CHAPTER 6
FINDINGS, SUGGESTIONS & CONCLUSIONS

This chapter enlists the findings, provides suggestions and draws conclusions of the study. This chapter is divided into six parts. Section 6.1 highlights the findings of the study on the perceptions of management, faculty and students with respect to the quality of technical education, Section 6.2 provides suggestions to improve and ensure the quality of engineering education due emphasis on various aspects which directly influence the quality of education, viz., Policy Planning, Finance, Administrative aspect, Infrastructural aspect, Faculty Resources, Students, Curricula, and Evaluation System. 6.3 puts forth the implications and direction for future study, and section 6.4 draws conclusions of the study.

6.1. FINDINGS OF THE STUDY

The following are the findings of the study conducted on the quality of technical education as perceived by students, faculty and management from four types of engineering colleges on the factors of quality of teaching, management, students, examination system and infrastructural facilities.

1. The management respondents across four types of colleges were positive in their responses to all the factors considered in the questionnaire and claim that the quality of engineering education in their institution is excellent. No significant difference is identified among the managements of four categories of institutions with respect to providing quality technical education.
2. Students and faculties of four categories of colleges significantly differ in their perception for quality of teaching. The null hypothesis for five statements, that were considered for quality of teaching were all rejected for 5% level of significance. Among students and faculties, later have a better perception for their teaching which is obvious. Accredited college students and faculties irrespective of their rural or urban location have better perception of quality of teaching compared to non-accredited colleges. The students and faculty of accredited colleges have expressed that the quality of teaching is effective, whereas the students of non-accredited colleges felt that quality of teaching is average, in terms of encouraging creative thinking, participation in group discussions, question and answers sessions, presentations etc, accessibility of faculty and improvement in teaching methodology. The findings indicates that the accrediting agencies are giving due weightage to the quality of teaching in granting accreditation to institutions.

3. All four categories of colleges significantly differ in their students and faculties awareness of the strategic plan to improve the quality of education. The null hypothesis of no difference is rejected at 5% level of significance. Among all the categories, urban accredited colleges have highest composite average score of 3.94 for students and 4.5 for faculties. Faculties have a better understanding of strategic plan of college compared to students. It indicates that the students are not part of the strategic plans for quality improvement. However the management of urban and accredited colleges are transparent about their strategies and the faculties are informed about the strategies to improve the quality of education.

4. The faculty of urban accredited colleges strongly agree, non-accredited colleges and rural located colleges agree, that the management takes into account the qualifications,
experience and achievements of faculty for promotion and advancement. Accredited college faculties are more satisfied with their performance assessment and advancement (78%) compared to non-accredited faculties (40%). Urban accredited faculties are having highest composite average score of 4.41. The study found significant difference in four categories of colleges for performance assessment and advancement of faculties. It is observed that the managements of four categories of institutions are giving due weightage for qualifications, experience and achievements of faculties. The managements are encouraging the faculties to improve their qualifications and academic achievements.

5. All four categories of colleges significantly differ in students and faculties perception for the quality of students in terms of creativity, interaction, grasping power, interest in practical application of the subject, and interest for extra-curricular and co-curricular activities. It indicates that the faculties of non-accredited and rural institutions does not have much concern on students understanding levels and practical application of the subject, etc., Accredited colleges have higher composite averages compared to non-accredited colleges. Similarly urban colleges have higher composite average to their rural counterparts. Faculties have inferior perception of quality of students intake against students perception.

6. Faculties of urban and rural accredited colleges have better perception of examination system, in terms of paper setting, conduct, evaluation of internal and external examinations, and review of answer scripts with students, to improve their learning process, in comparison to urban and rural non-accredited colleges. Rural accredited college students have superior perception towards examination system amongst the four categories with highest composite average score of 4.10. Null hypotheses of no
difference between four categories of colleges are rejected for all three statements considered for examination system.

7. To assess the perception of students and faculties for quality of infrastructure, eight statements related to furniture and fixture, building, classrooms, ventilation, laboratories facilities, library, canteen and quality food, and transport facility, were considered. Null hypothesis for all eight statements were rejected at 5% level of significance, enabled the researcher to conclude that there is significant difference in perception of students and faculties for quality of infrastructure amongst four categories of colleges. Accredited college students and faculties have superior perception compared to non-accredited colleges. The accredited institutions are maintaining good infrastructure and other facilities because of accreditation rules and regulations. Urban non-accredited college faculties have inferior perception of quality of infrastructure as their composite score is lowest at 3.16.

Overall it is found from the study that the quality of engineering education is better and effective in accredited colleges that are located in urban areas. It can be attributed to the accreditation status which ensures the quality of education and the urban location strengthens the quality outlook of students, faculty and management as they are influenced and guided by industry, technological growth and accessibility compared to that of colleges located in rural area.

6.2. SUGGESTIONS

The concepts such as ‘customers’, ‘processes’, ‘continuous improvement’, seem valid and relevant in technical education. A greater emphasis on customer needs, processes and continuous improvements could result in substantial affects on quality of technical education. A development in technical education similar to the one that has taken place in trade and industry
consequently seems possible, but would presumably not just happen spontaneously. The organizational structure is far from based on processes, and the activities related to the monitoring of student results have become integrated in the educational system. However, the existence of obstacles has never implied that change would be impossible.

Presently there are too many institutions due to unregulated growth, especially in the private sector; institutions are proliferating in geographical pockets, leading to oversupply in some markets and shortages in others; not enough qualified faculty, and acute shortage of PhD qualified faculty coming through the education system; weak quality-assurance structures, especially accreditation procedures; Lack of cooperation and interaction between industry and the classroom; high levels of unemployment and underemployment among engineering graduates; and colleges are not meeting the skilled manpower needs of industry. These problems and challenges which need to be addressed through an efficient mechanism to take care of the requirements of the technological advancements and global challenges.

Researcher would like to present the suggestions in the corresponding critical areas which are instrumental for creating a quality orientation to the engineering education system, Policy Planning; Finance; Administration; Infrastructure; Faculty; Students; Curricula; and Evaluation System.

6.2.1. Policy Planning

The first and foremost critical reform needed in the improvement in the technical education system is to free the individual teaching institutions from the present regressive bureaucratic controls of many governing and regulatory bodies and to make them fully accountable for their performance. For increasing autonomy of individual institutions and ensuring their effectiveness, the following actions are suggested:
1. The institutions be empowered to select students on the basis of criteria that are clearly publicized; to take all decisions on programs offered as per the local needs within the framework specified by the affiliating university; to conduct their own evaluation of students. Presently these powers are centralized at state directories or the affiliated universities.

2. Establish a transparent and effective system of ensuring external and internal accountability. Internal accountability requires commitment of the teachers, students and the management to ensure the timely action for conflict resolution and maintenance of quality educational standards, external accountability can be monitored through a strict accreditation process and regular performance audits.

3. Establish a corporate management style of functioning by decentralizing decision making and with accountability to ensure faster response to the changing educational demands.

4. The universities and institutions should take initiatives to improve the quality and effectiveness of faculty in terms of teaching learning process, the evaluation system, design of curricula to suit the industrial needs and employability of engineering graduates, and optimal utilization of the available physical infrastructure.

5. It is also to enforce an effective accreditation system with mandatory, but not centralized, transparent monitoring of quality of physical and academic facilities and of the teaching-learning processes, taking corrective actions where necessary.

6. Elite institutions should consider some additional responsibilities such as mentoring a few engineering institutions of their choice and helping them raise their standards, creating and making available educational resources in the public domain for use of all students.

6.2.2. Economic aspect
Most college administrators are struggling with financial limitations imposed on them. Profit making motive behind some private managements is often cited as the main reason for inadequacy of academic infrastructure. This is only partially true. Most important and relevant to current topic, it is the lack of adequate number of faculty, which often forces them to either increase the teaching load per faculty or engage visiting faculty who have no long-term commitment to the institution, the inability to recruit experienced faculty due to high pay packages and thereby recruiting fresh graduates mostly who do not exhibit a passion for teaching. In the process, institutions face a perpetually downward moving spiral of woes, which continues to worsen the quality metric of the institution.

6.2.3. Administrative aspect

Establishing effective quality assurance mechanism within the institution for teaching, recruitment of teachers, and student evaluation, transparent monitoring of the quality of physical and academic facilities and teaching-learning processes, taking corrective actions where necessary, the following are the suggestions to improve the administrative capabilities..

1. Institution should publish annually its academic achievements including data on the employment of graduates for information of its management, AICTE and the employees and those can be displayed in Internet or such electronic media which can be accessed by students and parents.

2. Industry-academia interaction to be taken up in priority to attain greater alignment of engineering education with employment opportunities, frequent dialogue with industry and government through seminars and workshops is necessary. To enhance employability, summer internships should be made an integral part of the curriculum. Likewise, industry
needs to encourage continuing education programmes for their employees by collaborating with appropriate educational institutes.

6.2.4. Infrastructural aspect

The quality of engineering education and the quality of engineering a graduate is directly and critically dependent on the quality of infrastructure, and laboratory facilities available in the institutions. The following are the suggestions to improve the quality of infrastructure and laboratories:

1. Implement the concept of depreciation at the institution level for timely replacement of obsolete equipments.
2. Allow additional grant proposals for installation, operation and maintenance whenever equipment is purchased.
3. The important source of information and references to enhance the knowledge levels of students is the library; there is an urgent need to update the books every three years. The digital library system shall be made mandatory to all the institutions.

6.2.5. Faculty Resources

In engineering colleges there is a high-demand for CSE, IT, EEE and ECE courses and notably majority of the faculty are graduates with less than 3 years of teaching experience. There is a small percentage of teachers with postgraduate qualifications, and a very small percentage with a Ph. D. This situation is unlikely to improve significantly in less than a decade. There are wide discrepancies between the remuneration packages offered by industry and academia, which are far more glaring in the high-demand disciplines like ECE, CSE, EEE and IT. As a result, the qualified people in our country do not show any aspiration or inclination to prefer academia as a
career, specifically in engineering colleges as there is a high growth of engineering colleges and
coupled with high attrition rate. The following actions are suggested:

1. Selection of faculty to be based on traits and attributes which fosters effective teaching
   learning process viz., (i).Educational background: (ii).Communication ability
   (iii).Adaptability (iv).Attitude (v).Motivation (vi).Consistency(vii).Respect for others and
   (ix).Transparency.

2. Increasing quality and effectiveness of teaching: to increase quality and effectiveness of
teaching the following are suggested
   a) Reward teachers of demonstrated competence with the opportunity to obtain further
      education leading to advanced degrees.
   b) Implement a system of student evaluations of faculty and peer reviews of course
      coverage to enhance accountability of teachers.
   c) Provide each student with a faculty advisor for academic matters.
   d) Provide re-certify teachers; require those who are found inadequate to take additional
      training in subject matter and teaching methodologies.
   e) Encourage the use of adjunct professors from industry sector to augment expertise where
      the institutional faculty is inadequate.
   f) Demand a minimum level of physical presence by faculty on campus and in the
      departments.
   g) Encourage but specify the time allowed for external activities, such as consulting, with
      intent of assuring that teachers maintain their focus on educational activities and student
      contacts.
h) Make compensation packages for teachers competitive with those offered by the industries of equivalent backgrounds and accomplishments.

i) Simplify the faculty recruitment process by permitting institutions to advertise and select candidates according to an approved process and publicized criteria.

j) Develop a transparent and fair career advancement policy to reward the deserving.

k) Special efforts should be made at the undergraduate level to identify and motivate those who have the potential as well as the inclination towards teaching.

l) Faculty resource is in short supply. Part-time involvement may be inevitable.

3. Teaching-Learning Process is a salient feature of an institution in imparting quality technical education; the following are suggested to churn out quality graduates from the institutions.

a) First, and more importantly, classroom teaching must connect textbooks with the real life experience of the students. This area deserves much more attention than it has received. Connecting textbook learning with a student’s daily life experience will transform a topic that seems abstract to a lively one that a student can touch and feel. As a result, it is a very effective way for the student to understand the topic taught in the classroom.

b) Second, classroom teaching must include hands-on experience for a student to practice the textbook knowledge for real world applications. The hands-on experience includes building simple machines, models, and making rough estimates of engineering quantities.

c) Third, there are teaching techniques and practices to make students learning more efficient. There are several ways to make learning more efficient.

   i. The first technique is to summarize the important and should-know points of a topic at the end of a lecture. Students are expected to understand those important points. Accordingly, the examination should focus on those important and should-know points
for all the topics covered in the examination. The purpose of this technique is to help the
majority of the students to better use their limited time on the more important points of a
topic; it does not discourage any student from thoroughly studying a topic by also
covering the less important aspects of a topic.

ii. The second technique is to give the students the correct answer to each homework
problem, when the homework is assigned. The student by getting the correct answer to a
problem will feel confident to move on to the next problem without wasting additional
time wondering whether his or her answer is correct.

iii. The third technique is to give students handouts before a lecture so that they can pay
more attention to what a professor is saying during a lecture rather than spending a lot of
time trying to copy the professor’s notes from the blackboard.

iv. The fourth technique is to use the Internet to make professors and teaching assistants
more accessible to the students outside classroom hours. Whenever students need help
on homework problems or on the course material, they should be able to communicate
with a professor or a teaching assistant by e-mail.

v. The fifth technique is to encourage students to ask questions and to seek their feedback
on the teaching. Is too much material covered in a lecture? Is sufficient time allocated
for questions? Is the size of the class too large to encourage the participation of the
students (e.g., asking questions, providing comments, making suggestions, etc.)? Are the
examination problems reasonable?

6.2.6. Students

Most students in all educational systems have always focused on passing examinations
with good grades. Increasingly, the engineering students believe that attending classes, tutorials,
and labs are not very meaningful in achieving this main objective. Guides, books, coaching classes, and private tuitions, all of which explicitly emphasize examination oriented studies, are far more popular today. Unchanging syllabi of our university system, set patterns of examination questions papers, lack of emphasis on problem solving abilities, are some reasons behind this visible mind-shift.

The following actions are suggested:

1. Spread awareness regarding the importance of knowledge
2. Counseling of students to help them realize their potential
3. Encourage participation and interaction of students in the teaching-learning process
4. Inculcate the habit of inquisitiveness and ability to explore and exploit the available resources of knowledge within their reach.
5. Motivate students to set their targets and goals and educate the students regarding the benefits of analyzing their strengths, weaknesses, opportunities and threats.

6.2.7. Curricula

The curriculum of the course determines the quality of the output of that university or college, the important issue today is that there exists a mismatch between the expectation of the industry and the subject knowledge mastered in colleges, in order to meet and surpass the expectations of industry and guaranteed employment to engineering graduates, the following suggestions are proposed to improve the curricula.

1. The current curriculum should be modified to provide greater flexibility, interdisciplinary perspective and choice of electives. First, engineering courses should be periodically upgraded to reflect the industry’s needs. To achieve quality of engineering education, there should be a biannual or an annual review of mandatory and optional courses that are offered
to an engineering student. The periodic curriculum review serves as a vehicle to allow the addition of new topics of the industry to the curriculum and, at the same time, to remove obsolete topics that have not been used by the industry for many years. A few well-thought-out criteria can be used to decide how to upgrade the curriculum. The periodic review should include participation not only by Department Head and Professors but also by engineers (especially the alumni), who represent key elements of the industry. If a new topic cannot be readily taught by the existing faculty members, instructors from outside can be hired on contract to teach the topic.

2. Identify hard and soft skill requirements for employment; identify generic skills and specific skills; develop standards for each of the objectives for all the subjects of study. Also develop standards for practical skills. Curriculum document must include all details and not merely the course content and evaluation scheme. Implementation of credit system is made for allowing self pacing. Credit transfer may also be allowed by having MOUs with different universities and institutions.

6.2.8. Evaluation System

Teachers should emphasize on continuous evaluation and develop parameters for judging the analytical, innovative and problem-solving abilities of students and to diminish the emphasis on memory and retention tests.

6.3. IMPLICATIONS FOR FURTHER RESEARCH

This study was conducted is broader in scope, covering perceptions of students, faculty and management. It assessed the quality of four categories of Institutions imparting Technical Education (ITE) and examined the challenges faced by the affiliated institutions of JNT University, Hyderabad.
In future research, study can be extended to various geographical pockets and an overall study of quality of technical education in India and comparisons may be made with the international quality standards is recommended, involving wider categories of TE stakeholders by adapting a longitudinal study in order to provide a more comprehensive view, and determine whether any evidence of a culture change has taken place. A longer term study may unveil a deeper dimension and highlight the dynamic and evolving nature of the quality of technical education.

6.4. CONCLUSIONS

The present technical education system seems to have some characteristics which are common with the situation encountered in yesterday’s industry. Mass production, reliance on screening and sorting, and lack on coherence between subunits within organizations appear to be common characteristics.

As quality is a journey and not a destination, technical education institutions should continue the journey by benchmarking the processes with renowned institutions to ensure it is of a world class standard. In technical education where leadership is scattered when compared with industrial organizations, the necessary support must come from leaders of an actual unit. Support expressed at the highest level, such as Directors and Principals, seems to be important or even necessary in order to achieve a climate where the individuals in the institution not only complete the everyday tasks but also actively find ways to improve. However, such higher level support alone does not seem to be sufficient. Due to the disperse leadership, there is also a substantial need for commitment and clearly expressed support for change by leaders on other levels.
Without both these factors, quality improvement initiatives often seem to result in uncertainty or even distrust.

Furthermore, it seems as if change in general and quality improvement in particular cannot be treated as an ‘administrative matter’. It must be systematically planned, but the necessary commitment and willingness to try new approaches seem hard to muster by force. If managers try to launch programs for change without being prepared to lead the way, they seem less likely to succeed. This conclusion is obviously not any novelty. It still seems to be very important to emphasize this aspect, perhaps especially in organisations with diffuse leadership such as technical education.

Finally, with the background given in the previous chapters, it seems relevant to discuss possible developments in the future. The reason for raising these particular questions apart from the rest of the discussion is that the present situation in technical education does not easily lend itself to forecasting. Historically, few institutions are older, but it does not seem evident that this relative stability can be the basis for extrapolations into the future. The role for technical education, and what possible changes the system will have to go through, is dependent on developments in other parts of society and of the interplay between technical education and society at large. Among the many factors influencing future development are:

a. Changes in demographic structure of the student population
b. Continued or even increased strains on monetary resources
c. Changes in demands on the competencies of the workforce
d. Lasting mass unemployment

The way technical education will respond to these developments is anything but clear. Due to factors as the organizational structure and the absence of some commonly held perception
of general problems which have to be solved. These and other factors point at a possible collapse of the system, so the conclusion is in a way rather pessimistic. However, the future is naturally not all dark. Higher learning and the research so far associated with technical education will presumably continue. The existing structures for technical education would, given such a development, be replaced by other structures, so there would not be much of a problem, at least not in a longer perspective. Meanwhile, we should make the best of the situation. In the shorter perspective, we have to cope with the system as well as we can, and in a longer perspective, we should point to possible problems and find ways to deal with these. This is perhaps also one possible side-effect of quality improvement: explicit efforts to find out who the customers are and how their demands could be met, not just today but also tomorrow, could highlight problems in the present system as well as possibilities for the future.

Finally a coordinated development of technical education system will prove to be a stepping stone for thousands of young people who had no access to regular education. Education is a priority for India and it will remain so till the last youth in the country is qualified in vocational and technical fields as it will also pave the way for eliminating completely the rural-urban divide. Education for all is the buzz word as India wants to take the people together on the path of growth and development. The concept of inclusive growth will cover the entire country and it will lead to reduction of poverty in the long-run. If this section is left out, there will be no overall growth in the country.