

AN ANALYTICAL STUDY OF INTEGRATED TOTAL QUALITY MANAGEMENT PRACTICE IN TECHNICAL EDUCATION – FACULTY PERSPECTIVE

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Abstract: *The importance of the education sector, particularly in a professional discipline like engineering studies, is increasing day by day in our country. The quantitative growth of the institution in private sector provides smacks of attempts to commercialize and this need to be curbed. Nowadays, a major threat in our country is that of brain drain which may occur very rapidly in the near future due to attraction of good quality students to foreign universities. It is, therefore, necessary for the Indian technical education system to change its face by improving the standards and offer world-class quality technical education matching the global standards so as to attract the students to Indian technical educational institutions. At present, most of the manufacturing sectors are gaining more benefits by the adaptation of quality concepts like TQM, ISO 9001:2000, Six Sigma, Kaizen, 5S and others, which are now being tried in the service sector of education also. The aim of this research paper is to study and analyze the integrated TQM practice in technical education. This work starts with background theory and outlines the result of a study conducted on faculty from selected engineering institutions in Tamilnadu to obtain a faculty perspective of the integrated TQM practice in their technical institutions. The collected data has been analyzed and interpreted by using Statistical Package for Social Sciences (SPSS) like ANOVA and correlation analysis. Based on the analysis, useful findings and recommendations have been made.*

Key words: TQM, ISO 9001:2000, Six-Sigma (DMAIC methodology), Integrated TQM, Technical Institutions.

1. INTEGRATED TQM

The present scenarios in engineering institutions are passing through a critical phase as they are facing a global competition. Certain technical institutions in India have adopted successfully some quality improvement strategies like ISO 9001, Six-Sigma (DMAIC methodology), Lean Thinking and TQM. The quality of education is becoming important, particularly in engineering institutions. ISO – 9000 certification is now not limited only to manufacturing sector but also equally acceptable to service organizations such as Educational Institutions, Hospitals etc. ISO 9000 is a guideline for selection and use of the standard on quality management, quality system elements and quality assurance. In educational institutions, ISO 9001 means quality assurance in servicing where the capability of suppliers is demonstrated through quality system to the buyers (i.e. parents and industry owners). Being an ISO 9000 certified institution, satisfying all the accreditation requirements, it looks as a right system. Six-Sigma has been considered as a business strategy that employs a well-structured continuous improvement methodology to tackle process variability and drive out waste from the process with the phases

called DMAIC (Define, Measure, Analyze, Improve and Control). The Six-Sigma uses DMAIC methodology as a road map for problem solving and process improvement in the engineering institution. The core concept of six-sigma is to minimize variation in a particular process. At present, most of the manufacturing sectors are gaining more benefits by adaptation of TQM. The core concept of TQM is to achieve zero defects through continuous improvement. Six-sigma is a methodology within the large framework of TQM: also it is an innovative approach to continuous process improvement. These concepts can be applied to the field of education. Total Quality Management (TQM) involves total commitment from everyone in search of continuous improvement individually or collectively. This paper work attempts to offer an approach that integrated TQM for quality assurance in engineering educational institutions through continuous improvement. The objectives of the study are:

- ✓ To study the quality level of education offered in ISO / Non ISO certified engineering colleges.
- ✓ To identify the low scoring factors and suggest suitable measures to improve them.

- ✓ To identify the most important predictors of academic and non-academic performance of the institutions.

Total quality management and six-sigma have evolved in Japan as the management philosophy for satisfaction of ever changing customer needs and expectation in an efficient manner. Continuous improvement is one of the main principles of both TQM and Six-Sigma. ISO 9000 need not be the enemy of TQM. TQM looks at the corporate culture and ISO 9000 and Six-Sigma look at the corporate system and together they help the institution to achieve quality in engineering institution. This is the reason why ISO9000 and Six-Sigma are incorporated into TQM. The integrated TQM is a bundle of global management practices. The end result of integrated TQM is to meet out the customers (i.e. Parents / Industry owners) expectation as well as improve the wealth of institution.

2. REVIEW OF THE LITERATURE

TQM has been used successfully in variety of organization, including manufacturing and service organization. Although, application of TQM in higher education institutions started later than in industries, gradually, colleges and universities are adopting TQM principles based on various research analyses. Some researchers have documented the experience of ISO 9001:2000 certification and TQM implementation in some higher educational institutions also. Madu and kwei (1993) discussed the dimensions of quality teaching in higher educational institutions. They pointed out that one of the major problems in higher educational institutions was that the emphasized Total Quality Assurance (TQA) rather than Total Quality Management (TQM). They discussed the difference between TQA and TQM, and recommended changes to be made in order to improve the quality of teaching in colleges and universities using TQM. Owlia et al (1996) were the first ones who started with services to develop a new framework, in which quality dimension and its corresponding characteristics were identified. In this frame work for measuring quality in engineering institutions, six dimensions comprising of 28 items were used as basis for different questionnaire is for students, staff and industry people. G.S Sureshchandar et al (2001) discussed 12 dimensions of quality management as critical for the utilization of a TQM environment in service organizations. A conceptual model for TQC has been proposed demonstrating the relationships among its dimensions. Sangeeta Sahney et al (2003) concludes and defined TQM in education as follows: "TQM in education is multifaceted...". The quality of process is the quality of output, in the form of enlightened students who move out of the system. K.Subramanian Bhat et al (2005), S.S. Sarda et al (2006) and Prabhakar Kaushik et al (2006) they all explained the role of six-sigma (DMAIC methodology) in technical institutions for the continual improvement of the student results. A. Pal Pandi et al

(2006) explained the concept of integrated TQM practice in technical institutions for quality assurance. S.G.Deshmukh explained the usefulness of TQM concept for technical education and also the six-sigma approach (DMAIC methodology) in evolving error free processes within the gamut of various activities of technical institutes. S.S.Mahapatra et al (2006) considered 256 articles from journals and identified 20 critical factors for successful implementation of TQM in any organization. Various researchers have identified the critical factors which identify the importance of implementation TQM in manufacturing as well as service institutions. Till date, there are research papers which give the out line of various quality improvement concepts such as ISO 9000 Certification and TQM in technical institutions but no one stress on integrated TQM practice in technical institutions. In this work we have defined Integrated TQM, which is nothing but global management practices such as ISO 9000 Certification, Six-Sigma (DMAIC methodology), lean thinking, knowledge management and TQM. Based on literature review, we pointed out the seven basic and most vital factors or dimensions which comprises of 65 items for measuring practice of integrated TQM in technical institutions.

3. NEED FOR THE STUDY

Engineering education is essential to improve the technical manpower of a country. Technical manpower is the key to the industrial growth and development of a country. Quality is the fabric of every organization, and it is a vital component for survival. Nowadays pass percentage, placement success rate, knowledge dissemination and the skills acquired constitute the vital output for engineering education programme. Unfortunately, these seem to be unsatisfactory level in engineering education. Because, some of the problems plaguing these institutions are lack of infrastructure, shortage of qualified faculty, poor student results, improper placement facilities etc. There is a great need to improve the quality of education. Quality of the student is impossible without the quality of the institution's process. So they must focus on quality of the process. But excellence in engineering institution is not an easy task. This can be achieved through implementation of integrated TQM concept in engineering education. The objective of this work is to identify the operating-system elements and critical factors of integrated TQM in institutional units in Tamil Nadu, and to develop the questionnaire for measuring the practice levels of integrated TQM implementation through faculty perceptions. The good academic performance comprises of teaching – learning process, since the teaching faculty plays a vital role in this process. So the perceptions of faculty are obtained to suggest improvement in technical education process. The critical factors are explained in table1.

3.1 Methodology

Methodology is a way to systematically solve the problem. To make our work easier and clear, we have prepared questionnaires based on 7 critical factors or dimensions of integrated TQM that is based on the Six-Sigma (DMAIC), ISO 9001 and TQM principles. The prepared questionnaire for 7 critical factors or dimensions of integrated TQM was distributed to 250 faculty members. The solutions of these questions explain the 7 critical factors of integrated TQM practice in technical education. This study offers a set of 7 critical factors with some operating elements or items of quality management as a comprehensive measure of integrated TQM implementation. Secondary data refers to the general ideas that are gathered from published research papers, journals and magazines etc. Sample size refers to the number of institutions where our survey is to be conducted. In this work we are taking 50 engineering institutions in south Zone of Tamil Nadu, India (Anna University Zone 9 & 10 Colleges).

3.2 Challenges Confronted By the Researcher

The researcher had to face many challenges in getting information factually from the records physically. Because most of the ISO9001:2000 certified institutions were reluctant to provide the records of ISO physically to the researcher for verification. But the information could be obtained only through oral conversation and also replying by the questionnaire. Hence the finding with regards to ISO document and quality management practices were given based on the opinion obtained through the questionnaire.

4. RESULTS AND DISCUSSION

In this work, we considered 50 engineering institutions in south zone of Tamil Nadu (Anna University Zone 9 & 10 colleges). The questionnaires for 7 critical factors or dimensions of integrated TQM were distributed to 250 faculty members. The respondents were asked to rank the factors on a five point Likert scale (5 – Strongly Agree, 4 – Agree, 3 – Neither Agree nor Disagree, 2 – Disagree, 1 - Strongly Disagree). The collected data was analyzed by SPSS package. The scores were added together and then divided by number of observation per factor to determine the mean score of each factor. Higher the score, greater the importance of the factor. The perception of faculty based on experience and age about the practice level of integrated TQM with respect to critical factors in their institution was analyzed. Some variables or items are insignificant that they are shown in following tables (table2, 3, 4, 5, 6, 7).

Table 1 The Critical Factors or Dimension of Integrated TQM

Critical Factors of Integrated Total Quality Management.	Explanation of Critical Factors
1. Top Management Commitment	Top management recognizes its roles and responsibilities to set direction, management principles and vision, and develops strategies and policies. Management should exercise its involvement and commitment in developing the management structure and environment in which the organization and its people can excel to achieve the organizations objectives.
2. Employee Involvement	Through shared values, trust and empowerment, which encourages the involvement of people in all levels in the organizations to release their potential to be used for the organizations benefit. Employee involvement begins with the personal commitment to quality the employees who accept and commit to quality philosophy (or) more techniques and use them in the daily work.
3. Teamwork	Teamwork is the cumulative actions of the team doing which each member of the team subordinates his individual interests and opinions to fulfill the objectivity (or) goals of the institution. <ul style="list-style-type: none"> It should maintain discipline, build team spirit and motivate each other. The team should have companionship, fulfillment of personal growth and self-respect Every one should work hard to see the task is completed.
4. Customer Satisfaction	Customer satisfaction and value creation are important yardsticks for a customer – focused institution. Therefore, it is important to plan the required measure and translate those measures in to actions, by organizing people driven systems and processing to meet the customers' expectations. Customer satisfaction is at the core of integrated total quality management, and this is an outcome of several processes in the institution.
5. System Approach to Management	Identifying, understanding and managing interrelated process as a system contributes to the institutions effectiveness and efficiency in achieving its objectives. The institution should be asking itself the following questions: <ul style="list-style-type: none"> Who is responsible for the quality process? Who is responsible for ensuring that there are adequate people and equipment for the quality process to be effective? Who is responsible for the measurement and monitoring of the system? By reviewing the above points periodically management should be able to ensure processes that operate in accordance with management policy to achieve institutional objectives.
6. Training & Development Of People	Provision for statistical training trade training, and quality related training for all employees. Achieving the highest levels employee performance requires well developed people education and training and adoption of ethical approach to promote people well being and satisfaction.
7. Continuous Improvement	The resources are planned, managed and improved with continuous review and update of strategies and policies. The importance of continuous innovation with the emphasis of learning culture should be developed and maintained. Excellence is developed upon balancing and satisfying the needs of all relevant stakeholders.

Table 2 The Perception of Faculty (Experience) About Practice of Integrated TQM – Top Management Commitment

Variables or Items	Experience (Mean Square)			F Stat	F Prob
	0-10	11-20	21 & Above		
1. The effort of top management in ensuring everyone in the organization has a customer focus and clear performance measures.	4.16	4.13	4.15	1.5908	0.2058
2. There is top management's recognition of contribution of workers or supervisors with respect to development, improvement and maintenance of quality.	3.31	3.24	3.36	0.6922	0.5014
3. Institution has clear vision, mission and policy statements related to quality.	3.98	3.95	3.97	0.6985	0.4983
4. Quality circle or employee involvement programmes are implemented in the departments.	3.45	3.42	3.41	0.5335	0.5872
5. There is an effectiveness human resources plan with respect to reward & recognition in the institution.	3.87	3.97	3.63	3.7645*	0.0056
6. Comprehensive goal-setting process for quality is within the institution.	3.57	3.65	3.31	4.8786*	0.0084
7. The top management has clear objectives with respect to quality performance.	4.13	4.21	3.91	5.1759*	0.0063
8. Employee is given opportunity to avail work experience in all the areas of institution by routine transfer.	3.32	3.37	3.18	0.7432	0.4766
9. The top management committed to implement ISO 9001:2000 QMS / Six Sigma / TQM in the institution.	3.66	3.55	3.71	0.5842	0.5583
10. Management representative (M.R) / Principal coordinating the Quality system activity.	2.91	2.90	2.95	0.0658	0.9382
11. ISO 9001:2000 SIX SIGMA TQM awareness programs are conducted to communicate the staff working in the institutions.	3.58	3.54	3.73	1.0440	0.3556
12. Team building and group dynamics training for employees in the departments.	3.04	3.03	3.05	0.0491	0.0952

*Indicates insignificant level at 5%

Table 3 The Perception of Faculty (Age) About Practice of Integrated TQM – Top Management Commitment

Variables or Items	Age (Mean Square)			F Stat	F Prob
	25-35	36-45	46 & Above		
1. The effort of top management in ensuring everyone in the organization has a customer focus and clear performance measures.	4.13	4.17	4.19	0.2855	0.7519
2. There is top management's recognition of contribution of workers or supervisors with respect to development, improvement and maintenance of quality.	3.34	3.18	3.39	0.4837	0.6171
3. Institution has clear vision, mission and policy statements related to quality.	3.98	3.94	4.03	0.2437	0.7839
4. Quality circle or employee involvement programmes are implemented in the departments.	3.40	3.51	3.49	0.1920	0.8254
5. There is an effectiveness human resources plan with respect to reward & recognition in the institution.	4.04	3.66	3.73	6.7762*	0.0014
6. Comprehensive goal-setting process for quality is within the institution.	3.75	3.28	3.49	3.8611*	0.0093
7. The top management has clear objectives with respect to quality performance.	4.25	3.91	4.12	4.3168*	0.0144
8. Employee is given opportunity to avail work experience in all the areas of institution by routine transfer.	3.41	3.22	3.22	0.8114	0.4454
9. The top management committed to implement ISO 9001:2000 QMS / Six Sigma / TQM in the institution.	3.52	3.75	3.58	0.9727	0.3795
10. Management representative (MR) / Principal coordinating the Quality system activity.	2.83	2.98	2.98	0.3172	0.7285
11. ISO 9001:2000/SIX SIGMA/TQM awareness programs are conducted to communicate the staff working in the institutions.	3.51	3.77	3.54	1.1399	0.3215
12. Team building and group dynamics training for employees in the departments.	3.03	3.08	3.03	0.0375	0.9652

Table 4 The Perception of Faculty (Age) About Practice of Integrated TQM – System Approach To Management

Variables or Items	Age (Mean Square)			F Stat	F Prob
	25-35	36-45	46 & Above		
1. Regular meeting are conducted to review the quality education.	3.60	3.38	3.24	2.4734	0.0864
2. There is allocation of resources for individual faculty development programme.	3.54	3.34	3.51	1.0965	0.3357
3. There is role and contribution of quality improvement team with respect to quality policy, new curriculum development, etc.	3.48	3.65	3.64	0.9267	0.3972
4. There is documentary practice of ISO 9001:2000 in the institution.	3.36	3.89	3.63	8.8130*	0.0002
5. A separate coordinator is to look after quality improvement system.	3.43	3.62	3.49	0.8760	0.4178
6. Six - Sigma (DMAIC Methodology) TQM is practiced in the institution.	2.67	2.58	3.10	4.6005*	0.0109
7. Institution has Academic Performance Analysis Cell (APAC) for maintaining quality in educational process.	2.93	3.43	3.20	3.5456*	0.0304

Table 5 The Perception of Faculty (Age) About Practice of Integrated TQM – Customer Satisfaction

Variables or Items	Age (Mean Square)			F Stat	F Prob
	25-35	36-45	46 & Above		
1. Institutions fostering parent's involvement in the educating the students.	3.11	3.33	3.05	1.2929	0.2783
2. The Industry- Institution interaction programmes are conducted periodically.	3.59	3.66	3.20	4.6066*	0.0109
3. Rewards are given recognizing good performance of faculty.	3.40	3.58	3.78	2.3092	0.1015
4. Rewards are given recognizing good performance of students.	3.75	3.66	3.81	0.2830	0.7537
5. The benchmarking practice is being followed in the institution.	3.90	4.12	3.80	5.8025*	0.0034
6. Better placement programme for student placement is being provided through campus recruitment.	3.32	3.38	3.39	0.1486	0.8620
7. Customer orientations are being conducted in such a way that every one in the institution are involved and committed to the process of customer satisfaction.	4.01	3.93	4.05	0.2704	0.7633
8. Staff are involved and committed towards the common goal of the institutions.	3.52	3.69	3.66	0.8747	0.4183
9. The goal of the institution is to Provide quality education within congenial environment.	3.87	4.08	3.83	1.6215	0.1997
10. There is continuous improvement of all process and activity, leading to total customer satisfaction and competitive advantages.	3.72	3.63	3.61	0.8453	0.5253

Table 6 The Perception of Faculty (Experience) About Practice of Integrated TQM – Continuous Improvement

Variables or Items	Experience (Mean Square)			F Stat	F Prob
	0-10	11-20	21 & Above		
1. Institution has Academic performance analysis cell (or) quality assurance cell for improvement in the institution.	3.78	4.13	3.99	0.7019	0.4888
2. Suggestions are corrected based on feedback / audits on academic affairs.	3.94	3.61	3.60	0.0243	0.9760
3. Management encourages the staff for improvement of skill and creativity.	2.67	2.58	3.10	4.6005*	0.0109
4. Expectations of stakeholders are met with the effective implementation of integrated TQM.	3.46	3.71	3.52	0.4908	0.5330
5. Management uses the ISO / SIX-SIGMA/TQM to reduce the problems concerning academic performance improvement.	3.43	3.62	3.49	8.8130*	0.0002
6. The suggestions from stakeholders are usually carried out in the institution.	3.96	3.45	3.19	1.2258	0.2953
7. Continuous improvement strategies are adopted in the institution.	3.38	3.81	3.39	1.3080	0.2722
8. There is more learning opportunities are provided in the institutions.	3.53	3.39	3.24	0.1920	0.8254
9. There is elimination of non-value adding activities in the institution.	3.82	3.48	3.42	0.1937	0.8224
10. The institution is striving to maintain high standards of quality in education through effective utilization of resources.	3.37	3.39	3.61	1.9194	0.1489
11. The complaints from staff students and stakeholders are immediately looked or rectified.	10.87	12.58	8.71	5.3033*	0.0046

Table 7 The Perception of Faculty (Age) About Practice of Integrated TQM – Continuous Improvement

Variables or Items	Experience (Mean Square)			F Stat	F Prob
	25-35	36-45	46 & Above		
1. Institution has Academic performance analysis cell (or) quality assurance cell for improvement in the institution.	3.99	3.92	4.10	0.8341	0.4269
2. Suggestions are corrected based on feedback / audits on academic affairs.	3.60	3.78	3.53	3.2174*	0.0417
3. Management encourages the staff for improvement of skill and creativity.	3.44	3.60	3.66	1.3339	0.2602
4. Expectations of stakeholders are met with the effective implementation of integrated TQM.	3.52	3.78	3.46	3.4957*	0.0318
5. Management uses the ISO / SIX-SIGMA/TQM to reduce the problems concerning academic performance improvement.	3.36	3.89	3.63	8.8130*	0.0002
6. The suggestions from stakeholders are usually carried out in the institution.	3.19	3.46	3.34	1.7322	0.1790
7. Continuous improvement strategies are adopted in the institution.	3.59	3.52	3.66	0.4227	0.6558
8. There is more learning opportunities are provided in the institutions.	3.24	3.43	3.25	0.6146	0.5417
9. There is elimination of non-value adding activities in the institution.	3.42	3.34	3.49	0.4647	0.6289
10. The institution is striving to maintain high standards of quality in education through effective utilization of resources.	3.61	3.62	3.36	4.0365	0.0188
11. The complaints from staff students and stakeholders are immediately looked or rectified.	8.71	9.74	12.59	7.0466*	0.0010

4.1 Findings

The perception of faculty based on experience and age about the practice level of integrated TQM with respect to critical factors in their institutions was analyzed.

- From the study, it has been found that many of the ISO-9001: 2000 certified institutions have a great deal of commitment from the top management side as quality issues are regularly reviewed in top management meetings and there is good co-ordination between quality coordinator and top management.
- At the same time, top management people reluctant to implement continuous improvement strategy.
- Many of the institutions do not have clear objectives with respect to quality performance.
- Very few of the institutions under study maintain close long-term relationships with their external customers (parents / industry owners) and they continuously inform them about their quality performance regularly.
- Improvements are continuously documented and controlled but the major steps required for the sake of continuous improvement such as bench marking practice is not done in ISO and non-ISO certified institutions.
- Most of the Institutions try to satisfy the customers as much as possible by measuring the satisfaction of the customers (both internal and external) by analyzing the complaints and suggestions systematically for enhancing quality level of education.
- The documentary practice of ISO 9001:2000 is not in place in most of the technical institutions and also well-known quality management systems such as Six-Sigma (DMAIC methodology) and TQM concepts are not practiced.

5. CONCLUSION AND RECOMMENDATIONS

Education is a life long process. Quality assurance in education particularly in the case of engineering educational institutions is not expensive but it needs hard work, commitment and dedication on the part of all concerned in the institutions. In order to improve the quality of engineering education and for attaining excellence in the service of the institute, they must get

ISO 9001:2000 certifications. From the analysis, after the implementation of ISO 9001:2000 certification norms, it was observed that many institutions neglected the maintenance of the norms under which the certification was awarded. Thereby, the standard of quality education in these institutions drops dramatically leading to poor results. The results of this study also show that a few of the institutions have been practicing ISO 9001: 2000 clauses to a higher extent for improving quality performance through effective quality management system such as Six-Sigma (DMAIC methodology) and TQM concepts. In this work, we conclude, from faculty perspective that the integrated TQM concept is not practiced in a full-fledged manner. The findings of the study may be applied by educational authorities to find out the quality of service provided by the institutions of higher learning and understanding the perceptions of their stakeholder in terms of their expectations and experience. This is the right time to execute integrated TQM for improving quality level of performance in the academic activities for achieving quality assurance in technical institutions. It is clear that if integrated TQM model is implemented, engineering institutions could assure quality education.

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