CHAPTER VI

RECOMMENDATIONS, SUGGESTIONS AND CONCLUSION

6.0 Introduction

Every student entering into the portals of an Engineering College comes with dreams and hopes for a bright future through an immediate appointment subsequent to the completion of the course. The hopes of approximately two thirds of the entry level engineering graduates stand belied for various individual lacunae including skills gap. By the time they realize the gap, they are out of the Engineering institutions left with less opportunities to develop their generic skills. Their belated repentance before being rewarded with a job affects individuals, families and the nation ultimately both social and economy-wise. Every human being is potency for a nation’s progress. The potency of an Engineering graduate, when compared with other courses and degrees proves to more valuable in directly contributing to the Gross National Product index of the country enabling it to meet international level economic, social and political challenges and competition.

This study fulfilled the objectives through the formulation of appropriate hypotheses and tested them against relevant statistical applications besides the Differential Aptitude Test battery and Fiedler’s Least Prefered Coworker scale. Based on the findings, this chapter presents a set of recommendations befitting various levels of stake holders – their roles and initiative to bridge the skills gap of the entry level engineering graduates besides suggestions for future research and conclusion.
6.1 Recommendations to Bridge the Skills Gap

The growth of Engineering and the IT industry in India has been of great interest to the international community due to its higher order of efficiency and cost effectiveness, comparatively speaking. As confirmed by reports and in line with the international trend, nearly one third of entry level Indian engineering graduates are currently joining the IT industry irrespective of their specialization.

The desperate need of the hour is to enhance the percentage of entry level engineering graduates with capabilities and employable skills. This should be taken care even when they are within the academic portals and ensure their success in getting their placement outside in the IT industry. Identifying and benchmarking the required skills have been on the way at the national and International levels. Reforms in engineering education and curriculum development merging sufficient provisions for employable skills have a long but slow history.

The situation warrants for a change and a good many measures in the light of reducing the gap between the industry needs and engineering graduate skills. Taking the various facets discussed at the national and international levels into consideration, a carefully thought over, meticulously designed set of recommendations are proposed as an outcome of this study. The recommendations include.

6.1.1 Standing Committee for Engineering Education and Training

As engineering education contributes to the industry in a very big way and subsequently to the national development, attention and care must be given to this issue. In this regard, it is suggested that as a first step, a State level ‘Standing Committee’ for Engineering Education and Training may be created in every State and all of them should be integrated at the national level apex
Committee. Experts from academy, industry and developmental and planning forums may constitute the body of this Committee. This committee may undertake primarily the responsibility of ‘Curriculum development’ reviewing national and international standards matching the industry requirements towards enhancing engineering skills in technical as well as non-technical, then the implementation phases, value addition to the existing system, value education, indigenization of industrial perspectives, commitment to the national growth, societal empowerment and similar physical, spiritual and other developmental phases.

6.1.2 Academy Policy Statement

Academy Policy Statement should facilitate, basically, the development of curriculum with due importance to the development of non-technical and behavioral skills of engineering graduates also in the light of the developments in the industry. State and national level scenario must be taken into account, wherein very dynamic natures of the industry in terms of its need and demands and success interwoven with the delicate intricacies of globalization, specificity, innovation and similar features should be the primary agenda.

6.1.3 Standardization and Definition of Skills

Only with a close and deep interaction with the industry, the real nature and demand for the skills looked for by the industry can be made explicit. In the Indian background, which is not isolated away from the global scenario, the real need of the hour in terms of the skills needed for industry must be properly defined, benchmarked and published periodically in the form of National Committee reports. Such reports should be made available to all the academic institutions in the country. Also the structure and philosophy of the test batteries can be well included into the classroom teaching schedule instead of shifting the responsibility to the industry alone. Definitions and standards of the skills set in
accordance with the changing needs of the industry, being brought out by National and International Engineering Councils should be taken into account. Such definitions and norms from developed and developing countries have been discussed in Chapter II – Review of literature of this report.

6.1.4 Periodical Academic Audits

Periodical academic audits of each of the precisely defined inventory of items specified as indicators to the overall development of an Engineering Academic Institution leading to their ranking at the state level in the context of both the academic environment and the funding and other supports from the industry must be arrived out meticulously and carefully. These may be covered in the study reports as follows:

There is an imperative need to ensure that Kerala strengthens its position as a centre for a world class, value added engineering work force in order to transform the human investment and financial commitment more meaningful. This should be realized by the stakeholders involved, but ‘where and how’ are the questions holding the minds. The Government of Kerala may come forward with concrete thoughts for creating a Council with Correspondents, Principals, teaching community and the experts from the industry from the state, National and International levels for this purpose.

The Industry Requirements of the engineering graduates’ skills should be framed by the Kerala State Engineering Council in collaboration with the Standing Committee and updated periodically, on par with the norms and standards pronounced now and then, at the international level and this may form an effective input into the National level efforts in India.

Such a State Council constituted, may include in its agenda, besides definitions and norms, the following:
The nature and design of a program, its length and dimension for non-technical skills development which should be introduced in the engineering courses with particular reference to pre-university education level should be properly designed;

The process of Regulation and Accreditation to engineering courses and institutions should strictly be in the context of skills development programme and its extent of implementation;

The most effective ways to inculcate non-technical skills among the engineering student population have to be discussed and appropriate guidance be given;

Reviewing overseas developments and Best Practices for skills development there and the means of incorporating such developments into Kerala State level programmes should be explored and ensured;

Funding provisions for periodical studies and updation of information required for the Council for its decision and policy making must be guaranteed either for individuals or institutions; and

The results and findings of such sponsored studies in the context of Skills Gap must be presented to The Standing Committee for Education and Training in Kerala State for necessary modifications in the structure and practice of the Engineering curriculum.

6.1.5 Proposal for Creation of Funds

It is beyond any doubt that the Human investment and resource, as finished products, form an ultimate input to the IT industry. The total expenditure on the skills development shall cause a heavy commitment to the Government
Exchequer. In order to reduce the burden of the State, it must be made mandatory by means of law that the industries established in the State should contribute a ‘Human Resource development cess’ to the State Government, raising a fund meant exclusively for the implementation of the development of non-technical and behavioral skills programme at the engineering academies. The skills development programme design may be left to the discretion of the State Council. A particular percentage of the revenue of all industries must be collected as a cess for the development and implementation of programs. Since the industries are the major beneficiary, there is every rationale for such a fund generation from them. Such an arrangement shall involve the industry. When the industry pays, there shall be feedback from them spontaneously on the status of the workforce supply and such feedback shall form the input for modification or revision of the plans and programs in Engineering education.

6.1.6 Industry-Institute Interaction

Studies available in India, from the academic circle are very much less when compared to the contributions from the industry. Every study targeted towards the students’ skills level and welfare shall bring an awareness among them. The mismatch between the skills of engineering graduates and the industry needs is a problem universal in nature. Various developing and developed nations have been constantly making systematic studies to evaluate how much the output from the engineering institutions meet the industry needs. One of the ways to achieve this is, for institutions of higher learning to reach out to industries to better understand their workforce requirements. This will enable institutions of higher learning to design new curriculum and redesign existing ones to be market-driven, placing emphasis on creativity, innovation and other enabling skills.

The involvement of Governments at both Centre and State levels should be insisted for their involving initiatives as they only can bring in standardization
and periodical revisions among the Best Practices. Such collaboration between institutions of higher learning and industries, of course with the State and Central Governments’ support and a continuous monitoring can ensure a supply of employable engineering graduates. It is obvious that engineering education curriculum review, industry-government-academia collaboration, and reforms in the method of teaching and learning in engineering discipline are imperative in producing employable graduates.

6.1.7 Curriculum Development

Curriculum development also in the context of providing rooms for the development of the employable skills should be discussed with the concerned stakeholders. The Indian Accreditation agency for Universities and Engineering institutions should be mandated to undertake precise requirement analysis for curriculum design involving the tripartite stakeholders. Provisions should be included for the faculty’s familiarity and experience with real life engineering projects should be enhanced through suitable programs. Initiative for the designing of the curriculum sponsored at the State level by the Standing Committee (referred under section 6.1.1 of this chapter) with representations from the academia and the industry besides experts, may reduce the risk and duplicating efforts of individual institutions. This shall bring uniformity and standardization in the Engineering Curriculum.

6.1.8 Hone Engineering or Tuning Semester

Similar to the ‘house surgency’ – a Post Course Completion Practice in the Medical Education field, an additional tenure of one semester or a minimum of 6 months must be set apart also for the Training and Professional Development of the engineering graduates after the completion of the course under Hone Engineering or Tuning Semester program. Credits can be designed and decided internally. In some universities results are delayed resulting in a
fallow period and few months of the students are wasted which in turn can be converted very creatively and fruitfully into this.

This is the time for fine tuning their skills, both technical and non-technical. Another alternative is that a major work of the main project also can be brought hereunder wherein the industry-institute interaction may corroborate the actual materialization of the project.

This is the time wherein tests for identifying the aptitude and capabilities of the candidates can be conducted. Intervention program as remedial measures in lacking skills and also counseling can be given to them enabling them to identify which field is best suited and most appropriate to the candidates. In such a case, the aspiration of the candidates and parents, and other aspects also are taken care of. Counseling can be oriented to help the candidates to select their future career as teaching, higher studies and research profession, jobs in various industries, entrepreneurship etc and suitable training can be imparted accordingly to different groups.

This must be the time for placement and recruitments. Campus selection should be fixed to this post course completion, “House Engineer” semester alone. This could be made mandatory by the orders of AICTE through Standing Committee of the State ensuring well affirmed co-operation from bodies like CII, NASSCOM and FICCI.

6.1.9 Academic Autonomy

Even if the concerned authorities take initiatives to update the curriculum, conduct examinations in time and publish the results immediately, in most cases, they are incapable of doing so because of the intrinsic limitations they suffer due to heavy work load, bureaucracy, political interference and many such issues. In such cases, the best solution proposed is to give the institutions academic
autonomy. Outside Kerala, this has been experimented and found successful. In Kerala, still it is under thought process only. The apprehension of the decision makers is that once this is granted, it may be misused by the institutions. But, the primary preoccupation of the planners, legislators and decision makers should be to set measures so that the privileges granted in this regard are not misused rather than not to grant it at all. Definitely guidelines must be provided, wherein educationists, social thinkers, cultural leaders, scientists, industrialists, employees -- all should have their real say in it. Hence, maximum number of educational institutions whose quality has been audited and accredited through rigorous and meticulous methods, must be given autonomy in academic activities. Such matters requiring autonomy may include curriculum development, conduct of examinations and publishing results and in phased developments the entire process of learning – teaching with the main objective of bridging the skills gap.

6.1.10 Research Centers

Every educational institution should look at growth, with a longer perspective, which should contribute to the global society with far reaching impacts on every field of activity. Any growth without research capabilities may not stand the test of time. Hence, every institution should establish a research center allocating a considerable amount of its revenue for this purpose. In the long run it must get approved by universities, state and central Governments and industries all of which can support such centers in many ways including finance. These centers can take up studies about the job market trends, the skill gaps and methodologies to bridge them, and the proper development of revised curriculum and other related matters apart from the purely scientific and technical research areas.
6.2 Human Resource Management

Human Resource Management should address both the faculty and the students at the Engineering institutions. Continuing Education to the faculty should be facilitated promoting their professional development.

6.2.1 Continuing Education for Faculty

As the teaching process must be ever vibrant and jive, it is imperative that the faculty should keep abreast with the latest trends, challenges and developments in the subject and job market needs as well. The continuing education program should quell any possible skills obsolescence on the part of the teaching community. Continuing education can be provided in a variety of forms that may include online programs, attending workshops and seminars, visiting workplaces in different areas of the nation and foreign nations, provisions with funding for doctoral and post doctoral programs. Exchange of students, scholars and teachers for specific period within an academic year either within or outside the country can be tried. Simulated industry/workplace environment for different specilisation should be assigned to each academic institution and Industrial Training Institutes for Engineering level students should be created in every district or tidel park.

6.2.2 Motivating Younger Minds Towards Engineering Education

Culmination of Self actualisation in every student shall pave the way to motivation. According to Maslow, self actualization is the apex reached by an individual after all the other four needs are satisfied. If the real aspiration and passion of a student could be identified at a younger age before completing the schooling tenure, the engineering academic efforts can prove to be more effective in producing right candidates with skills of a higher order. Research also can be undertaken in this area so as to find out means and methods to
design the mechanisms to do these operations at younger ages which will lead to great national savings and higher individual satisfaction and mental harmony.

### 6.2.3 Personality Development Programs

A well designed personality development program must be formulated at various levels, holistic in approach so that the real needs from the part of the industry, entrepreneurship, governance, education and business could be well met. It must contain elements which will furnish every need as the soft skills with communication skill at the base.

As far as the Engineering field is concerned, the main concern is not the lack of numbers, rather the actual identification and fine tuning of the human resource befitting the appropriate areas and utilities. Hence, real management of the human resource with fully developed employability skills and the statistics of available candidates in specific trades and areas, individual skill levels, potentials etc is the area which must be well thought about and properly planned.

### 6.2.4 Data Bank of Graduate Engineers

Also, it is recommended that the Engineering Institutions keep a follow up file for each one of the Graduates going out of the institution after completing the course. The Youth Welfare Directorate of the State Government can undertake for the creation of a database of individual student employment profile with his/her first entry in coordination with engineering institutions in the concerned State.

### 6.3 Periodical Surveys

Periodical surveys should be undertaken at the institutional, state, regional and national levels by academics, governments and private agencies sponsored
by governments as going on in the developed countries. Taking inputs from the results of the tests conducted by the industries shall supplement the situation audits conducted by the other agencies.

The set of recommendations may be of interest to the Higher Education Council of the Government of Kerala, various other states in India and to the Working Group on Engineering Education of the Knowledge Commission, India.

These suggestions, when implemented, may vastly improve the quality of engineering education in India. This can augment the success of the Indian IT academic and industry environment and make India a preferred destination for engineering education and employment.

6.4 Indian Engineers Prepared to Meet the Global demand

There is a global requirement for engineering workforce in general and Indian engineers in specific. It is not enough if India produces engineers to work within the country. The requirement for engineers is on the increase all over the world, and this will require even more sophisticated employable workforce to address a growing list of complex and interdependent global challenges, such as sustainability, security and economic development. Engineers whether working at home or abroad, play a critical role in addressing global challenges. In the global context, the plans and programs of the Engineering Institutions should be designed to respond to the growing demand for competent engineering graduates with technical competence, generic skills in the future.

6.5 Suggestions for Further Study

Future research should look into the types of non-technical skills lacking in engineering graduates, the non-technical skills requirements in the different types of Industries periodically at regular intervals. Survey of this kind should be
undertaken with a higher number of samples covering each of the branches of engineering discipline. Elaborate Research should be encouraged in areas like the cost effectiveness and cost benefit of engineering education, cost of producing an engineering graduate in Indian terms, identifying remedial measures to fix the skills gap. Research is required to find out ways and means for motivating the potential candidates in schools towards engineering education. Though this survey adopted the existing academic like manual system for conducting the tests, it is suggested that scholars in future may adopt online surveys which shall make such projects cost and time effective. Curriculum development is an area exclusive to the Board of studies so far and in future research scholars should be encouraged to undertake investigations in such areas/topics also for Ph.D. level investigations exploring the possibilities of meaningful recommendations for reforms.

### 6.6 Conclusion

Moderated by the Guide and recorded by the investigator in a pre-survey stage, personal interviews with selective HR personnel of the IT industry revealed certain basic facts and confirmed the justification of the present topic for study. They admitted at the outset, the existence of the skills gap of the entry level engineering graduates in India in general and in Kerala state as well. According to their feedback, so far as Kerala state was concerned, the recent developments like the establishment of Technopark in Thiruvananthapuram, Smart City at Cochin and Infoparks in every district of the State have only brought in a ‘spark’ breathing in an air of improvement. Yet, it is a bitter fact that all the Engineering graduates coming out with degrees do not find their way into the IT industry, the reason being their lack of employability skills as one of the facets of a major set back.

The heavy investment of time, money and efforts committed to Engineering Education in India cannot afford to be satisfied with only one fourth of the
outgoing Engineering graduates getting into the stream of employment. The situation warrants for imperative measures to seal off the skills gap. To the question, ‘Who stands to profit in such measures?’, only one answer is there and it is not anyone specific individual or institution or sector, but they are the society, whole of the academic community, industry, the Governments, the Engineering profession and our nation ultimately, and of course, the Engineering graduates at the base. This means the whole nation.

The institution is the underlying thread bringing the three sectors namely, Academia, Industry and the Government into the chain. Money and time constraints are the impediments in designing and implementing strategies for bridging the skills gap. These two constraints leave a question “who is to bell the cat?” The answer is that the academic institutions should act as the binding force and the level should be initiated from the School Schedule as Gandhi has prophesised that ‘schools should develop basic skills in children’ and now this may be advanced/extended to the college level. Government should come forward to the rescue of the situation with initiatives through special committees, programs and funds.

The current is stronger for one of the proposals -- to fix the skills gap at the higher secondary level through Finishing School Program as many experts across the globe have expressed. Perhaps, the day is not far off to expect a suggestion to fix it still at a lower level of schooling. If this is going to be true, Gandhian concept of Basic Education, insisting on the development of life skills at the primary level, all along with academic skills shall help fix the skills gap at an earlier stage than the currently proposed High School or College level. The spirit of Gandhi lives. This is the land of Mahatma Gandhi.