

A Theoretical Framework for Attainment of Total Quality in Engineering Education Institutes : A Case Study for Chhattisgarh Region

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ABSTRACT

Technical institutes are continually producing the huge amount of engineering graduate students with technical knowledge and skills as per present requirement of industry. The maximum numbers of engineering educational institutes (EEIs) are witnessed for providing low quality education due to non availability of specific model to achieve total quality of education. The objective of EEIs is to produce good quality students having good knowledge and skills to face present standard successfully. However, to achieve total quality in EEIs there is a need of a theoretical framework which help to improve total quality of EEIs situated in Chhattisgarh. The lot of tools and techniques are available for quality management of technical education such as Total Quality Management (TQM), Continues Quality Improvement, Six Sigma (SS) methodology, Lean Management (LM) Concept, Knowledge Management (KM) approach etc. This study proposed a theoretical framework of Integrated Educational Quality Management Framework (IEQMF) to achieve total quality of EEIs. The findings of this study have to meet the expectation of customer (i.e. guardian/ industry) and improvement in wealth of EEI. The objective of this study is to discuss the development and implementation of framework to achieve total quality of EEIs situated in Chhattisgarh region.

Keywords : Technical Institute, Engineering Educational Institutes, Total Quality Management, Six Sigma, Lean Management, Knowledge Management

I. INTRODUCTION

In present scenario technical education institutes are producing a huge amount of engineering graduate students resulting unemployment rate has been continuously increases. the quantity of engineering graduate students has been increasing continually due to high availability of seats in various engineering education institutes. Unfortunately, the quality has been decreasing of student's parallel the employment rate has been decreasing day to day. The engineering educational institutes (EEIs) in Chhattisgarh, there are a lack of standard quality policy and having very

less infrastructure and resources. The significance of standard quality policy and infrastructure with resources for their students in a state like Tamil Nadu, where these record the number of quality engineering graduate students occurred from various EEIs. In Chhattisgarh, India there is shortage of facilities in EEIs due to non availability of standard framework to improve total quality of EEIs. There is a need to upgrade quality of engineering education institutes (EEIs) with the development of new framework which can help to improve total quality. it has been observed by the author with various literature review the various quality improvement model developed by

the author could not fulfil the demand of students, faculty and other stakeholders for providing quality of education. these institutes does not able to produce quality students which demanded by the industry. moreover there is lack of technical skills and knowledge in current engineering graduate students. in the field of technical education, the quality dimension have not been addressed properly, the very few studies existed in this regards. The previous studies have been identified the use of total quality management (TQM) has made limited attempt by the author for quality improvement of EEIs. Hence these problem has been occurred from lack of appropriate quality standard framework existed in technical education. the aim of this study is to development of theoretical framework and discusses an overview of ieqmf framework. the study also explains the technique to achieve total quality of EEIs.

A. *Problem Statement*

The engineering education institutes are producing engineering graduate students having technical knowledge and skills. Technical education is very necessary to improve technical human power of state as well as country. The technical manpower with having good technical knowledge and skills required by the industry is the key which help in industrial growth and the development of state. The objective of any EEIs is to provide required recourses and infrastructure for the students, faculty and other stakeholders to improve quality of education. The improvement in student's quality occurred with the maximum utilization of available facilities having in technical institutes. In various EEIs situate in Chhattisgarh, India having spite of quality management system such as ISO9001:2000, 2001, 2002, and 2003 etc. and National Board of Accreditation (NBA) certificates maximum EEIs fail to offer total quality education as fail to successful implement the total quality concept too. Due to the impact of present demand by the industry and global market, it required to offer total quality in EEIs for their survival and excellence in Chhattisgarh state. Unfortunately, the overall performance of technical

institutes is not satisfactory. To overcome such type of situation need to develop quality improvement framework (IEQMF) which can help to improve total quality of EEIs of Chhattisgarh state.

II. LITERATURE REVIEW

Sahney et al. (2002) [1] suggested that the TQM in Education is multi-dimensioned. The study further stated educational institute consists of Management System, Social System and Technical System. Sahney et al. (2003) [2] studied about the several criteria such as delivery, competence, content, attitude, and reliability to evaluate the quality of service in education therefore the gap identified for customer requirements. The study has been also introduced about Management System, Social System and Technical System for design characteristics of education for better quality improvement. Sahu et al. (2008) [3] analysed the effectiveness of Total Quality Management (TQM) concept in technical education and identified the various factors which can affect the effectiveness of technical education. This study further evaluated the various influences affecting each factor and improved condition of quality improvement factors so that it has positive effect in the effectiveness with the use of mathematical modelling. The study suggested that in order to produce well qualified engineers in any college, an organization have to work efficiently. They also suggested that the seven factors which can affect directly or indirectly the effectiveness of technical institutions facilities such as administration, infrastructure, effectiveness of teaching, quality of interaction of students with industrial peoples and society, extracurricular activities, development and research. Sahney et al. (2008) [4] reported that the satisfaction level of faculty of any institute depends on quality factors such as attitude, competence, content, reliability and delivery. Khan and Mahapatra (2007) [5] reported that the various quality factors such as personality development, learning outcomes, physical facilities, responsiveness, and academics as quality factors for enhancing the technical education

quality. Pandi et al. (2009) [6] proposed an integrated Total Quality Management model in self-finance technical institutes in Tamil Nadu. The various factors to improve total quality of institute has been considered as Customer Satisfaction (CS), Top Management Commitment (TMC), System Approach to Management (SAM), Training (TRG), Employee Involvement (EI), Team Work (TW) and Continuous Improvement (CI) has been considered for this study. The study provided equal importance to each parameter. They used two integrated approaches ANOVA and Regression analysis for their findings. Pandi et al. (2009) [7] studied the integrated TQM in engineering institutions situated in the state of Tamil Nadu. This study considered different stakeholders such as faculty, parents, students, public & Governments etc perspective to improve the quality of technical education. Sayeda et al. (2010) [8] explored the adoption of total quality management practices in the technical education institutes in India to enhance the total quality of education from management's perspective. Kruger and Ramdass (2011) [9] investigated the common criteria which help to improve technical education quality between industry and higher education institutes. Pandi et al. (2012) [10] proposed that the three more critical success parameters along with the seven csfs, are Corporate Social Responsibility (CSR), Academic Culture, Knowledge Output. This study suggested that every institution must adopt quality improvement practices to achieve global quality in Education. I.e. ISO-9000, Six-Sigma, Knowledge Management in Education, Lean management, ISO-14000 and Occupational Health and Safety for achieving global quality in engineering education. Rezazadeh et al. (2012) [11] identified and prioritized the different Critical Success Factors (csfs) of TQM implementation in Iranian organizations. Gambhir et al. (2012) [12] investigated the endeavor towards findings the various csfs for the evaluation of technical institution. Jain et al. (2013) [13] identified the eight factors to improve education quality such as academic facilities, curriculum, industry exposure, support facilities, input qualities, interpersonal relationship, campus

seek to improve quality of service nonacademic activities etc. Ramachandran et al. (2013) [14] reported that the low-quality engineering institutions can be mitigated through the adoption of TQM processes. Sahu et al. (2013) [15] identified the various quality improvement factors such as training development infrastructure, students placement, consultancy, research and development to increase organizational performance with quality intensification. Hietschold et al. (2014) [16] identified the need for an organization to measure the different critical success factors (csfs) of Total Quality Management when introducing TQM. Pandi et al. (2016) [17] evaluated the importance of Critical Success Factors in order to successful implementation of IEQMS framework in eeis with the help of ISM approach. Tulsi and Poonia (2015) [18] observed the various quality improvement factors are Input, curriculum, resources, instructional processes, research, and management towards build excellence in engineering education. Gambhir et al. (2016) [19] discussed the current scenario of technical education in India, and also proposed the quality factors affecting the quality of technical colleges then applied a suitable approach for assessment, ranking and comparison. It has been summarized from the literature review that the potential of quality improvement exists in the field of quality education, particularly evaluation of technical education service quality. Pandi et al. (2016) [20] presented the relationship between the ten proposed criteria for integrated educational quality management system with institutional performance is studied using SEM approach using Amos software. Kaur (2016) [21] studied the implication of TQM and their relationship in higher education with sufficient knowledge from the project for future implementation.

III. POSSIBLE SUGGESTIONS

A. *Six Sigma methodology in Education towards achieving standard quality*

Six Sigma is a quality improvement tools which help to improve the process variation. The success of Six

Sigma in education on over the world has been promoted to adopt such quality control tools to achieve total quality in education. The concept of this technique is to reduce the defect rate in the process with help of their Six Sigma Define-Measure-Analysis-Improve-Control (DMAIC) tools and techniques. This methodology uses previous statistical data to analyse the current process variation and try to reduce with the help of their tools. The DMAIC approach used data for analysis and improves EEIs performance by identifying defects and reducing chances of failure of students and other stakeholders. There have been various quality improvement models used in the literature introduced by Edward Deming i.e. Plan-Do-Check-Act (PDCA) cycle. The modified version of PDCA is DMAIC. The Six Sigma DMAIC methodology has been used as a problem-solving approach and quality improvement in process of EEIs.

B. Lean Management technique to improve quality in technical education

Lean management technique is a systematic approach to identify and eliminate waste from the process through continues improvement. This is a combined set of principles and practice that help to eliminate nonvalue-added activities from the process. The nonvalue-added activities are defined as waste which does not have any value in the process. In this technique involves changing in work areas wherever possible and improve for continuous flow of material as well as information. The continual improvement of total quality in EEIs can be achieved with the uses of lean management principles and tools. In present, most of the industries are used lean management techniques to improve their quality and called lean enterprises. Similarly, the engineering educational institutes adopt lean management approach to become lean institutes.

C. ISO -9000 standards towards improvement in education quality

The ISO -9000 quality standard is not limited to manufacturing sectors but it has been providing certification to a service organization, educational

institutes, hospitals etc. ISO certification provides for the quality standard in the organization. The improvement in educational quality can be achieved with the help of one most important quality improvement tools called 'Mission Statement'. In this mission, every technical institute has clear mission statement followed by ISO organization to promote the standardization. ISO 9001:2000 quality standard certification series is the requirement for management review, and preventive action should require providing a good platform towards the development of best management practice throughout the technical education institutes (Pandi et al. 2012). With the successful implementation of the quality system in EEIs can improve total quality in technical education with a reduction in failure cost, therefore, satisfying the students as well as other stakeholders.

D. ISO 14001 Environment Management System towards improvement in education quality

Every educational institutes and service organization sector should ensure its environmental responsibility. This responsibility accomplished with a statement of "Environmental Quality Policy". The environmental quality policy has directly or indirectly affected the health, hygienic, moral of all stakeholders who have working within the organization as well as outside peoples. The ISO 14001 (EMS) integrated with the other quality management system to achieve goals. In quality improvement process, the IEQMF framework focused on the requirement of all stakeholders. The documentation for ISO 14001 is similar to ISO 9000 and makes two systems getting is too easy in one process. This quality standard certification promotes environment related awareness among the students and other stakeholders to improve quality of education in EEIs.

E. Use of Knowledge Management (KM) technique in education

The word "Knowledge" is a power of students to achieve success. KM is anxious in order to development of required knowledge as per current situation requirement. It is an asset to any

organization to achieve their goals and fulfil the objectives. The main objective to adopt Knowledge Management (KM) technique for effective and efficient use of available recourses in the organization. The technical institutes use KM in order to improve the various abilities such as learning, reading etc. The adaptation of Knowledge Management in technical education help to knowledge conversion process which acts as an asset. A well conversion process resulting improvement in quality performance of EEIs.

F. Essence of developed IEQM Framework

Six Sigma is quality improvement methodology with integration with Total quality management concept; it continues innovative quality improvement approach. An ISO 9000 (QMS) and 14000 (EMS) framework included various methods, process, and responsibilities. Total quality management looks to improve corporate culture and both ISO standardization included with Six Sigma are looking to improve corporate systems. The integration of all can help the EEIs to improve quality.

The integration of Knowledge Management and TQM is used for effective use of available resources in EEIs. The main reason for integration of all quality management concepts used into basic TQM i.e. the integration of all quality management concepts called integrated educational quality management framework (IEQMF). The 19 TQM Critical Success Factors (CSFs) has been used in the developed framework. The result of IEQMF leads a world-class education in various EEIs situated in Chhattisgarh, India. The theoretical quality improvement framework is shown in figure 1.

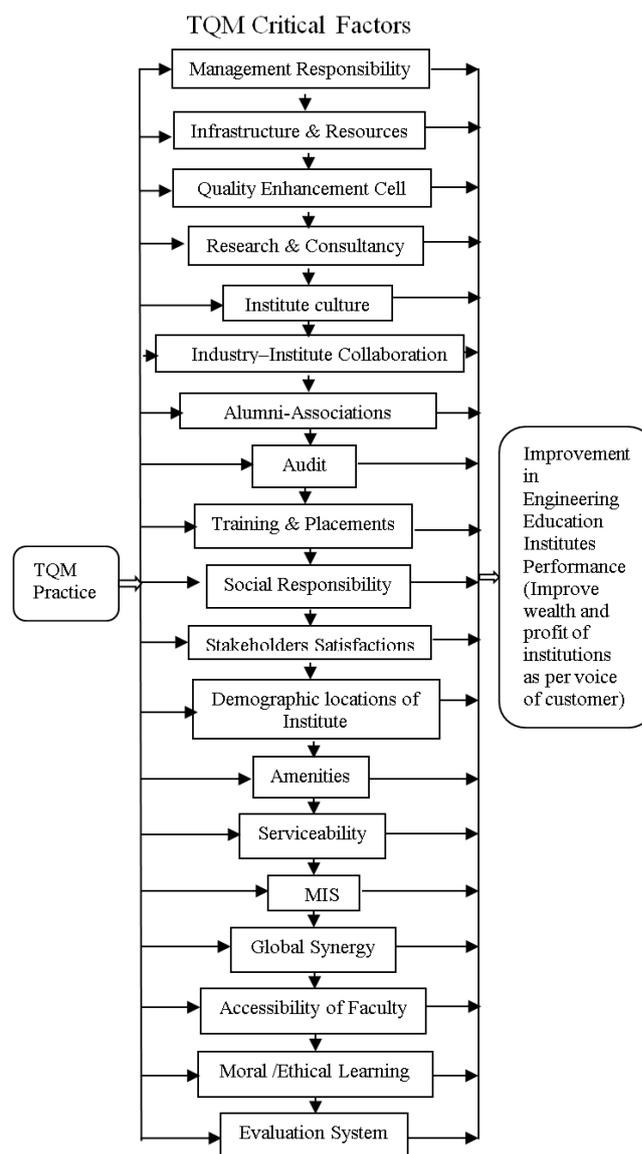


Figure 1: Developed theoretical IEQM framework for EEIs

IV. CONCLUSIONS

The developed theoretical IEQM framework for improving total quality in EEIs provides an effective scope for an efficient academic environment in order to better satisfaction of students and other stakeholder needs. This developed IEQMF provides a healthy, social and green environment to enhance total quality in various engineering education institutes (EEIs). The successful implementation of the developed framework will provide a good and healthy environment for both student and faculty to do their work with the efficient use of available

facilities and resources. This study developed integrated quality management framework to improve EEs quality in Chhattisgarh state. The study also suggested that the successful implementation of IEQM framework would enhance the total quality of technical education and produce good quality students with good technical knowledge and skills to fulfil the industry demand.

V. REFERENCES

- [1] Sahney, S., Banwet, D. K., & Karunes, S. (2002). Quality function deployment and interpretive structural modeling for development of a total quality education framework for a developing country. In Proceedings of the 7th International Conference on ISO (Vol. 9000).
- [2] Sahney, S., Banwet, D. K., & Karunes, S. (2003). Enhancing quality in education: application of quality function deployment—an industry perspective. *Work Study*, 52(6), 297-309.
- [3] Sahu, A. R., Shrivastava, R. L., & Shrivastava, R. R. (2008, July). Key factors affecting the effectiveness of technical education—an indian perspective. In Proceedings of the world congress on engineering (Vol. 2, pp. 2-4).
- [4] Sahney, S., Banwet, D. K., & Karunes, S. (2008). An integrated framework of indices for quality management in education: a faculty perspective. *The TQM Journal*, 20(5), 502-519.
- [5] Mahapatra, S. S., & Khan, M. S. (2007). A neural network approach for assessing quality in technical education: an empirical study. *International Journal of Productivity and Quality Management*, 2(3), 287-306.
- [6] Pandi, A. P., Rao, U. S., & Jeyathilagar, D. (2009). A study on integrated total quality management practices in technical institutions—students' perspective. *International Journal of Educational Administration*, 1(1), 17-30.
- [7] Pandi, A. P., Rao, U. S., & Jeyathilagar, D. (2009). A study on integrated total quality management practice in technical institutions—stakeholders' perspective. *International Journal of Management in Education*, 3(3-4), 416-428.
- [8] Sayeda, B., Rajendran, C., & Sai Lokachari, P. (2010). An empirical study of total quality management in engineering educational institutions of India: perspective of management. *Benchmarking: an international journal*, 17(5), 728-767.
- [9] Kruger, D., & Ramdass, K. (2011, July). Establishing a quality culture in higher education: a South African perspective. In *Technology Management in the Energy Smart World (PICMET)*, 2011 Proceedings of PICMET'11: (pp. 1-9). IEEE.
- [10] Pandi, A. P., Sethupathi, P. R., & Rajesh, R. (2012). A conceptual model for achieving global quality in engineering educational institutions in India. *Procedia engineering*, 38, 3628-3634.
- [11] Rezazadeh, A., Najafi, S., Hatami-Shirkouhi, L., & Miri-Nargesi, S. (2012). Evaluating and prioritising critical success factors of TQM implementation based on fuzzy AHP. *International Journal of Productivity and Quality Management*, 9(1), 1-24.
- [12] Gambhir, V., Wadhwa, N., & Grover, S. (2012). Pareto analysis of critical factors affecting technical institution evaluation. *Management Science Letters*, 2(5), 1701-1706.
- [13] Jain, R., Sahney, S., & Sinha, G. (2013). Developing a scale to measure students' perception of service quality in the Indian context. *The TQM Journal*, 25(3), 276-294.
- [14] Ramachandran, M., Shivaprakash, N. C., & Bose, S. K. (2013, March). Quality assessment of technical education in Indian Engineering Institutions. In *Global Engineering Education Conference (EDUCON)*, 2013 IEEE (pp. 973-977). IEEE.
- [15] Sahu, A. R., Shrivastava, R. R., & Shrivastava, R. L. (2013). Critical success factors for sustainable improvement in technical education excellence: A literature review. *The TQM Journal*, 25(1), 62-74.

- [16] Hietschold, N., Reinhardt, R., & Gurtner, S. (2014). Measuring critical success factors of TQM implementation successfully—a systematic literature review. *International Journal of Production Research*, 52(21), 6254-6272.
- [17] Pal Pandi, A., Rajendra Sethupathi, P. V., & Jeyathilagar, D. (2016). The IEQMS model for augmenting quality in engineering institutions—an interpretive structural modelling approach. *Total Quality Management & Business Excellence*, 27(3-4), 292-308.
- [18] Tulsi, P. K., & Poonia, M. P. (2015, March). Building excellence in engineering education in india. In *Global Engineering Education Conference (EDUCON)*, 2015 IEEE (pp. 624-629). IEEE.
- [19] Gambhir, V., Wadhwa, N. C., & Grover, S. (2016). Quality concerns in Technical Education in India: A quantifiable quality enabled model. *Quality Assurance in Education*, 24(1), 2-25.
- [20] Pandi, A. P., Sethupathi, P. R., Jeyathilagar, D., & Rajesh, R. (2016). Structural equation modelling for analysing relationship between IEQMS criteria and performance of engineering institutions. *International Journal of Enterprise Network Management*, 7(2), 87-97.
- [21] Kaur, A. (2016). A Study on Total Quality Management Implementation in Higher Education in India. *International Journal*, 4(7).