

Study on the Improvement of Teaching Quality Management System for Higher Engineering Institutes¹

ETUDE DE L'AMELIORATION DU SYSTEME DE GESTION DE LA QUALITE D'ENSEIGNEMENT POUR LES INSTITUTS D'INGENIERIE SUPERIEURS

Liu Shuqing² Wu Tian³ Wang Yuji⁴

Abstract: Based on the analysis of its establishment and implementation of controlling scheme of the teaching quality management system (TQMS) for advanced institutes of technologies domestic and overseas, from the inspect of the management principles of TQM and 6 σ as well as the process method of ISO9000 family standards, in combination with the evolution scheme of teaching quality of undergraduate courses in ordinary universities, applying the running principles of PDCA, this paper has probed into the objectives of the establishment and improvement of the management system on teaching quality, put forward its basic procedures. We believe that its establishment and maintenance should have four stages, namely, plan, do, check and action, as well as eight steps, which includes decision-making, programming, analysis, design, running, assessing, improvement and perfection, which, lays a solid foundation on concrete teaching quality assurance programs for its improvement.

Key words: quality management system, procedure improvement, implementation and maintenance, continual improvement, institutes of technology.

Résumé: Basé sur l'analyse de l'établissement et de l'application du plan de contrôle du système de gestion de la qualité d'enseignement pour les instituts de technologie supérieurs tant nationaux qu'étrangers, à partir de l'examination des principes de gestion de ce système et de 6 σ ainsi que la méthode de traitement des standards familial ISO9000, en combinaison avec l'évolution du système de la qualité d'enseignement des cours universitaires dans les universités ordinaires, en appliquant les principes de PDCA, cet essai explore les objectifs de l'établissement et de l'amélioration du système de gestion de la qualité d'enseignement et met en avant ses procédures de base. On croit que son établissement et maintenance devrait comporter quatre étapes, soit plan, application, révision et action, et huit pas qui comprennent prise de décision, programmation, analyse, design, application, évaluation, amélioration et perfection, qui, jette une base solide avec des programmes concrets d'assurance de la qualité d'enseignement pour son amélioration.

Mots-Clés: système de gestion de la qualité, procédure d'amélioration, application et maintenance, amélioration continue, instituts de technologie

¹ Shaanxi Provincial Educational Fund (00k009) aided&Xi'an University of Technology Fund (107-210505) Aided.

² School of Business Management, Xi'an University of Technology, China.

³ School of Business Management, Xi'an University of Technology, China.

⁴ School of Business Management, Xi'an University of Technology, China

*Received 20 September 2006 ; accepted 26 November 2006

1. INTRODUCTION

TQMS refers to the management system of coordinating and dominating organizations in terms of teaching quality level.⁵ At present, our higher education is experiencing the transition from extractive education to popular education, leading to the relative drop in teaching quality compared with its enrollment expansion. Therefore, a teaching quality management system with perfect rules and coordinated sectors is increasingly important for universities, and it is of great need to learn from higher educational experience in other countries, to positively introduce the advanced educational modes and methods, as well as to intake for reference the ISO9000 family standards, TQM and 6 σ management principles and modes successfully applied to enterprise management. Some researchers concerned have analyzed the feasibility and applicability of introducing the ISO9000 family standards in educational management for universities, described its new principles based on TQM and ISO9000 family standards, explored the key points in implementing the ISO9000 family standards for universities, and put forward the main processes and procedures for compiling necessary documents. They even did the research about the four procedures of its product realization during the educational and teaching service: reorganization and identification of its customers and social needs, design and exploration, purchasing, as well as planning, identification and controlling of operation process in teaching and teaching service. Moreover, they measured and analyzed the training requirements and the feasibility of the continual improvement of the quality management system, and testified their improved programs.⁶ Furthermore, they come up with the idea that we should set up TQMS, modify and improve the quality monitor and evaluation system by TQM thoughts.⁷ Recently, in reality, in order to get through the evaluation of the TQMS, some colleges even managed to improve it based on the ISO9000 family standards. More and more colleges are perfecting the system in the preparation for passing the national undergraduate-teaching quality evaluation; many colleges overseas managed to improve their TQMS by adopting the American national quality evaluation system, namely, Malcolm• Baldrige, in order to perfect its teaching quality. However, all of these yet have not formed systematical and perfect

procedures and schemes of quality management, leading to that the concepts that “promotion through assess, perfection through assess, combination of assess and promotion, solid promotion” stands only in one’s mind, and the service thoughts and requirements are passively abided by, mainly to meet the requirements in form so that those teaching quality managements can not be applied to the reality and be of great need for improvement. In the light of the reasons above, this paper, from the inspects of the process method and systematic method of the ISO9000 family standards, the paper has probed into the establishment and improvement of the procedure of TQMS for higher engineering institutes by the principle of PDCA, to make the institutes adapt to the changing environmental requirements, and promote the feasibility of their management system as well as the capability of continual improvement in teaching quality.

2. BASIC DEMANDS IN ESTABLISHMENT AND IMPROVEMENT OF TQMS

2.1 Systematic feature of TQMS

TQMS is involved in several aspects, firstly, the forming process of teaching service, including identification of customer requirements, arrangement of teaching program, recruiting, implementation of teaching, and employment guiding for graduates; secondly, resources management process, including managers, construction of teacher groups, teaching materials and experimental equipments; thirdly, teaching efficiency supervision and its improvement, including supervision techniques, methods, measures for nonconformity controlling, correction and precaution, as well as its continual improvement. What’s more important, the management responsibility is also involved, at least including the guiding thoughts of teaching, orientation and goal of the institutes, organization structure, management responsibility, and some other facts related to characteristics of formal or informal organizations, such as campus culture, relationship quality of individual teacher and its group, relationships between groups such as teachers and students, managers and teachers, managers and students, etc. TQMS has its systematic feature, and the processes composed of TQMS that interrelated, inter-restricted and interacted upon should be identified, be understood and be managed, including ascertaining the sequence of these processes and their interaction, principles and methods required to ensure these processes be effective operated and controlled, resources and information needed to support their operation, methods necessary to supervise, appraise and analyze these processes, as well as some necessary measures taken to control facts influencing these processes, attaining the results of planning these processes and their continual

⁵ National Standard of the People’s Republic of China’, *The standard of Quality Management System* [S]. Beijing: Standards Press of China, 2001.9-10.

⁶ Liu Yu, ‘The Study On Quality Management System of Ordinary Colleges [J]’. *Journal of Capital University of Economics and Business*, 2002, (4): 74-76.

⁷ Zhang Liqing, ‘Overall Quality Management and Establishment of Teaching Quality Ensure System in Colleges [J]’, *Journal of Guangdong Institute of Business Administration*, 2003.18(4): 84-88.

improvements, ensuring a integrated and dynamic effective function of TQMS, and hence make the TQMS meet both the knowledge requirements of customers(students, organizations) and expectations of teaching organizations, faculty, the society, and some others that concerned.

2.2 Operational feasibility of TQMS

To improve the TQMS, the orientation and characteristics of a college should be combined, quality management principles and methods advocated by ISO9000 family standards as well as management principles of TQM and 6σ should be introduced in our teaching service, requirements adaptive to changing environment as well as process methods adaptive to the quality of faculty and teaching management mode should be selected. Besides, the process should be converted to certain quality function and quality function activities, the most concise paper should be adopted to clearly describe the procedure of every quality activity, of which its goals, contents, methods of controlling as well as inspection and appraise, responsibilities, authority limitation, pursuant files, required resources, and personnel qualification should be stipulated, of which the linking mode, communication mode with another activity, and responsibility of both, should be clearly presented, ensuring that all departments and the faculty enjoy their own specific responsibilities, and that all certain requirements have solid feasibility or can be achieved by efforts, in order that potential problems in teaching works can be immediately ascertained and resolved, resulting in an effective controlling system in the whole process of teaching service. Moreover, computer network can be utilized and popularized in teaching system to promote the supervision function of the TQMS, so as to keep the feasibility and validity of TQMS.⁸

3. ESTABLISHMENT OF TQMS AND DESIGN OF IMPROVEMENT PROCEDURE

In Combination with the basic ideas of the establishment and improvement of TQMS above, in the light of management systematic method of ISO9000 family standards, the

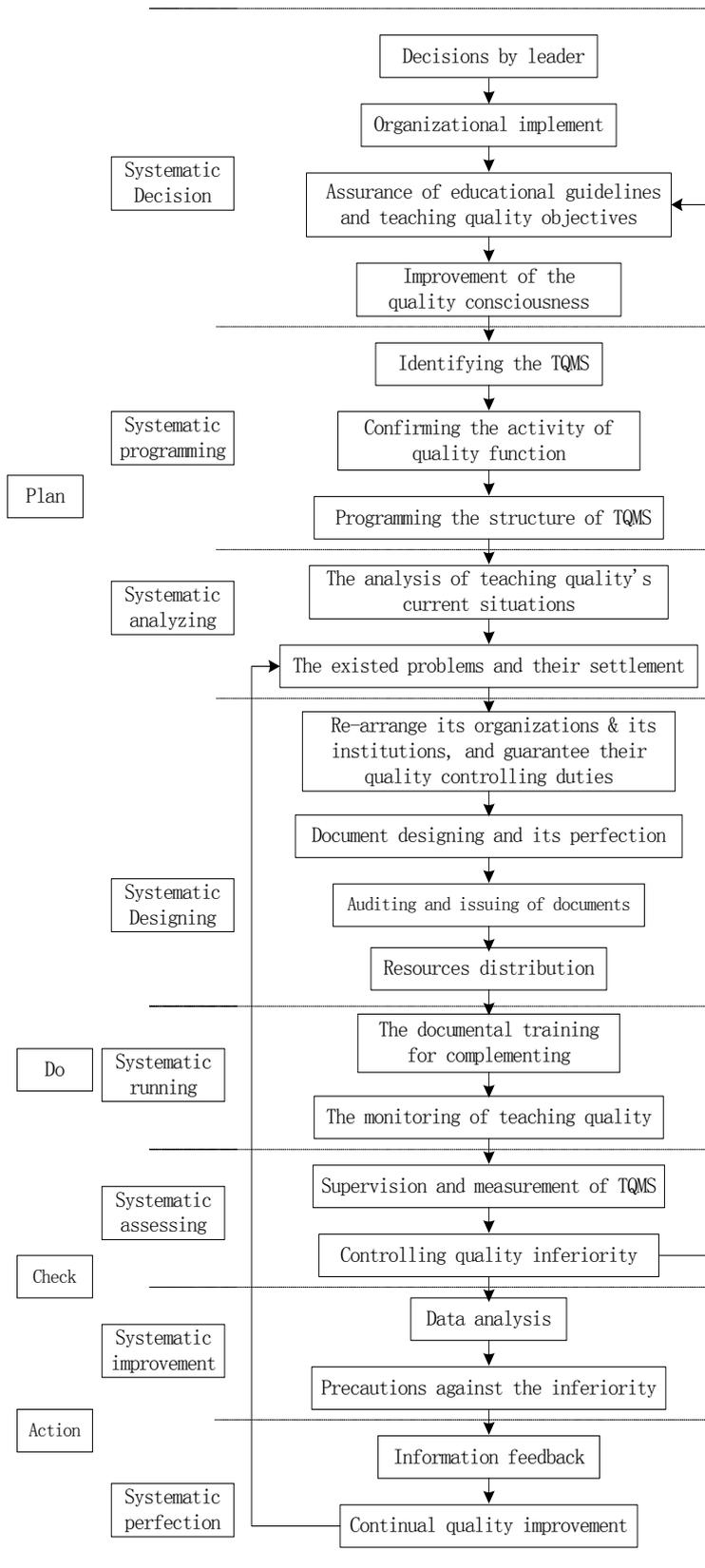


Fig.1 Set up and perfect procedure chart in TQMS establishment and improvement of TQMS, according to PDCA circulating method, can be divided into four

⁸ Peter Hodson and Harold Thomas. 'Quality assurance in higher education: fit for the new millennium or simply year 2000 compliant? [J]' *Higher Education*, 2003, (45): 375-387.

main stages and eight basic steps,⁹ as shown in figure 1. The following will describe the main contents of the eight basic steps, including the PDCA circulation.

3.1 Planning stage

Planning means confirming the educational guiding thoughts, teaching quality objectives and identifying required processes and their sequences of TQMS according to requirements of students, talent-needed organization, government, faculty and others, confirming process controlling method and principles as well as required resources and information. It can mainly be divided into four steps, including systematic decision-making, systematic programming, systematic analysis and systematic design.

3.1.1 Systematic Decision

In systematic decision, pre-preparation of perfecting TQMS should be well done, including leader decision-making, organizing and implementing, confirming educational guiding thoughts and establishing quality goal, as well as educational training and quality consciousness promotion.

1) Decisions by leader. Based on the idea of promoting educational quality, College leaders should combine ISO9000 family standards, teaching quality evaluation scheme of universal colleges, Malcolm• Baldrige national quality program evaluation scheme, and requirements of other TQMS specification, so as to put forward the objectives and certain requirements of improving TQMS, create and keep an inner environment favorable for faculty to fully participate in the attainment of quality goal.

2) Organizational implement. To ensure the implementation of the goal and certain requirements of the improvement of TQMS, principals should confirm the teaching quality director, perfect its organization structure, select suitable personnel, establish the core organization, and constitute its detailed programs.

3) Assurance of educational guidelines and teaching quality objectives. Based on the orientation of the college, persist in looking at customers as its working nuclear cores, offer

all-round development for customers in accordance with the law, the distinct or potential requirements from its directing administrative superior sections, the service objects or customers (such as teaching attitude, images and respects to students or other requirement that society may be concerned about), even meet the needs beyond their those requirement, in order to assure the educational guiding thoughts and quality objectives, and then to expand the quality objectives, so make the responsibility of related organization and faculty into existence.

4) Improvement of the quality consciousness. College leaders, based on quality guideline and goals as well as definite responsibility and rights limitations presented above, should implement faculty training and education to make them understand the quality goal and their requirements of responsibility, understand specific requirements of the improvement of TQMS, to make them, during the design and implementation of the educational scheme, bear in mind the knowledge structure requirements that the talent-needed organization concerned, individuation development of students, and the more importance of the capability cultivation than the knowledge infusing, in order to radically promote the consciousness of teaching quality management.

3.1.2 Systematic programming

Systematic programming mainly do a good job to plan the whole structure of TQMS, including discern the necessary course and the order relation of TQMS, probe into the quality function activity that every course should be launched, plan 3 links of TQMS structure.

1) Identifying the TQMS. According to the systematic principles of TQMS, in the improvement of TQMS, it is necessary to consult the ISO9000 family standards, the evaluation scheme of teaching quality for universal colleges, Malcolm• Baldrige national quality program evaluation scheme and so on, so as to confirm the specific steps required in effective implementation of TQMS and their sequences and interrelationship, to add, reduce, integrate, decompose and confirm suitable processes of TQMS and activities in the course of the attaining process of the teaching service quality. In addition, it is necessary to pay attention to the continual improvement of supervision, measurement and analyze process, so as to continually perfect the inner facts influencing the teaching quality (teachers, students, conditions, managements and so on) to be suitable for the outer environment through supervision system.

2) Confirming the activity of quality function. Every step of TQMS is implemented by a series of quality responsibility activities. It is necessary for colleges, in combination with their own conditions, to identify the customers, compile teaching plans, design curriculum, and offer services effectively, control operating process and methods and etc, introduce the access to the information and, distribute all the teaching quality functional programs to the each department and each staff that may be concerned about.

3) Programming the structure of TQMS. Colleges should combine their own management mode, according to the features of immateriality, impartibility, changeability and easy dissipation of education service, to divide the processes and activities of TQMS into: (1) the teaching quality forming process (such as the identifying process of requirements from students, talent-needed organizations, etc, the specialty setup and design process of cultivation scheme, the collocation of the teaching conditions and the recruiting process, as

⁹ Liu Shuqing, Yang Shuili. *Quality Management* [M]. Beijing: Publishing House of The Mechanical Industry, 2003.57-62.

well as implementation of teaching cultivation scheme and service supply, etc.); (2) teaching service controlling technique and criterion planning process (such as responsibility, rights limitation and communication criterion, teaching conditions and controlling criterion, criterion for teaching and learning vogue, criterion for faculty construction, controlling scheme of teaching quality and so on), the perfecting process of teaching quality (such as supervision and inspection for efficiency of teaching implementation, nonconformity control, information feedback and analyzing, correcting and precaution measures, management comment, continual improvement and so on), so as to make out the structure of TQMS.

3.1.3 Systematic analyzing

Systematic analysis is primarily to collect data and assess the current situations of teaching quality management system, which includes two stages: firstly, the analysis of teaching quality's current situation; secondly, detecting its major problems in the process and seeking for their settlement.

1) The analysis of teaching quality's current situations. Based on the concrete requirements set by the teaching quality management system, the carefully designed surveys and questionnaires are conducted to check the management system itself, to review every exact operating conditions, to analyze the distance from requirements, as well as to take down the problems it may meet in great details.

2) The existed problems and their settlement. According to the analysis we have made, try to detect and analyze the major problems, so as to track down its sources beyond the problems, and thus finding their major reasons in 5M1E (man, machine, material, method, measure, environment) introducing the solving approaches and concrete measures, and then finally coming up its goals and monitoring programs.

3.1.4 Systematic Designing

Systematic designing is chiefly to make sure of their controlling methods, principles and its needed resources and information, which includes the following 3 concrete stages.

1) Re-arrange its organizations & its institutions, and guarantee their quality controlling duties. The teaching quality management system is deeply involved in every sectors: each department & college, every sector concerned, and the university itself. Therefore, according to really existing problems and systematic requirements, each sector of the school is to be well organized and reasonably duty-fulfilled, as a result, which enables that the concrete arrangements and duties can be directly appointed to the sectors concerned in every stage: the quality coming-into being stage, the quality service technique and regulating stage, quality improvement, perfecting stages. Every functional programs and its activities are able to concretely

appointed to every sectors, confining their duties, setting up their link-up, establishing their communicative channels and methods, meanwhile, it is also needed to properly combine each quality professional activities with those sectors' functional professions so as to make it possible to make a good evaluating system, in which duties can be well shared, power can be efficiently used, and profits can be distributed in order to the quality measures can be strictly conducted and easily assessed.

2) Document designing and its perfection. The document of the teaching quality management system at least contains the following 4 category documents: first teaching quality manual, telling the teaching rules and behavior principles; second, procedure document (including its management standards); third, directional guidance which includes teaching service items (eg, teaching schemes, teaching plans, and teaching minimum requirements) and administrative rules (e.g., system of personal responsibility, letter of personal commission, teaching and learning regulation, administrative system of student's statute); fourth, teaching quality documental recording (e.g., teaching quality recording forms). It is of great necessity to organize certain staff concerned to compile teaching quality guidance booklets, to abolish its procedure documents, to finish commission guidance, to fill out the teaching quality recording, guaranteeing the top category documents properly direct the bottom categories and are supported by the bottom.¹⁰

3) Auditing and issuing of documents. Firstly, the relevant experts invited by the school verify those compiled documents, analyzing its feasibility and adaptability, then, according their suggestions, the sections concerned revise, abolish, improve those documents, eventually, after certain procedures and the presidential agreement, those teaching quality management systematic documents are to be issued, becoming the school legal documents and principles that each of the staff take his own responsibility, strictly adhere to those documents.

3.2 Doing stage

It is one step in the system to carry out and offer teaching services, including 3 stages: resources distribution; the documental training for complementing, the monitoring of the operational process.

1) Resources distribution. This stage aims at getting access to necessary recourses and information for operation and monitoring. In terms of the teaching requirement, the school effectively distributes its teaching resources, especially, focusing on personnel resources offering all kind of needed teachers, teaching

¹⁰ Wang Linyi, 'The Compiling Thoughts of Quality Management system File (ISO9000: 2000) [J]'. *Information Technology and Standardization*. 2002.12:40-43.

foundational facilities, teaching devices and information resources, so as to meet the teaching objectives and subject requirements, to ensure teaching services.

2) The documental training for complementing. After the teaching process network, teaching facilities and teaching recourses meet the teaching needs, all the staff are required to be trained and be familiar with all the documents in order to properly abide by the documents, thus making it possible for those documents to run smoothly and effectively.

3) The monitoring of teaching quality. Now that the documents have been issued, they should be strictly abided by. And also encouragement system & regulation system are needed to be established so that the teaching quality can be guaranteed. The monitoring system at least contains 4 parts: 1, absorb students, parents, employees to participate in the teaching quality management, to establish a communicative bridge among teachers, students, teaching administrations for information exchanges. 2. choose reasonable and scientific observing points, conduct regular surveys and evaluations, strictly control every teaching process, make a better learning and studying environment come into being 4 broaden information channels, set up an effective information broad, making sure the branches in charge of teaching quality can be well-informed, the dean responsible for this matter (representative of the school management) is supposed to organize, direct and try to coordinate various departments, students, employments, and others that may be concerned, realizing all the teaching quality assurance programs can run in harmony and in good order.

3.3 Checking stage

The check-up stage is mainly to deal with the information collected during the Teaching Quality Management System, to supervise, measure, analyze, and assess those information, the stage is composed of two elements: supervision and evaluation of TQMS; the controlling of quality inferiority.

1) Supervision and measurement of TQMS. Colleges, according to the quality objectives, should spot the range of information collection¹¹ (such as surveys of customer's content degree, measurement of teaching service process, changing trend of talent market, and employment status of graduates, etc). And it also need supervise and appraise the TQMS. The supervision and appraise includes: the measures can be taken to supervise, measure, evaluate its teaching quality management system, such as inner verification, self-evaluation of its undergraduate's teaching quality level, comparison between Malcolm-badridge's Quality Testing Program and its own system; teaching

inspection and teaching assesses, students exams, the assess of staff personal proficiency, the state of experimental equipment's maintenance can also be regarded as important points to know how well the system runs; students's behavior performance, their fitness, and their adaptability are also considered important things to assess the system; in addition, talks with employments, parents' meetings are very helpful to spot the problems, and thus taking effective measures and meeting the needs of all lines.

2) Controlling quality inferiority. In the process of supervision and measurement, if the inferiority of management, or potential inferiority, arises, the certain detecting procedure is supposed to identify the inferiority, mark it, record it, then assess it's overall consequence, strengthen their administration of the status as a student, promptly handle it.

3.4 Action stage

The stage of action is just to take some precautionary measures against potential problems in the light of former stages, in the pursuit of improvement and perfection.

3.4.1 Systematic improvement

Systematic improvement mainly involves taking certain precautionary measures against what the problems have been found in the process of the inferiority assess, so that the planned results can be achieved in the end, which includes data analysis, precautionary measures two steps.

1) Data analysis. The school should carefully collect and analyzed all the information and data in the management system, rightly evaluate the effectiveness of the management system, in hopes to seek opportunities for improvement.

2) Precautions against the inferiority. The school, according to the data analysis of the inferiority problems, makes some correcting and precautionary measures against the inferiority. And then analysis of the effectiveness of those precautionary measures should also be taken to evaluate those measures' feasibility and adaptability to really know what situation it is and how it functions.

3.4.2 Systematic perfection

System perfection aims at continual quality improvement, feedback and continual quality improvement being its two main elements.

1) Information feedback. In the operating process, certain measures should be taken to keep conducting information feedbacks; existing problems should be promptly reported to the relevant departments and managements, especially, those problems that have existed and have already handled. Only in this way can those problems be paid enough attention to and be corrected fundamentally.

¹¹ Lesley Vidovich, 'Quality assurance in Australian higher education: Globalization and steering at a distance [J]'. *Higher Education*, 2002, (43): 391-408.

2) Continual quality improvement. Improvement and innovation of teaching quality is an everlasting process. Therefore, the mind of improvement and innovation should be employed in each procedure of teaching. The Teaching Quality Management System also needs keeping mending itself based on the PDCA circle. When the first PDCA circle finishes, the practices and programming schemes of the first circle should be standardized and put into the administrative documents in the following procedures; those yet unsolved problems or newly-found problems are shifted to another PDCA circle, namely the Systematic Analysis Stage (marked 3.1.3 stage in the paper). The procedures and steps as usual takes place again based on what we have mentioned in the 3.1.3 stage. In the stage of planning in another circle, first, analyze those unsolved problems, track down their reasons, put forward the concrete solutions, then find what resources and information are needed to solve the problems; those resources and information are firstly guaranteed in the stage of Doing in another circle, the problems being solved by the support of documental training and the monitoring procedures; in the stage of Check-up, the problem-solving processes and their effectiveness should be monitored and evaluated to report the results and strictly control inferiority ;and in the last stage of Action , further detailed measures and the precautionary are taken against the found problems, and the practices in the circle is to be introduced into coming circle, meanwhile ; the problems left in this circle always convert into the coming circle. In the recycling way, continually study the feasibility and effectiveness; seek opportunities for improvement, making the Teaching Quality Management System really in the continual, everlasting process. Through the correct analysis of

various data and its effectiveness in the light of ever-changing surroundings, the traditional mode of management system, which mainly concentrates on "assess and control" tends to shift into the new mode, which pays much important attention to "improvement and innovation", thus keeping improving and perfecting the teaching quality management system.

4. SUMMARY AND SUGGESTIONS

Though implementing the procedures of establishing and improving the TQMS has been put forward in this paper, the TQMS can operate in cycles of the four stages of PDCA circulation, and is endowed with promotion of new contents and goals during every cycle. From this point, it can not only cultivate talents that market requires, but also can achieve the coordination between magnitude and quality, overall and characteristic development, current and future development, success and innovation, and thus attaining the continual upgrading of the TQMS. During operation, much attention should be paid to the action stage (A), unresolved problems left by the last stage of PDCA circulation should be regarded as nonconformity and should be strictly analyzed and controlled according to the certain steps presented above, make further correction and precaution, in order to prevent reoccurring of the nonconformity. In addition, we should not wait the opportunity, but probe into the adaptability and feasibility of TQMS, seek the opportunity of continual improvement, and continually perfect the teaching service quality.

THE AUTHORS

Liu Shuqing, professor, School of Business Administration, Xi'an University of Technology, Dean of Industrial Engineering Department. Xi'an, Shanxi, 710054, P.R. China.

Wu Tian, postgraduate, School of Business Administration, Xi'an University of Technology, Xi'an, Shanxi, 710054, P.R. China. E-mail: wutian_1020@163.com

Wang Yuji, School of Business Administration, Xi'an University of Technology. Xi'an, Shanxi, 710054, P.R. China.