Chapter I

INTRODUCTION

1.1 Introduction

Engineering is the profession in which knowledge of mathematical and natural sciences, gained by study, experience and practice is applied with a judgment to develop ways to economically utilize the materials and forces of nature for the benefit of mankind. Engineers turn ideas into reality; they create useful products and systems with imagination and possibilities, leading to new and meaningful connections and outcomes while interacting people and environment.

Role of engineers has been broadened these days to cover aspects of organizational competitiveness. Macro-engineering awareness is perceived to be the element of their education/ training which will enable them to understand how large systems operate. The systems include people processes, machine processes, market behaviors, suppliers etc. Educational establishment needs to redesign the curricula and are required to be more innovative in providing skills according to the industry demand. The concept of stakeholders under Total Quality Management (TQM) umbrella is influencing most of the educational establishments supplying engineering - skills to industry.

The purpose of the present research is to identify and measure the factors affecting the quality of engineering education process.

This chapter introduces the topic based on brief background of engineering education scenario in India. This is followed by the objectives, scope of the research and chapter wise overview.

1.2 Background

Today, engineering graduates not only require adequate technological ability and problem solving skills, but also be endowed with soft skills like co-operative working, communication and presentation skills, business ethics, inter-personal relationship.
They must possess a deep commitment to safety, reliability, quality and sustainability of all engineering activities.

The rapidity of technological obsolescence is compelling the education system to ensure that students during their stay in the institution develop an attitude for lifelong learning and acquire self-learning skills. Continuous learning is an essential part in any quality engineering education system.

After independence, there has been a phenomenal growth in higher education in terms of quantity. From thirty universities, 591 colleges, 21,244 teachers and 2,28,300 students enrolled in 1947-48, today we have more than 294 universities, 13,150 affiliated colleges, 4,27,000 teachers, and a student strength of 88,21,000. This unprecedented increase in numbers in last 50 years, coupled with unmatched increase in infrastructure, has led to dilution of standards, quality and excellence [1].

The total number of institutions imparting degree level education was only 44 in the year 1947. Prior to 1950 i.e. first five-year plan the number increased to 53. In 1960 due to fast development of technology in all the fields, the number increased to 102. Subsequent increase took place and in between year 1970 – 1980, the number reached to 158 with the increase of almost 50 number of institutions. After 1980 due to heavy industrialisation in all sectors of manufacturing and service employee requirement was also in proportion to the progress. The number of institutions increased to 880 in the year 2000. In the year 2006 again the rise in number of institutions took place up to 1350.

During the period of 2000 to 2006 this number increased by 470 more institutions and the total number of institutions went to 1350 by 2006. With this rate of increase in number of degree institutions one can easily predict the number of institutions increased by the period 2010 must be around 1600. Corresponding to the growth of number of institutions, the intake capacity for under-graduate programs in engineering education also increased significantly.

For the period 1990-2000 in these 10 years the total sanctioned capacity rose from 66,600 to 2,28,511. This period may be considered to be the most important period in the context of growth of under-graduate engineering education in the country. During this time number of institutions went up by 580 and stood at 880 by the year 2000, implying almost 200 % increase over the period. The sanctioned capacity has further
increased sharply during 2000-02 and reached 3,48,400 in the year 2002 i.e. about 52% in just 2 years with 300 new institutions [2].

Some of the reasons behind the phenomenal growth of engineering education are listed below.

- Increase in production of automobile sector, which is considered as backbone of economy growth of the country
- Industrial growth in all sectors of manufacturing
- Computerized operated machines got introduced and these machines and operators of these machines replaced skilled labor
- Industries started demanding higher educated manpower for the operation of the production shops
- Demand and supply gap for the employment in the market.

The growth of engineering institutions in an uncontrolled manner has serious implications for the viability, quality and credibility of the Indian technical education system. This is already getting reflected in the fact that a large number of seats reportedly remain unfilled in private engineering colleges in recent years. As a result, these institutions tend to shuffle the admission capacity between disciplines, leading to unhealthy practices in the tenure of faculty and necessary infrastructure resulting in compromises on quality of the institutions. With the rapid growth in the number of engineering institutions, non-availability of adequate number of competent faculty has emerged as a serious problem. Faculty shortages have been seriously undermining the quality of technical education.

However, a rapid growth of engineering education has created a serious problem of quality of teachers, infrastructural facilities and appropriate learning environment. This brings to focus the necessity to have a system of quality, its measurement and implementation.

The need felt to study the existing engineering colleges as regards its present status with reference to the quality of teachers, infrastructural facility, management & leadership, physical resources and research and development. In view of the above, the objectives of the present research work are given below.
1.3 Objectives

In view of the above the present work has following objectives.

- To study the present degree engineering education system to understand the factors involved in education process.
- To identify factors affecting the quality of the engineering education process.
- To assess the relative strengths, weaknesses of the engineering institutions under Pune University.
- To identify the deviation for each of the colleges, for each factor responsible, for the quality of engineering education in comparison with branded institutions.
- To find the correlation between education process score and the performance of the students at entry and exit to the engineering degree program.
- To model the mathematical expression based on the correlation between education process score and the performance of the students at entry and exit to the engineering degree program.
- To analyse the perceptions of the stakeholders of the engineering education system towards factors responsible for education quality.

1.4 Scope of the Study

In this study, nine colleges have been selected from Pune University Area from the state of Maharashtra based on their location, age, co-education and women only colleges. Extensive data was collected through questionnaire, information obtained from the colleges and discussions with key persons of the colleges. Data on students input, process parameters and product coming out of the colleges over the period of 5 years was collected. These were subjected to statistical analysis using statistical tools and techniques and conclusions were drawn on the basis of analysis.

The present studies are basically directed towards developing the tools and techniques for the measurement of quality in engineering education and its implementation and continual improvement.
The work represents the picture of engineering education institutions under Pune University and is believed to be indicator of the sector elsewhere in the State. The findings are based on both primary and secondary data readily available for the research.

1.5 Organization of the Thesis

Chapter 1 (this chapter) gives an overview of the present research work, discussing the present engineering education scenario. A brief introduction to the problem under study is followed by the need of measurement of quality of engineering education. It also discusses objectives, scope and organization of the work.

Chapter 2 presents a review of literature for the present thesis. A brief overview of quality concept and its evolution is presented. The chapter discusses role of quality in technical education, accreditation initiatives and different quality management systems in India. A review of earlier studies carried out in recent times by various research workers in the area of quality in engineering and higher education is presented. The work has been carried out to identify the research gaps and objectives behind present study.

Chapter 3 discusses the methodology adopted and the analytical framework for the research work. This chapter identifies and discusses the criteria for the present evaluation study. Detailed report on identification of stakeholders for the engineering education, factors responsible for quality in education, data collection and analysis of data collected is discussed in this chapter. It also discusses tools used for data analysis.

Chapter 4 discusses the results of the present research work. It discusses the procedure adopted for calculating score of each factor responsible for quality of all the ten colleges. The gap analysis, correlation coefficients and coefficients of determination between process score and students’ performance at entry and exit to the degree engineering program are presented. Regression analysis has been carried out in this chapter to find correlation coefficients and coefficients of determination. In this chapter, analysis of variance has also been carried out to find the perceptions of each stakeholder of engineering education process.
Chapter 5 presents summary and conclusions of the research. General conclusions are followed by specific contributions of the research work. Areas that require further exploration are identified and recommendations are presented in this chapter.

Chapter 6 presents a list of references / bibliography.

Chapter 7 contains seven appendices. They include questionnaire for Stakeholders, ANOVA Test and its output and degree examination results for seven colleges.