IMPLEMENTATION OF ISO 9000 IN SCHOOL SYSTEMS: BENEFITS, DILEMMAS AND OPPORTUNITIES

A PEDAGOGICAL APPROACH FOR THE TQM LECTURES IN THE ENGINEERING COLLEGES

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Abstract

An experimental pedagogical approach has been used at Agder College for the TQM lectures. The lecture syllabus has been redesigned as a project oriented task. The students are engaged in the project task of preparing a quality system after ISO 9000, using their own college as a model. Positive reactions have been noted. The method benefits first the students and their understanding of TQM and ISO 9000. The problems of using the college as a model, and expansion of the method to other areas are discussed, and further opportunities are also addressed.

Key words: ISO 9000 standards, student project work, manufacturing producers, school systems.

Introduction

ISO 9000 is becoming a familiar jargon for many industrial managers in the Western nations. Making good business by implementing TQM (Total Quality Management) and ISO 9000 standards (including 8402, 9000, 9001, 9002, 9003 and 9004) are no longer a new strategy for many manufacturing companies. Certification of quality systems after ISO 9000 standards is not luxury, but also a necessary survival strategy for the most manufacturing companies and producers.

It is easy to imagine the consequences to the educational sector of such development. The future demand for qualified engineering graduates with sufficient knowledge of TQM and ISO 9000 may increase drastically. The engineering colleges are expected to place their TQM lectures among the first priority in the lecture plan and need to do substantial research work about TQM lectures. Furthermore, the pedagogy of the TQM lectures may also be redesigned according to the most important needs from students - namely understanding and practicing of ISO 9000 standards.

This report deals with problems answering the issue above, thus finding the new pedagogy of the TQM lectures in engineering colleges. The new pedagogical approach for the TQM lectures is a problem oriented and project based experiment, rather than a pure lecture hour-based class lesson. The background, experiment design, project follow-up, observation, problems, benefits, and further opportunities for such a pedagogical approach will be discussed in the coming sections. The report consists of the following sections: Backgrounds and ideas; Design of the experiment; Reactions and problems; Who are the customers in this TQM game?; Conclusions and further suggestions.

Background and ideas

Although TQM is widely applied and ISO 9000 is familiar jargon for many industrial managers, the history for TQM lectures in the educational sector is rather modest. Compared with other scientific subjects, the theoretical basis in most TQM lectures is relatively limited, at least for engineering colleges. Hence, there is still no clear school discipline and syllabus for TQM
lectures. Many of the lectures used TQM concepts, definitions, and statistical calculations (Aune 1993, Jersin 1984, Bergman & Klefsjø 1991). Others used ISO 9000 standards as the syllabus, and lectures consisted of reading the various chapters of the standards. There is basically nothing wrong with such approaches for knowledge transference alone. However, the reactions from students are often negative. They found it especially hard to understand the contents of ISO 9000 and how they can use the standards for quality systems in practice. This is because ISO 9000 standards are much too remote from their daily life. It is also because their knowledge of manufacturing producers is insufficient.

Because of this problem, the students reactions are understandable. They seem to need an interpretation of the contents of ISO 9000. They want to see the real picture of ISO 9000 standards and how they function properly.

The solution is to introduce the practice of learning by doing into the TQM lectures. The idea is borrowed from organization development theory and its implementation in practice (Argyris & Schön 1978). Thus, the TQM lecture is redesigned into a form of project oriented group exercises. The students have a simulated “case” organization which they work with through out the semester. They have a project assignment, the task of implementing ISO 9000 standards into that “case” organization. They are expected to compile a complete quality system for the organization by the end of the lectures.

Design of the experiment

The experiment has been tested for 3 consecutive semesters. Three student classes were engaged in the exercise. The majority of the students were marine technology majors where ISO 9000 standards are widely adopted from industry. A minority of them were civil engineering and technical economy studies. Most students were in their final year of study and they had been in the college system for at least two years. They have very good technical backgrounds with strong detailed knowledge on drawing, welding and underwater robotics. The principal problem for them, as mentioned previously, is their insufficient knowledge of the integration of a manufacturing producer. They often have difficulties seeing how different parts in a production organization function properly as a whole. In that sense, their overall knowledge about integration of unequal parts of a production organization needs to be improved.

The design of the experiment is therefore based on the need to improve this non-technique element of this knowledge. The students are required to develop more understanding of the following topics:

-Integration of different technical parts
-Organization of manpower and resources
-The importance of laws and rules for production engineering
-The essence of documentation for engineering works
-Interpretation of ISO 9000 for different functions

Different models were used as “case” production organizations. The school - Agder College, the college laboratory, and some other divisions in the college, as well as some external manufacturing producers which were chosen as the “case” production organizations.

Different options of “case” production organizations were tested during the experiment. In the first test, the college laboratory was used as the model. In the second test, the entire school system was used as the model. In the third, some divisions of the college and external manufacturing producers were used as the models.
The student class was divided into several groups. Each group had to pick up one or several specific chapters from one of the ISO 9000 standards to work with. The selection of the appropriate ISO standard for the particular model was also left to the students. This is an approach for learning the effectiveness of different quality systems designed to meet the customers’ requirements (Corrigan 1994), and furthermore, an overview of ISO 9000 standards.

The model, whether it was the college, laboratory or manufacturing producer, usually consists of many interrelated factors. One of the major student tasks was to analyze those factors and their interrelations and functions. This approach gives simplicity of the model structure (Logothetis 1992, p 354), and is called working factor analysis (Aune 1993, p 104). The purpose was to let students exercise their abilities to define and analyze the scope of the problems. Because this is usually the weak point of their learning situations, they are very good at solving the problems, but not at finding or delimiting the problems.

Combined with approaches above, the definite instruction and examples of quality system preparation from industrial companies were presented at the same time in the TQM lectures. The questions and problems from the students during their projects on their simulated quality systems were also good subjects for the lectures. Hence, the lecture syllabus was not only based on the presentation of knowledge of TQM and ISO 9000, but also on development for understanding of the contents and improvement the abilities of knowledge implementation of the students. In the broad sense, this approach gives also the positive impact of the human resource function on TQM lectures (Wilkinson, Marchington & Dale 1993).

The final stage of the experiment consisted of student discussions and the presentation of their work. After each group concentrated on different chapters of the standard and unequal parts of the “case” organization, it was time for assembly of the whole. Each student group was allowed to present their works in front of the class audience, with discussions, comments and criticism. By presenting project work from every group, all actual topics, such as relevant chapters and different parts of the “case” organization were covered. Hence, the students were able to overview the process of implementing ISO 9000 in other divisions through out presentations and discussions. On the other hand, they were undoubtedly able to learn detailed knowledge in the partial group work. From the theoretical point of view, this is a process of learning and improvement. The former is adapted from the concept of quality teams, and the latter is rather quality circles related (Ishikawa 1992, p220).

Reactions and problems

During the first test, the college laboratory was used as the model. The students used much efforts to prepare procedures which belonging to the lower level of a quality system. In the second test, the entire school system was used as the model. The students were required to concentrate on the quality system which belonging to manual level. This is the level of holism with less details. It is interesting to notice how students prefer one particular type of preparing work to the other, even for preparing the same quality system. They seemed to be more enthusiasm for the detail oriented work such as preparing a quality procedure. They were also more active to ask the questions about details of procedure. However, their questions concerning to TQM in the level of organization and management were not quite profound and their willingness to carry on this part of preparing work was modest.

The reactions of the students were therefore much more positive from the first test than from the second. The first was concentrated on procedures with details, while the second was on upper management level in a quality system. Naturally, the first was more visionary and the second was more diffuse. They had also difficult tasks to define the interrelated factors for the college system, because the interrelations between divisions, or say in a macro level, were less “visible” for them. On the contrary, it was relatively easy for the students to overview the activities and
their interrelations in a laboratory, or say in a micro level, and remark them by a number of factors.

When the students were asked for the reasons why they were less interesting to carry on the quality system work in a macro level, they gave the following explanations:

- It is hard to settle a quantitative measurement for a such level
- School situation is quite unfamiliar from the industrial examples
  - Every quality system’s policy and requirements looks nearly same
  - The divisions in the college are not so much depending each other
- Huge gap between the general rules of ISO 9000 and every particular situation, a problem of interpretation and implementation

Point one certainly makes hard time for engineering students since they traditionally are used to work with quantity. Lacking of a quantitative measurement for them is lacking of a work task. This causes frustrations among them. Point two creates a new and unfamiliar situation for the students, so their previous knowledge about industrial examples is useless. However, this only can be improved through experience and training. Point three misleads students to an abstract level so they are unable to distinguish difference from one to another. Thus, every thing or nothing makes sense. Point four illustrates the daily situations for a student in a college system where the interrelations between divisions are rather invisible or less depended. Therefore, it is hard to prepare a quality system which total integration between divisions is essentially required. The last point is probably the most common dilemma for the students. They may ask where is the key solution for using ISO 9000 in school systems? How to interpret ISO 9000 laws and rules for every particular situation? How general or specific a quality system instruction should be written in literature sense?

The five points above have also addressed very interesting discussion issues for the implementation of ISO 9000 in school systems. Pedagogically, they represent mainly problems and dilemmas during the student works. Pragmatically, they give us an illustration of how specific problems are expected and occurred in many other sectors, including manufacturing industry.

Quantification is an important part of implementation. The importance of investigating measurement methods for TQM is addressed in the early theories (Ishikawa 1992, p256). There are many techniques available in this area (Logothetis 1992, p229; Aune 1993, p203), so it should not be any problem for the practical use. Other research findings suggests that lack of metrics and quantitative measures causes barriers to TQM progress (Fuchs 1993). Hence, simulating activities and problems in quantity, especially for organization and management level is good training for the students. The dimensions that considerably lead them to quantify activities and problems easily are for example econometrics, time spent on different activities, numbers of events and meetings.

Similarly, the school situation can be simulated closely from an industrial sample, so the parallel analysis is made by both. Such training provides students’ consciousness for seeking the similarity from different situations, improves their cross-industrial learning. In long term, this helps expansion for implementation of TQM to all industries and all functions (Godfrey, 1993).

Each quality system has primarily its own policy and requirements. Making difference from one quality system to the other, is a question of experience and practical learning. The vast numbers of ISO manuals and handbooks with various versions were illustrated and analyzed in the TQM lectures for seeking the differences of policy by unequal situations. However, customers are regarded as the first priority according to the ISO 9000 policies, so there should not be huge differences in the main directions of the policies.
The divisions in the college are not visibly depending each other. This is because the cultures in colleges or universities are quite unlike industrial organizations. Strong individualism cultures usually dominate school systems. The cooperation between divisions is modest for many colleges. On the other hand, the school situation may consider class advancement as the elementary process. For example from under-graduate class to graduate and then post-graduate and so on.

There is no fixed answer or solution to the problems of point five above. The huge gap between the general rules of ISO 9000 and every particular situation is existing in every situation for preparing a quality system. The grade of general or specific level for a quality system will be determined by customers’ needs, organizational resources, the sizes and types of organization tasks. For the students, it is a question of their knowledge to school systems and ISO 9000 standards, and interpretation of both.

Regarding to issues and problems above, the third test was modified considerably from the first and second. There were a few models, including the entire college system, the laboratory, a division, the canteen and some external industrial organizations were chosen into the project work. Each group had to prepare a complete quality system as a whole, not only one part or chapter as their previous classmates did. Therefore, their abilities to solve problems on the coordination level and manage integration of an organization were substantially improved.

**Who are the customers in this TQM game?**

The issue of customers was been frequently discussed by students. In the traditional sense, the college is a service institution and students are forest people who make direct contact with the college. Many propose therefore students as customers of the college. However, the analysis of integration between colleges, students and industrial business shows something else. The real customers of the college, according to the marketing principle, are not students, but industrial business. It is true that the college provides service to the students, but it is also true that the college produces many engineering graduates to match the requirements from industrial business. The latter seems to be more essential for colleges. The students in that sense, are regarded as raw materials and they only deserve internal service, not customer service.

The philosophy of TQM and the principles of ISO 9000 give more space to the customers’ needs. The organization’s infrastructure and routines may be strongly influenced by the customers’ requirements. Therefore, changing the perception of customers from students to industrial business impacts substantially the college system. For the educational sector, it is time for rethinking.

Still many students consider themselves as customers of the college and they put forward quite a few requirements (based on their own views) for the quality system of the college. Such requirements were mostly true concerning the internal service of the college. However, those requirements were largely placed at the procedure level for the above reasons.

At the present time, the dialogue between the educational sector and industrial business is relatively limited on this issue. The internal service is still the dominant element for most colleges. The quality systems for colleges still remain at the procedure level in most cases. Focusing on industrial business as the external customers is still at a philosophical level and has a long way to go.
Conclusions and further suggestion

Generally, the reactions of the students towards this experiment were quite positive. They appreciated the pedagogical approach of learning by doing. They believed this provided opportunities for them to learn TQM and ISO 9000 in a relatively substantial way. By doing quality system work, they were able to read and absorb ISO 9000 standards slowly, but definitely. By solving the particular problems in the project work, they were able to observe and analyze closely their current “manufacturing producer” - the college, and understand better how TQM has been functioned in the college in the narrow sense, and how it will function in industrial business section in the broad sense. They were training for teamwork and documentation management.

The most important thing is: They have learned how to implement ISO 9000 standards for different situations where they all have unequal systems. The main conclusions and suggestions from this experiment indicate following outcomes:

**Benefits**: Implementing ISO 9000 in school systems first benefits the students and their knowledge of TQM and ISO 9000. It is primarily pedagogical training, not a consulting use. The benefits to industrial business is still in discussion. However, the experiment showed the following positive impact: (1) Teamwork is a good exercise for TQM study. (2) Learning by doing is an effective approach for understanding, even for a simulated case. (3) Working with a TQM case stimulates creativity and brings out further profound questions to the debate

**Problems**: Implementation of ISO 9000 in school systems will certainly meet greater problems in practice than in the classroom. The situation in school systems is quite different from industrial business. The former is dominated by public administration where customers still need to improve their status, and the latter is by marketing principle where customers are already regarded as the first priority. Also, when developing the similar experiments in the future, detailed problems need to be improved, such as the five points mentioned previously from section 3 and definitions of customers for school systems.

**Opportunities**: Clear evidence has been showed for increasing demand for TQM engineering graduates from industrial business sectors. Learning by doing is an effective approach to meet this demand. Such approach also provides pre-requisite for cross-industrial learning and abilities for practice management. Through these student projects, the college is also able to seek opportunities for cooperation between itself and industrial business organizations. The experience from this pedagogical approach is also transferable for other non TQM studies in school systems. It is a question of adaptation.
Bibliography:


