concept of Quality Control [8].

From figure 1, all kind of management process of healthcare are affected by the Input quality of own process, which is the result of previous management process. And, the quality of process depends on the quality of previous process, and not to be able to exist alone each. Therefore, for the purpose of improvement of the quality of Healthcare, it is important to evaluate not only process but also product such as Input, Resources, Constrain and Outcomes. For the purpose of improvement of quality of healthcare, rotation of CPD cycle is necessary as shown in figure 1. In order to rotate the CPD cycle, quality of target entities about Product and Process should be visualized. And it is important to evaluate target entities of Product and Process of healthcare, and confirm the existence of Problems.

Generally, CPD cycle is called PDCA cycle as Plan-Do-Check-Action. But, improvement action is synonyms Doing, and Planning is necessary before performing improvement activity. It may not be the solution of Problem to move to improvement without passing through the planning after checking immediately. Therefore, improvement action should be performed after planning, and resolve the confirmed Problems. It may cause the risk that not only fail achievement of improvement but also lead the change of worse if we do not make plan before Action for improvement. Therefore, it is thought that you should say PDC instead of said PDCA till now. However, it is very difficult and risky to draw an ideal plan from at first.

Therefore, in this study, we have used CPD instead of PDC because it is better to check the situation of Problem or Issue before planning for the purpose of improvement action. Above assumptions, it is important to evaluate both quality of Product and Process based on the consideration of basic concept of quality control. Every kind of activity is a process to convert from an Input product into Outcomes. We cannot evaluate a quality of process even if we measure a characteristic of process own. Therefore, it

is thought that the process quality can be evaluated by the quality of both Outcomes Product and Input Product. In order to improve Outcomes, we should improve not only Process but also product such as the quality of Input, Constrain and Resources. Table 3 is the definition and explanation of the quality-related terminologies which we showed in this paper.

Concept of new TQM TQM Matrix for Healthcare

Figure 2 shows the TQM Matrix for Healthcare which includes the four target domains of management process of new TQM based on the consideration of our previous suggested TQM matrix [8].

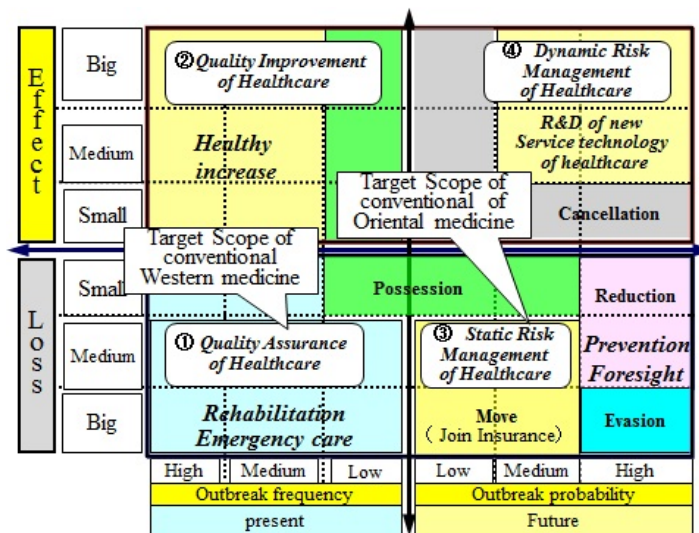


Figure 2: Concept of TQM Matrix [8].

From figure 2, it is recognized that the both conventional Quality Assurance and Quality Improvement for Healthcare are included in the management domains of TQM Matrix. Also, it is recognized that the additional management domains such as the Dynamic Risk Management (Investment or Project management) and Static risk management (Conventional risk management) for Healthcare are included. The Issue is defined as the scale of the Prospective Good Value and outbreak probability that Prospective Good Value will achieve in future when occurred. On the other hand, Problem is defined as the scale of the prospected damage and outbreak probability that damage will produce in future when occurred. Dynamic Risk management should be performed based on the consideration of the view point of effectiveness, priority and limited input resources. On the other hand, the solution of Static Risk management such as possession, move, reduction and evasion should be performed based on the consideration of the result of risk analysis from the view point of TQM Matrix.

Framework of new TQM

Figure 3 shows the Unified framework of new TQM for Healthcare based on the application of proposed framework of new TQM which is considered effective to lead healthcare for success of improvement of management quality in the previous paper [8].

From figure 4, the unified framework of TQM for Healthcare can

be defined based on the consideration of quality requirement and evaluation framework of system product quality defined in ISO/IEC25040, 25041 [4,5] and proposed concept of TQM Matrix [8] and Three Dimensional Unification Value Models as shown in figure 5 and 6.

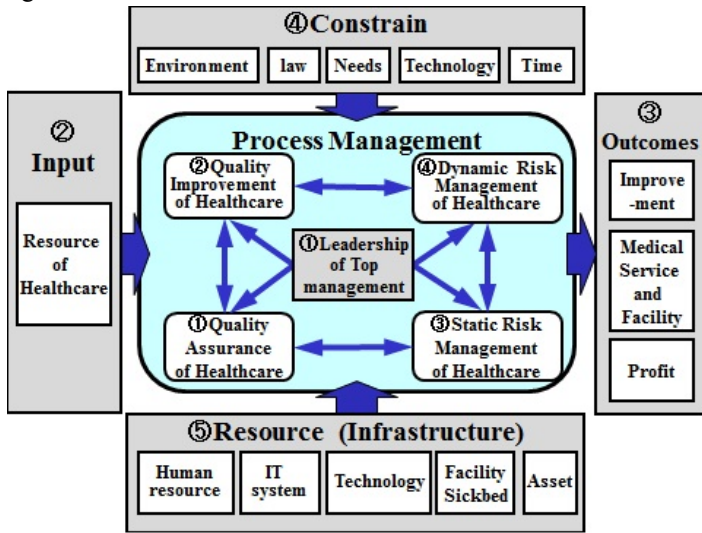


Figure 3: Framework of new TQM for Healthcare [8].

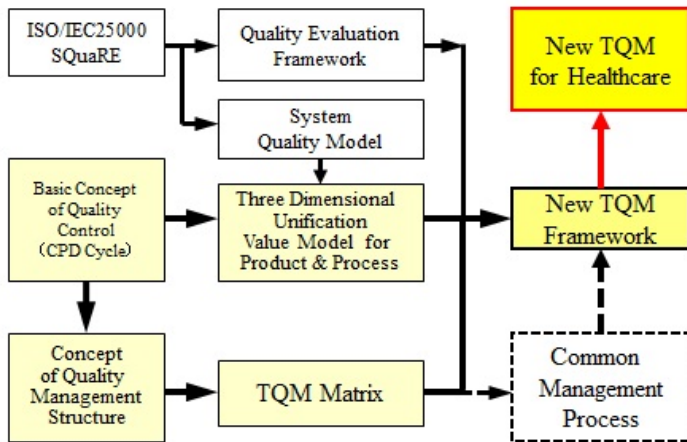


Figure 4: Construction of new TQM for Healthcare.

Five Target Domain of Product

From figure 3, five kinds of target domains of product assessment such as Input, Outcomes, Constrain and Resources, Top management are defined in the unified TQM for Healthcare. The domain of Top management is located in the centre of figure 3. On the other hand, Input, Outcomes, Constrain and Resources are located in the outside of circumferences. And, target entities of product assessment should correspond to the each target domains of product assessment.

Top management for Healthcare: He has a responsibility of total management for operation of Medical institution of Healthcare.

Input for Healthcare: Necessary Resources should be taken from outside of organization or project in order to achieve purpose of process activities.

Outcomes of Healthcare: Outcomes of process are service, equipment and improvement. Primary result of healthcare activities

is the quality of product such as the service and profit. Secondary result of healthcare activities is the result of various improvements or Bad Effect such as environmental load.

Constrains for Healthcare: It is the limitation of activities such as the contract, requirement, budgets and time from the agreement with the stakeholders of outside or inside. Also, include the limitation of activities such as law, rule, standard, corporate strategy of the healthcare, financial Resources, human Resources, facilities, environment and technologies, etc.

Resources for Healthcare: It is an infrastructure which is an organization helping practice of the healthcare activity holds. For example, infrastructure for supporting healthcare activities such as top management, various human Resources, core technologies, information system, financial Resources, facilities, materials, etc.

Four Target Domain of Process

From figure 3, four target domains of process assessment for healthcare such as the Quality Assurance, Quality Improvement, Static Risk Management and Dynamic Risk Management (For ex, investment or project) are defined in the new TQM based on the concept of TQM Matrix as shown in figure 2.

Quality Assurance of Healthcare: Activities of assurance to achieve a Primary Quality of Product or Process of Healthcare service those are promised according to the contract of patient.

Quality Improvement of Healthcare: It is the improvement activities of realization for Secondary Quality of Product or Process for Healthcare service.

Static Risk Management of Healthcare: This management domain is the conventional Risk Management, however, in this paper; it is called Static Risk Management based on the consideration of TQM Matrix. It is defined by the Outbreak probability and scale of Expected Damage in future if we leaving a Problem without hitting any solutions. We investigate the Negative Risk of Product and Process based on the result of risk analysis and need to perform possession, move, reduction and evasion as shown in figure 2.

Dynamic Risk Management of Healthcare: Dynamic Risk Management is performed in order to realize Prospective Good Value in future. Therefore, this domain is the synonyms as conventional investment management or Project risk management [11]. The Dynamic Risk is defined by the Outbreak probability and scale of Prospective Good Value and Expected Damage when performing investment or project.

Concept of Target Entity

Product quality of Healthcare: Figure 5 shows the concept of Three Dimensional Unification Value Model of Product [7] for the management quality of Healthcare based on the consideration of expanding ISO/IEC9126 System product quality model [2]. In this model, three kinds of characteristics such as the value, performance and adaptability for the assessment of product quality management of healthcare are defined. In this model, three axes correspondence to the three characteristics of system product. Also, these three axes are correspondence to the CPD cycle of process as shown in figure 1.

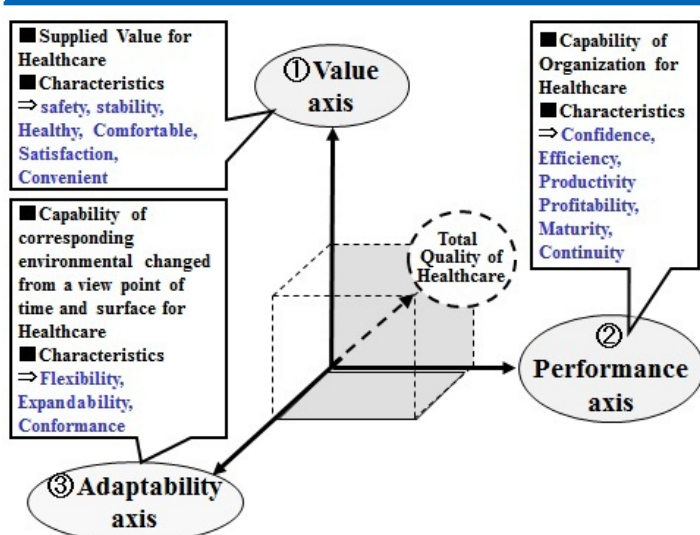


Figure 5: Concept of Three Dimensional Unification Value Model of product for Healthcare [7].

Value axis of Healthcare: The value axis indicates the value of Service or product for Healthcare such as the supplied service, facility or equipment for specific context of situation of patient.

Performance axis of Healthcare: The performance axis indicates the capability of service or product for healthcare, which is the capability of medical institution or healthcare worker to achieve or maintain the defined value.

Adaptability axis of Healthcare: The adaptability axis indicates the capability of adaptation of service of medical institution or healthcare worker which corresponds to the change of medical or social environment. The value axis and performance axis should be differentiated because excellent performance may not achieve excellent value necessarily. For example, intelligent and high technical skill healthcare worker cannot always achieve the satisfaction of patient without adaptability. From figure 5, the overall management quality of product of healthcare can be displayed by the volume or feature of the cube or vector formed by the three axes of Value, Performance and Adaptability quantitatively.

Process Quality of Healthcare

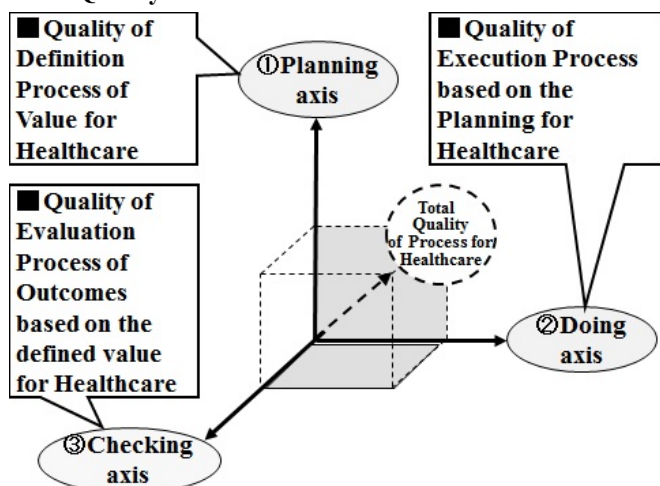


Figure 6: Concept of Three Dimensional Unification Value Model of Process for Healthcare [9].

Figure 6 shows the concept of Three Dimensional Unification Value Model of process for the management quality of Healthcare based on the consideration of basic Concept of Quality Control as shown in figure 1 and Three Dimensional Unification Value Model of product as shown in figure 5. In this model, three kinds of target entities of management process such as Planning, Doing and Checking for healthcare is defined for the purpose of process quality assessment of healthcare. These three axes are corresponds to the process of CPD cycle shown in figure 1. Also, these three kinds of characteristics correspond to the three axes of system product such as the Value, Performance and Adaptability for the assessment of product quality management of healthcare as shown in figure 5.

Planning axis of Healthcare: Planning axis indicate the quality of planning process for Healthcare in order to make suitable plan that can achieve ultimate goal such as purpose, aim, Target, schedule and budget. Purpose of planning process activities is the definition of suitable targeted values.

Doing axis of Healthcare: Doing axis indicate the quality of execution process for Healthcare in order to achieve defined goal of plan.

Checking axis of Healthcare: Checking axis indicate the quality of evaluation process for Healthcare in order to take suitable result from evaluation based on the defined plan. From figure 6, total quality of management of process for healthcare can be displayed by the volume or feature of the cube or vector formed by the three axes of Planning, Doing and Checking axis.

Verification of Application of TQM

Table 1 is constructed by the consideration of framework of new TQM, and viewpoints of Three Dimensional Unification Value Models Also, table 1 show the result of verification of application of new TQM framework to Healthcare management from the view point of the five target domains of TQM matrix and three target entities of both product and process quality assessment of Three Dimensional Unification Value Models.

Target entities of Healthcare of Product

From table 1, it is confirmed that the five kinds of target domains of product such as Leadership of Top management, Input, Outcomes, Constrain and Resources of the framework of new TQM include the example of target entities of Healthcare. Also, the three kinds of characteristics such as the Value, Performance and Adaptability for product assessment defined in Three Dimensional Unification Value Model as shown in Figure 4 include the example of target entities of Healthcare management. From table 1, the scope of proposed target domains of new TQM is useful for Healthcare management. Also, some duplication and confusion of target entities are recognized.

Target entities of Healthcare of Process

From table 2, the four kinds of target domains for process assessment

such as the Quality Assurance, Quality Improvement, Static Risk management and Dynamic Risk management of the frame work of new TQM include the example of concrete target entities of Healthcare management. Also, the three kinds of characteristics such as the Planning, Doing and checking for process assessment defined in Three Dimensional Unification Value Model include the example of concrete target entities of Healthcare management. Therefore, new TQM may be applicable to support Healthcare management. It is recognized the fact that not only Assessment Product Domain of Outcomes but also Product Domains such as the Inputs, Constrain and Resources are important. Furthermore, not only assessment Process Domains of Quality Assurance or Improvement but also Static Risk Management and Dynamic Risk management from long term prospects are important for Healthcare. Assessment Criteria for Target Entities of Product and Process from the view point of Three Dimensional Unification Value Models may be useful.

Conclusion

In this study, we suggested the whole target entities of product and process of Healthcare based on the consideration of the new TQM in order to achieve total quality of healthcare management. Also, we verified the suitability of suggested whole target entities of Healthcare management based on the result of examination as shown in table 1 and table 2.

Furthermore, we suggested that it is also necessary to identify the target entities of Healthcare from the viewpoint of product and process quality assessment based on the basic concept of quality control. In this study, target entity of the product quality of Top management is considered important for healthcare management of organization as shown in table1. Also, for the purpose of improvement of Healthcare management, it is necessary to improve not only service quality of Outcomes but also product quality such as the Leadership of Top management, input, constrain and resources. It is important to evaluate process management quality how much you lead the best outcomes from limited input resources. Therefore, the quality assessment of target entities of product such as input, constrains and resources are considered necessary for healthcare service as shown in table1.

On the other hand, in the previous study, lack of the target domains for process assessment for TQM such as Static risk management and Dynamic risk management was recognized in conventional TQM. From the figure 2, the conventional western medicine intended to subsequent maintenance when we injured health, and medical technologies such as the surgery to remove a cause of illness developed. Furthermore, the rehabilitation after the emergency procedure is necessary for the purpose of quality assurance of healthcare. On the other hand, conventional Oriental medicine intended to monitor and maintenance the state of non-illness before a disease developed. Therefore, it is thought with

Table 1: Target Entities of Product for Total Quality Management of Healthcare; ●: This mark is the view point of management.

Framework of New TQM										Criteria of Healthcare for Three target Entities and Five target Domains of Product			
Five Domains of Product	Target Entity of Three Dimensional Unification Value Models					Four Domains of TQM matrix						Definition of Product	Example of Target Entities
	Product					Process							
	Value	Performance	Adaptability	Checking	Planning	Doing	Assurance	Improvement	Static Risk	Dynamic Risk			
Top Management	●			●	●	●	●	●	●	●	- The mind that can provide value	» Outlook on ethic, Fairness, Good sense of responsibility » Ethic, Decision making, Leadership, Strategy Control	
		●		●	●	●	●	●	●	●	- Ability of Improvement	» Decision making, Political Skill, Good sense of responsibility, Ability for self-act, Leadership, Strategic control, Communication	
			●	●	●	●	●	●	●	●	- Adaptability of a change of management environment	» A future Flexibility, Accountability	
Input: for organization	●			●	●	●	●	●	●	●	- Value of input resources	» Safe food, Water, Air, Taste, a look, the freshness, a fragrance, pleasure, comfort, Intelligence, Superior medical equipment, Medicine, Sickbed, Facility, IT System	
		●		●	●	●	●	●	●	●	- Capability of input resources	» Human Resource (Doctor, Nurse, Healthcare Worker), Valuable Education, Service, Facility, Patient, Health Worker, IT System, Equipment	
			●	●	●	●	●	●	●	●	- Adaptability of input resources	» Flexibility, A future expandability	

Outcomes: of organization	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	- Value of outcome - Result of improvement of value	» Health body, mind, skill » Safety food, Water, Air, Taste, a look, the freshness, a fragrance, pleasure, comfort, Safely, Relief, Happiness	
		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	- Capability of outcome - Result of improvement of capability	» Good Service, Healthcare worker, Facility, Equipment, Technology, Waiting time, Cost performance
			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	- Adaptability of outcomes - Result of improvement of adaptability	» Satisfaction of both Patient and Healthcare Worker
Constrains: of organization from an inside or outside need	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	- Constrain from a strategy and rule - Constrain from Needs - Constrain of Schedule & Budget	» Law necessary for healthy social maintenance, A medical system, A change of the medical environment, Medical expenses » Human resource, Budget, medical facilities, Sickbed, Supporting technology, Superior medical equipment Medicine
		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	- Limitation of capability of resources	» Limitation of medical expenses, technology, medical support system, ability of healthcare worker
			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	- Limitation of adaptability of resources	» Medical Technology, Medical support system, Education » Flexibility, A future expandability
Resources: Infrastructure of organization	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	- Value of inner organization resources	» A medical system, Human resource, Budget, medical facilities, Number of Sickbed, Supporting technology, Superior medical equipment Medicine, Rule, Knowledge
		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	- Capability of inner organization resources - Suitability of inner organization resources. For example, inner organization shared Service	» Human resource, Budget, Supporting technology, Medicine, Number of Sickbed, Superior medical equipment, medical facilities, Medical System
			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	- Adaptability of inner organization resources	» Technology, Medical support system, education system » Flexibility, A future expandability

Table 2: Target Entities of Process for Total Quality Management of Healthcare; •: This mark is the view point of management.

Framework of New TQM											Criteria of Healthcare for Three target Entities and Five target Domains of Processes			
Four Domains of Process	Target Entity of Three Dimensional Unification Value Models					Four Domains of TQM matrix							Definition of Process	Example of Target Entities
	Product					Process								
	Value	Performance	Adaptability	Checking	Planning	Doing	Assurance	Improvement	Static Risk	Dynamic Risk				
Quality Assurance	•	•	•	•			•				An activity of assurance to achieve a Primary Quality of Product or Process of Healthcare	» Checking Process of quality assurance for Healthcare		
	•	•	•		•		•					» Planning Process of quality assurance for Healthcare		
	•	•	•			•	•					» Execution Process of quality assurance for Healthcare		
Quality Improvement	•	•	•	•				•			An activity of improvement to realize Secondary Quality of Product or Process for Healthcare	» Checking Process of quality improvement for Healthcare		
	•	•	•		•			•				» Planning Process of quality improvement for Healthcare		
	•	•	•			•	•					» Execution Process of quality improvement for Healthcare		
Static Risk Management	•	•	•	•						•	An activity to keep Primary Quality of Product or Process for Healthcare service in future.	» Checking Process of static risk management for Healthcare		
	•	•	•		•					•		» Planning Process of static risk management for Healthcare		
	•	•	•			•				•		» Execution Process of static risk management for Healthcare		

Dynamic Risk Management (Investment)	•	•	•	•						•	An activity to realize prospective good value of Product or Process for Healthcare service in future.	» Checking Process of dynamic risk management
	•	•	•		•					•		» Planning Process of dynamic risk management
	•	•	•			•					•	

Table 3: Explanation of Terminology [9].

Terminology	Product	Process
		Input, Recourses and Constrains for Process of Healthcare activities and Outcomes of process. Also Top Management of medical institution.
Problem: Abnormal status of Healthcare service which cannot achieve primary quality. It can be finally zero if push forward to correction.	An abnormal status of Healthcare service that is deviated from quality requirement specification of Healthcare service. -For example, defect, a fault, an error, an obstacle, etc.	An abnormal status of activity of Healthcare that is deviated from quality requirement of activity of Healthcare. -For example, it is not to satisfy the requirements of ISO9000 or rules of the inner or outer organization.
Issue: An prospective status of Healthcare service which achieved primary quality but cannot secondary quality. It is never disappears.	An prospective status of a Healthcare service which want to be improved in a more attractive quality. It is necessary to soak a priority depending on importance and urgent degree.	prospective quality of activity of Healthcare that want to be improved more efficiently. It is necessary to soak a priority depending on importance and urgent degree.
Primary Quality: Quality to meet specified requirements.	A Healthcare service quality meets quality requirement specification of Healthcare service.	An activity of Healthcare quality meets quality requirement specification of activity of Healthcare. For ex, rules of inner medical organization or international standard.
Secondary Quality: Prospective quality of “Healthcare service and activity of Healthcare”	An attractive Healthcare service quality to meet a tacit expectation of customer needs.	An effective activity of Healthcare quality to meet a tacit expectation of stakeholders needs.
Prospective Good Value: Prospective status of Healthcare service in future. Status of secondary quality.	Prospective status of a Healthcare which want to be invested or improved in a more attractive quality. It is necessary to soak a priority depending on importance and urgent degree.	Prospective quality of activity of Healthcare which wants to be invested or improved more efficiently. It is necessary to soak a priority depending on importance and urgent degree.
Expected Damage:	Expected Damage of Healthcare in future.	Expected Damage of activity of Healthcare in future.

the treatment that established an important point for the static risk management of the health care service.

In this study, offering stable value of service to patient continuously, necessity of process quality management of target domains such as Static risk management and the Dynamic risk management from long range outlook was recognized, and to grow up continuously. The Static risk management and Dynamic risk management are considered effective for a stage of foresight non-illness. Preventive maintenance regularly and development of new medical technology for health care service may cause reduce disease and medical cost and increase health care service investment and reward. As the result, satisfaction of Patient and healthcare worker is grown up. Therefore, it is very important to circulate positive CPD cycle effectively.

Based on the study, view point of target entities such as Value, Performance and Adaptability for product assessment and Planning, Doing and checking for process assessment of healthcare are recognized. Therefore, the characteristics of target entities such as Value, Performance and Adaptability should be identified for product quality assessment of healthcare. Because, the performance

is means and it is not a purpose of values. We should not mistake a purpose for means. Also, the characteristics of target entities such as planning, Doing and Checking should be separated for process quality assessment of healthcare. The definition of value is considered most important for management of service quality of Healthcare during the planning process because the Value is very important in order to achieve goal successfully.

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