Improving the Quality of Technical Education System using TEM

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Abstract. The demand of the quality in knowledge level is ever increasing. The excellence in science, astronomy, art, music, literature etc. demands the excellent mind from the institutes, but our modern education system hardly succeeds to deliver such expectation. Total Education Management, TEM, is a philosophy of continuous improvement in education system which enables our students to achieve higher sense of excellence with an attitude of higher responsibilities and commitment. It focuses on overall personality development with academic excellence among the students taking cue from ancient Indian knowledge system coupled with modern management tool, TEM. The tool identifies the shortcomings of the current technical education system and sets action plan to improve the system by eliminating or reducing the factors responsible for lowering the quality.

Keywords: Quality, TPM, TEM.

1. Introduction

The higher education system in India is one of the largest in the world and has expanded exponentially since 1990 whence there were 190 universities and 7,350 colleges with total enrollment of 4,925,000 (UGC 2012, Report no. 57). As of 2011, there were 610 universities and 31,320 colleges with 14,624,990 enrollments (UGC 2011a). The unprecedented expansion of the higher education system in India has arisen partly because of the substantial growth of engineering education. The number of engineering institutions doubled in five years, from 1,510 in 2006 to 3,390 in 2011. Accordingly, the total enrollments in engineering education increased from 795,120 in 2004–05 to more than 1.5 million in 2009–10 (UGC 2004, 2011a). The main component in the significant expansion in engineering education is private institutions, which accounted for about 94 percent of engineering institutions in 2011. The 12th Five Year Plan working group report on technical education stresses the importance of three areas: expansion, equity and excellence. This selection reflects the challenges facing the sector. Of the three, excellence bears the issue of quality, which stems from various aspects of the engineering education system. Only about 25 percent of engineering graduates are found suitable for employment in the offshore IT industry. Of the employers hiring fresh technical graduates, 64 percent of employers are only somewhat satisfied or worse with the quality of the new hires (Report no. 57 2013; NASSCOM and McKinsey 2005; Blom and Saeki 2011). The sector suffers a severe shortage in high-quality faculty. It is observed that the affiliation system of the Indian universities represent an impediment to overall quality development in engineering. Because of a large number of affiliated colleges, the quality in planning, regulation, and supervision is usually not maintained by the universities. As a result, curricula are often obsolete, the skills taught are usually not matched with the demand or local needs, and the number and quality of faculty are frequently not sufficient. It has been observed that the present education system hardly succeeds to achieve overall advancement of the students. Education philosophers are engaged to discover better method of imparting knowledge and cultivating higher morale in life, while, the present education system only focuses on the collection of facts from different resources and advancement of theoretical knowledge.

2. TPM and TEM

Total Productive Maintenance (TPM)

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In industry Total Productive Maintenance (TPM) is implemented to achieve targets. TPM is a plant improvement methodology which enables continuous and rapid improvement of the manufacturing process through use of employee involvement, employee empowerment, equipment effectiveness and closed-loop measurement of results.

Break down of TPM Terminology

TOTAL: stands for involvement of all employees in the process to eliminate all breakdowns, defects and accidents.

PRODUCTIVE: stands for indicating that all activities are implemented while the production goes on. Troubles for production are minimized, if not eliminated.

MAINTENANCE: stands for monitoring of machines and equipment health to check, clean, lubricate and repair, and keep equipment in good condition.

The pillars in TPM are given below (Fig.1):

1. *Focused Improvement:* Large number of small improvements are more effective than a few improvements of large value.

2. *Autonomous Maintenance:* Uninterrupted operation of equipment. Flexible operators to operate and maintain other equipment to eliminate the defects at source through active employee participation.

3. *Planned Maintenance:* Aimed to have trouble free machines and equipment producing defect free products for total customer satisfaction.

4. *Training and Education:* Aimed to have multi-skilled employees with high morale and eager work and perform all required functions effectively and independently.

They are trained to achieve four phases of skills: Phase 1: Do not know.

Phase 2: Know the theory but cannot do.
Phase 3: Can do but cannot teach.
Phase 4: Can do and also teach

5. *Early Management:* Reduce product development and prototype lead times, reduce equipment development, design, and fabrication lead time. Achieve stable commissioning of new products.

6. *Quality Maintenance:* Aimed towards attaining customer satisfaction by delivering highest quality through defect free manufacturing. QM activity is to set equipment conditions that preclude quality defects, based on the basic concept of maintaining perfect equipment to maintain perfect quality of products.

7. *Office TPM:* Achieve zero functional losses, create highly efficient offices, Provide effective services, support production department.

8. *Safety Health and Environment:* To create a safe workplace and a surrounding area. It plays an active role in each of the other pillars on a regular basis. Creates awareness among employees through various competitions.

Focused Improvement
Autonomous Maintenance
Planned Maintenance
Training and Education
Early Management
Quality Maintenance
Office TPM
Safety and Health Environment

Fig. 1 Pillars in TPM

Total Education Management (TEM)

Based on the concept of TPM, a new concept is proposed in the present paper to improve the quality of technical education in the current scenario by treating institute as an industry, student as a product, as well as a customer, faculties, staff members and labs as equipment. This new concept is termed '**Total Education Management**'. As the product here are students, being living objects, the term maintenance is replaced by management. It is more of a management of technical education of scholars than maintenance of production processes of non-living products. In a similar manner to explaining TPM, TEM terms stand for the following:

TOTAL: Treating scholars as an entity subject to physical, intellectual, moral, and spiritual advancement. Encompasses all the manpower available in an institute.

EDUCATION: The deliverable to a scholar to make him/her fit for the purpose of educating.

MANAGEMENT: An effective management system to execute TEM in an institute by incorporating various source of knowledge within a fixed period by continuous improvement to achieve the set target.

Identifying the problem is the first step of improvement. In an industry, 5-S system is implemented for this purpose. This is a systematic approach to identify the problems and comprises of Sorting, Systemizing, Shining, Standardization and Sustainability. In an institute, the main focus is on students, so identifying their weakness and correlating those with the advancement needed in an institute is the prime target. To do this, TEM is proposed to be implemented in a similar manner as TPM and the pillars of TPM are modified into pillars of TEM to be followed at institute level. These are as follows.

1. *Identification of Focused Improvement Areas:* Unlike TPM, TEM deals with living beings, who are basically a combination of four things namely Body, Brain, Mind and Soul. A perfect harmony between these is directly proportional to the overall success in life. Identifying the big problem areas that student generally faces is a main issue. Estimating and setting target for improving student's overall effectiveness, analyzing the problems and reviewing of possible remedies are the required actions.

2. *Quality Management in Education:* Quality means 'fit for purpose'. The idea is to cultivate different abilities in students to perform at his best in his post-education life, to achieve higher academic excellence along with practical knowledge as well as overall personality development among the students. It should be practical first and knowledge afterwards since knowledge comes from experience. The idea is that while a technical student learns the theory during class room lecture, he/she also needs an equal share of practical exposure to capture the theoretical aspects completely. Students should be given practical assignment in each subject instead of the paper work, putting focus on practical related tutorials. The Industry-Institute Interface cell should establish collaborations with industries and service organizations, where student can complete their project work as well as the orientation program in the organizations. The curriculum should be so designed that it addresses the present need of the industries and should be open to revamping from time to time depending upon the changes in the industry requirement. A department can set a target for the students to appear in national and international conferences in a year in order to achieve global exposure as well as establishing a standard for them. The summer and winter internships can be extended to at-least half yearly training schedules at the end of third year of graduation course. This will reduce the time taken by the organization to train the students after hiring them by the placement process, and also help the students to choose their respective areas of interest. Quality management should also be conducted by upgrading the existing facilities/infrastructure to do away with obsolete facilities and make way for state of art facilities. Classroom should be equipped with latest audio visual means to impart knowledge, because memory studies reports that audio video impression is more effective to store the facts in permanent memory than conventional teaching method.

3. *Overall Student Effectiveness Measurement:* Just like equipment, the quality of the student must also be evaluated at every stage and strict scrutiny should be carried out to bring defect to the surface. The present assessment system only provides the information of academic achievement in examination, but when the scholar faces the real scenario the expectation is much higher. An institute can prepare an additional performance index by which the exact picture of the student can be seen. The format may include parameters from social and environmental awareness, general awareness, sports activities, group activities, and aptitude and leadership qualities. The qualities needed at corporate level should also be included in the overall

training scheme and seriously assessed and indexed. The performance card of each scholar should be maintained in a database and made available to the recruiters. Activities leading to the award of 'student of the month' should be introduced in each department to encourage the potential of the student. Another system of the measurement analysis called "why-why analysis" could be employed. The analysis informs about the root cause of any failure. When a student finds himself in a situation when he is unable to deliver the expected performance, he should be asked why? The answer may point towards the cause for that failure. The query 'why' should be repeated against the cause. The procedure should be repeated until a satisfactory answer is obtained. Then analysis of all the queries 'why' should be carried out to obtain the answers that provide the root cause of any failure at the institute or student level. Remedial measures should follow to eradicate the failures and can be used as a benchmark for further improvement in future.

4. *Faculty and Lab Development Management:* An institute is best known by its faculty. Infrastructure being the secondary thing, the level of student will always depend upon the level of faculty members. A department should have appropriate strength of faculty members to perform task at optimum level. Contribution from industries should be encouraged in form of series of lectures by experts from industries. Bi-lateral programs between Institute and Industries should be encouraged to increase interaction with industries, invite curriculum-related suggestions, and for regular conduction of short term courses. In a technical institute, lab plays a vital role in order to impart practical experience amongst the students. The present system and curriculum only focus on the conventional labs that have become obsolete. There is a need of upgrading labs to fulfill the latest expose of technology to the students. In order to achieve this, industries could be invited to start joint ventures with institutes by funding labs at institute premises that will offer solution to the problems faced by the industries.

5. *Society, Health and Environment:* Aims at attaining and sustaining higher responsibility and commitment among the students towards the society and environment. Attempts to create healthy, rewarding and pleasant workplace and developing their character in order to become good citizen contributing towards the growth of the nation. To achieve this, several social welfare events such as plantation camp, water harvesting awareness program, blood donation camp and other similar events could be organized by departments.

6. *Office TEM:* The departments other than academic ones also contribute in equal proportion to run the institute successfully. There should be a proper coordination and healthy relationship to build up an effective ambience in the area of education. The concept of TEM should also be shared with these departments in order to achieve success with their support and suggestions. It will be also helpful to eliminate delay in providing service to the student. 5S system can be applied to these departments for improving the quality.

3. Implementation of TEM

a. Preparation phase
* Discussions with different levels of staff, faculties as well as managing committees.
* Establishing TEM promotion committees at different departments.
* Establishing basic TEM policies and targets and predict the results.

2. TEM launching phase
* Before commencing the session, call for formal presentation by top-level members of TEM promotion committees and management representatives. The objective behind this is to gain support of all employees in the institute. Recruiters from different organizations, social personalities must also be invited to attend in order to apprise and to get their supports and suggestions.

3. Implementation phase
This includes following steps:
* Start interaction with students, plan the lectures/periods according to the policy and target set.
* Assign the staff members to individual responsibilities according to their specialty with corresponding target.

- Develop a planned management program. This may include planning, scheduling and executing the periodic and predictive based system.
- Develop an autonomous management program involving training leaders with staffs. Leader should share information with staff members by taking weekly or fortnightly meeting.

4. Stabilization phase
- Once the TEM has been adopted and implemented, it should be properly monitored and evaluated at different levels and some reward system can be introduced for further encouragements. Also a checklist for departments can be established to find out any difficulties encountered or irregularities made during implementation of targets.
- By setting higher goals and continuous improvement TEM level can be raised in the institute.
- Before starting TEM concept for the institute, different levels of staff members should be convinced about the upper management's commitment towards TEM.
- To emphasize the upper management's commitment the institute must appoint TEM coordinator for different departments. It is coordinator's responsibility to educate the staff members on TEM concept and to implement to their areas. TEM coordinator can come up with an education program designed in-house or hired from outside.
- The 'study and action team' are given the responsibilities of the respective areas, the team are supposed to analyze the problem areas and come up with a set of suggestions and possible remedies.

Once the problems are identified a suitable measure for rectifying those issues can be done by consulting with TEM coordinators and may be taken as benchmark for further improvement in TEM.

4. Conclusion

The present work reports the need of implementation of TEM in the domain of technical education system. Total Education Management, being a monitoring tool identifies the shortcomings of the current technical education system and sets action plan to improve the system by eliminating or reducing the factors responsible for lowering the quality.in education system which enables our students to achieve higher sense of excellence with an attitude of higher responsibilities and commitment. Also TEM focuses on personality development with academic excellence amongst the students taking cue from ancient Indian knowledge inheritance.

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