2. A NEW PARADIGM OF VALUE ADDED APPROACH TO SELF FINANCING ENGINEERING INSTITUTIONS

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Abstract

The central purpose of establishment of educational system, world over, is pursuit of teaching and learning to define and refine the behaviour of human society through students. A high quality of technical education is becoming increasingly important in India and abroad due to globalization and worldwide demand for quality engineers. This calls for revitalizing the existing system of technical education by adoption of method like lean thinking concept for optimum utilization of existing resources. Lean thinking concept considered a successful business strategy, employs minimization of process variability and non-value added activities (waste) using Value Stream Mapping (VSM) as a strong "lean tool kit". The objective of this paper is to present a future value stream mapping for achieving quality enhancement in engineering institution by eliminating non value added activities through the adoption of lean six-sigma strategy, resulting in a progressive quality.

***Keywords**: Lean Thinking, Six-Sigma (DMAIC methodology), Value Stream Mapping, Technical Institutions.*

1. INTRODUCTION

Human resources are vital to add value to products and services in the present knowledge economy. Engineering education is the most important means of creating techno human resources. Liberalization, privatization and globalization have affected engineering education. Today, Lean thinking is a formidable strategy to achieve success in competitive service markets. Basically it is applied to eliminate waste from manufacturing processes by focusing on what adds value to processes from a customer's perspective. The procedure continuously reduces non-value added activities (waste) in the production process. This concept of lean thinking has not been fully applied to educational institutions in general and self-financing engineering institution in particular which numbers 250 in Tamilnadu alone. Today, there are 1400 engineering colleges in India turning out more than 4, 50, 000 graduates every year.

The rate of failure of the students is an important quantifying consideration to define the quality of teaching – learning in an institution along with its placement successes. In educational institutions, failure rate of the students can be considered as

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waste component. In order to sustain global competition, the technical institutions must utilize their resources in an optimum manner. Value Stream Mapping is a tool from "lean tool kit" that provides an organization with a more complete overview of the functioning of educational institutions and supports designing a more effective future implementation plan. The value stream mapping is used as a road map for solving problems and continuous process improvement in engineering institutions. The objective of this paper is to propose and test lean thinking concept to enhance the quality of engineering institutions.

2. DISCUSSION

2.1 Current State Layout of Technical Institutions

The purpose of education is to develop and enhance the potential of human resource and progressively transform into a knowledge society. Due to rapid expansion of technical education, majority of technical institutions are not able to meet the requirement of stakeholders like parents as well as industrialists and also due to lack of research efforts in the teaching-learning process. As a result the capacity utilization of installed facility in most of the institutions becomes low. Many institutions have ISO9001: 2000 and NBA accreditation certificates yet, even some of these have failed to satisfy the needs of the society. Around 35 to 40% students have backlog of compartments, a large burden of accumulated arrears of subjects even at the time of completing their course. Even those who passed the course rarely acquired the required values in tune with the expectation of different industries including the Information Technology (IT) and IT enabled service industry. Usually to be called for an interview or to be eligible to appear for placement examinations, one requires at least 60% of overall marks. The major cause for lower percentage score can be traced to lack of student-centered approach and absence of case method study. In essence, knowledge management practice is obsolete and requires drastic change in approach. Lack of facilities like round the clock network, digital libraries, fully functional computers with updated software, well equipped modern laboratories for training students in advance science and technology, high level projects and research training compel students to work on projects away from their own laboratories.

With reference to management, it has failed to recruit experienced faculty and also practice quality concepts. Moreover, inadquate interaction between the institute and industries and proper provision of incentives to the staff and students is lacking. At present no proper counselling programmes are conducted in most of the technical institutions. Hence faculties as well as students are not receiving any values and ethical morality from their respective fields. In our country, interaction between engineering institutions and local industries is found to be clearly lacking. Academic performances are not properly monitored in most of the institutions. The suggestions and complaints from faculty and stakeholders are not taken for further development. The existing layout is shown in Figure 1.

3. FUTURE STATE LAYOUT

In industry, the value stream map (VSM) provides a blueprint for implementing lean thinking concepts by illustrating how the flow of information and materials should operate. In the present context of globalization and the large growth in the number of institutions at degree level, especially in the self financing sector, it is time for us to review the existing programmes and develop and implement a comprehensive and effective professional development programmes for faculty as well as students through value added approach. In technical institution, students undergo a transformation process in the classrooms,

Figure .1 Current State Mapping for Technical Institutions

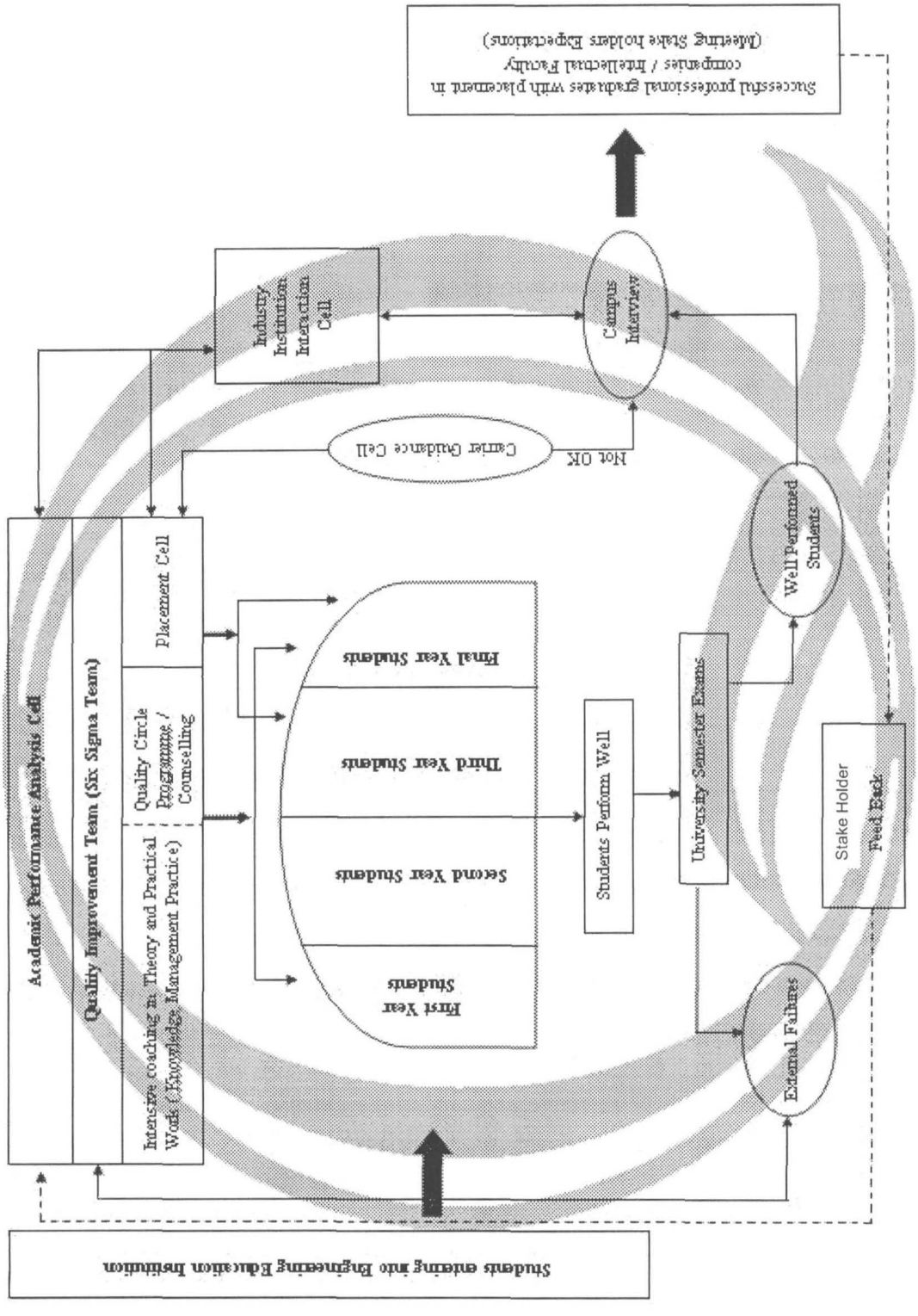

Figure 2 Future Value Stream Mapping for (Lean Six-Sigma Practices) Technical Institutions.

which in turn enable them to become responsible service providers in the employment market. Every institution's academic and administrative activities must be value added. Hence it is proposed to have future value stream mapping for efficient engineering institutions shown in Figure-2.

4. PROPOSED SUGGESTIONS

The duty of the institution is to provide value education, sound moral behaviour along with congenial environment. There are many factors that influence value based education and moral behaviour. They are explained in a holistic manner:

4.1 Teaching – Learning Process

The teaching methodology is a major cause for the inefficiencies witnessed in engineering educational institutions. On the whole, it can be improved by employing ideas and means that complement each other. New initiatives are required now to enable the students at technical institutions to develop into mature professionals in a short span. For this purpose, faculty members are required to function as mentors, advisors, guides, motivators and also as role models for the students. Providing modernized and well-equipped laboratories can do the overall improvement of the infrastructure of the engineering institution. Adequate should be library facilities, available to both students and staff. At present, the society is more and more knowledge based and the use of information technology will determine the level of quality in all spheres of human activity. So the institutions must adopt knowledge management concept. Knowledge management programmes should be continuously updated, modified and evaluated as per the requirement to keep the knowledge afresh. The use of teaching tools like LCD / OHP and other constructive methods must be encouraged. Various workshops, seminars and conferences must be conducted for the student to improve their subject knowledge and also as a supplement to higher study. Case study method of teaching must be instituted in the class session.

4.2 Role of Management

The most crucial factor in ensuring excellence of teaching, learning and evaluation is the quality of faculty. The management has a role to play in recruitment of faculty. As far as possible, experienced staff must be considered and preference must be given to Ph.D holders for senior posts and handsome must be paid. The knowledge of the staff can be improved by conducting faculty improvement programmes. Furthermore, regular seminars and workshops must be conducted to give them both experience and involvement in the subject matter. Management must stimulate continuous quality improvement programmes such as quality circle, stakeholders' feedback session and six-sigma (DMAIC) in technical institutions. The suggestions from staff, students and stakeholders should be immediately looked into. Six-Sigma is a set of methodologies used in businesses to achieve low failure rates in any process. Similarly it can be used in the field of education. Six-Sigma is a rigorous and disciplined methodology that uses data and statistical analysis to measure and improve an institution's academic performance by identifying and eliminating "defects" (i.e. failure rate of the students). It is a sub tool of lean thinking and also a road map for solving problems and process improvement in the engineering institution, which is explained in the following paragraphs:

4.2.1 Define Phase

The project team (Six-Sigma team) must be formed to solve the academic problems in the technical institution. Process Mapping or Value Stream Mapping is a way of graphically depicting institution's academic activity process and then looking for ways to streamline the process and to reduce the defects. Project team frames the problem

statements using Process Mapping consisting of more failure rate of students and less placement opportunities in the engineering educational institutions. The goal statement prepared by six-sigma team should be to minimize the above academic problems. The Dean or Director in the master black belt cadre should possess 21days of training in the field of solving academic problems using six-sigma concepts. The Head of the Department holding the black belt cadre should possess one week training. The HOD together with the help of the Dean or Director should help the faculty members in the green belt cadre and the students in the team member cadre in achieving the ultimate goals.

4.2.2 Measure Phase

The information is to be collected by Six-Sigma project team throughout various departments for analyzing the increased failure rate of students and reduced placement opportunities in the engineering educational institutions.

4.2.3 Analysis Phase

This phase analyses the system to understand the causes for the student failure and key process variables. The engineering educational institution must adapt statistical tools such as Cause and Effect Diagram, Pareto chart, etc. The root causes of failure are to be identified by six-sigma team from cause and effect diagram analysis. Six-Sigma Team members should submit a clear report regarding the state of improvement of student performance.

4.2.4 Improve Phase

The Six-Sigma team suggests the management that statistical tools are to be frequently used to identify and quantify the key academic process variables and their influence on critical to quality. Moreover Process improvement tools such as Quality Circle, FMEA, 5S, and Brainstorming etc., are also to be used to reduce the number of failed students, improve quality of teaching learning process and reduce the number of rejected students by companies.

4.2.5 Control Phase

The wealth of any institution resides on the percentage of students getting placement in companies. It is important that institution must have Academic Performance Analysis Cell (APAC) for controlling the above-mentioned phases continuously to meet required standards. The APAC is under the control of senior persons. The above-mentioned DMAIC procedures must be followed in all departments of B.E / B.Tech courses for attaining high standards. An Academic Performance Analysis Cell (APAC) is proposed for improvising the soft and allied skills like imparting training in aptitude, communication skills, generating creative thinking in project proposals, performance of the students and counselling for magnifying their positive effects accruing from emotional stress arising due to adolescence, which a student meets along with his technical course. However, in excellent engineering institution it is possible by making a continuous approach towards perfection. Academic audit is a vital academic process to assess the quality level of institutions. So the institutions should have APAC for prompt monitoring of student progress, remedial and support services, professional counselling, career guidance and placement.

4.3 Faculty / Student Development

In order that there is continuous value addition in the development of TQM in professional institutions, a prime duty of the institution is to provide continuous training to the faculty at regular intervals on technical skills, managerial skills and ethical values apart from textual teaching. Conducting workshops, seminars and conferences can help to develop technical and managerial

skills, but ethical values in students could be developed through proper interaction with psychologists either from outside the institutions or preferably by training the faculty in this soft skills. However, experience shows that students select role models from teachers and follow their behaviour more than teaching. The well-planned training programme will in turn make the staff to be more effective trainers. Every institution should have a counselling centre for developing the behavioural characteristics of faculty and students.

4.4 Counselling

Problems of adolescents are complex and they arise out of student's interaction with the environment like educational, social, rural, cultural, economic, religious etc. To face these emotional problems of helping the youngster, college teachers have to understand the psychology of adolescents. In the present day complexities compound, hence there arises a need for establishing trained counselors in colleges. Counselling psychology is the scientific basis of this particular kind of helping act. The overall attitude and work culture of the faculty and student can be improved through such counselling and quality circle programmes (QCP). It is one of the main tools of lean thinking. The main purpose of the quality circle programme is to solve academic related problems. Employee involvement can be improved through quality circle programmes and counselling for better performance which causes a reduction in non-value added activities, and is the focus of lean thinking. With a developed sense of attitude accruing from counselling, a student will experience an enhanced success rate in examination, a diminished absentee rate in regular classes and increase in capacity to adapt to a competitive environment with right corporate culture.

4.5 Industry-Institution Interaction Cell

In order to enhance the effectiveness of Indian engineering education system every institution must have industry-institution interaction cell. An adequate interaction between the institute and industries must be established to give staff and students proper view or ideas concerning the industrial field. Some nominal percentage of teachers should be allowed to work as consultants to industries in collaboration with the university or college on a compulsory mode for 70% of UG / PG project should be real time application. Institutions will have to arrange campus interviews through this cell. The students failing in campus interview are to be trained by career guidance cell, which is controlled by APAC. Better placement opportunity could be achieved to the student community by the effective use of this cell - an act equivalent to recycling and reusing in industry (Refer Figure 2).

4.6 Rewards & Recognitions

Proper provision of incentives to the faculty / staff and students could result in improved efficiencies of the institution on the whole. Reward and incentives should be given for publications according to the standard of the research journals. A well maintained reward system would result in better performance among the faculty / staff and students. The academic institution should bring out quarterly information journal illustrating important activities.

4.7 Feedback

Stakeholders feedback as an effective resource of quality enhancement in the perspective of global scenario. The technical institution must prefer stakeholders' feed back for upliftment of their academic areas.

5. CONCLUSION

Lean thinking is a concept widely applied to eliminate waste from processes. It has been successfully employed in manufacturing processes by focusing on what adds value to

processes from a customer's perspective. At present, the society is more and more knowledge-based and the use of information technology determines the level of quality in all spheres of human activity. Human resources are vital to add value to products and services in the present knowledge economy. Engineering education is the most important means of creating value added techno human resources. Future value stream mapping is suggested in this paper for achieving quality enhancement in engineering institution by eliminating non value added activities through the adoption of lean six-sigma strategy, resulting in a progressive quality. An Academic Performance Analysis Cell (APAC) is proposed for improvising the soft and allied skills like imparting training in aptitude, communication skills, generating creative thinking in projects proposal, performance of the students and counselling for magnifying their positive effects accruing from emotional stress arising due to adolescence, which a student meets along with his technical course. Six sigma DMAIC methodology thus could be adopted for all departments of B.E / B.Tech courses for improving the academic standard, high enough to attract placement offer from standard companies and admission to higher studies. It is found that adoption of future 'value stream mapping' that is lean-six sigma practices in technical institutions yield results in providing quality education.

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