7. QUALITY OF ENGINEERING EDUCATION IN SOME OF THE ENGINEERING COLLEGES WITHIN PUNE UNIVERSITY AREA

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INTRODUCTION

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

After independence, there has been a phenomenal growth in higher education in terms of quantity. From 30 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 the last 50 years, coupled with unmatched increase in infrastructure, has led to dilution in standards, quality and excellence.

Similarly, a rapid growth of engineering education has created a serious problem regarding quality of teachers, infrastructure facilities and appropriate learning environment, this brings to focus the necessity to have a system of quality, its measurement and implementation. Therefore, it is necessary to develop the tools and techniques for the measurement of quality in engineering education and its implementation and continual improvement.

Ten colleges have been selected from Pune University area from the state of Maharashtra based on their location, age, co-ed and women only. 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. We believe that the present micro level investigation has added significantly to our understanding of the quality aspects of the degree level engineering education.

SELECTION AND CLASSIFICATION OF THE COLLEGES

Stratified sampling has been used in the selection of ten colleges under Pune university area for collection of data and data analysis. The information on the colleges selected based on stratification factors has been given below

**The article is based on the part of the research work done by Dr. N. D. Junnarkar, under the guidance of Dr. S. G. Dixit - Academic Advisor at Tolani Maritime Institute, Induri Village, District Pune.*

Selection and Classification of the Colleges

Classification of the colleges
Colleges from Urban with 25years age College 1,2,3
Colleges from Rural and Urban with 10 to 15 years age College 4,5,6,7
Colleges less than 10 years age (newly opened) College 8,9
College 10 Benchmark college

FACTORS RESPONSIBLE FOR THE QUALITY OF ENGINEERING EDUCATION:

Factors identified and taken for studying quality of engineering education are

- Management, Leadership, Mission and Goal
- Teaching process- faculty, students, teaching and learning process
- Physical resource- Library, IT lab, work-shop, other related labs
- Industry and Institute linkage
- Research and Development

While identifying the above factors the following two major inputs have been considered as guidelines

- AICTE (All India Committee for Technical Education) norms for effective operations of Degree level engineering educational institutions/colleges
- NBA (National Board of Accreditation) guidelines for assessment of Quality in education

While forming questionnaire the above factors are used as input for the categorizations of questions and new subtitles are devised as follows

Factors identified for framing questionnaire with respective score

Factors	Maximum Score
Management, Leadership, Mission, Goal	300
Teaching process - Faculty, Student, Teaching learning process	450
Physical resource - Finance and physical resource like IT, Library, Labs etc.	100
Industry and institute linkage	100
Research and development	50
Total Score	**1000**

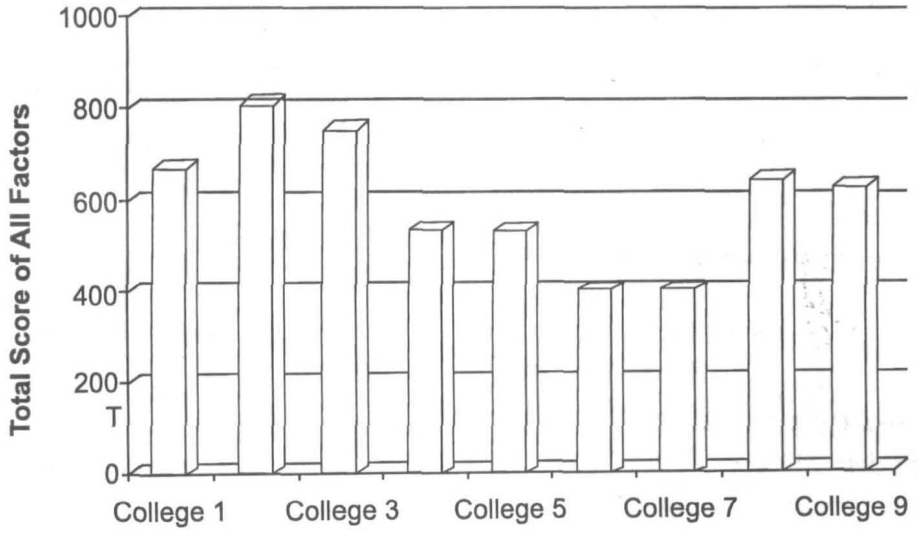
The purpose of determining a questionnaire is to know precisely how to increase stakeholders' satisfaction by finding weak service areas and suggesting about service area where improvement is desirable. Design of questionnaire is also made suitable for SWOT analysis.

More than 600 samples were collected for processing and this sample size has been checked and validated by using Chi Square statistical test. The five factors with the individual average scores of all the ten colleges including benchmark college have been shown in the comprehensive Table given below along with the Total Score.

It will be seen from the data that College 6 and 7 have the lowest total score. Also all the colleges except benchmark college do not either have any research programs or a very weak R & D activity. The above figures obtained in numbers gives us the difference in inputs from the stake holders. The histogram shows the 'Total Score' which has provided good readability and understanding about the same.

A Comprehensive table showing score of each factor

Factor / College	Physical Resources	Management and Leadership	Teaching Process	Institute Stakeholder Linkage	Research & Development	Total Score
Max. Points	100	300	450	100	50	1000
Bechmark	92.7	266	408	91	45	903
1	67	197	314	68	23	669
2	86	235	376	76	35	808
3	81	210	345	86	34	753
4	56	145	265	58	10	534
5	58	165	240	56	12	531
6	43	110	194	41	10	398
7	476	117	190	43	10	407
8	63	190	320	64	15	652
9	68	184	315	56	15	638



GAP ANALYSIS (DEVIATION) FOR EACH COLLEGE IN COMPARISON TO BRANDED COLLEGE:

Following are the figures which show % deviation for each of the colleges, for each factor responsible, for the enhancement of the quality of engineering education in comparison to Benchmark College.

P% = Present Score in %

Dv = Deviation in %

A Comprehensive table showing deviation of each factor

College	Physical Resources		Management and Leadership		Teaching Process		Institute Stakeholder Linkage		Research & Development	
	P %	Dv %	P %	Dv %	P %	Dv %	P %	Dv %	P %	Dv %
1	67	25.7	65.6	23.0	69.7	20.9	68.0	23.0	46.0	44.0
2	86	6.7	78.3	10.3	83.5	7.1	76.0	15.0	70.0	20.0
3	81	11.7	70.0	18.6	76.6	14.0	86.0	05.0	68.0	22.0
4	56	36.7	48.3	40.3	58.8	31.8	58.0	33.0	20.0	70.0
5	58	34.7	55.0	33.6	53.3	37.3	56.0	35.0	24.0	66.0
6	43	49.7	36.7	51.9	43.2	47.4	41.0	50.0	20.0	70.0
7	47	45.7	39.0	49.6	42.2	48.4	43.0	48.0	20.0	70.0
8	63	29.7	63.3	25.3	71.1	19.5	64.0	27.0	30.0	60.0
9	68	24.7	61.3	27.3	70.0	20.6	56.0	35.0	30.0	60.0
Benchmark	92.7	-	88.6	-	90.6	-	91.0	-	90.0	-

The following figure shows the relation between Process score of each college with CET score (student quality at entry to the college) and degree examination result (product quality at exit from the college).

The relation between Process score, CET score and Degree examination result

These studies have yielded the following results

CONCLUSION:

The findings of present work are as follows

- Amongst other institutions, colleges having more than 25 years of experience have all their processes except R and D stabilized and they have very good total process score, however college 2 has relatively more score than college 1 and 3.
- College having age between 10 to 15 years located in urban area have scores in the intermediate range, however colleges having the same 10 to 15 years age but located in rural areas i.e. colleges 6 to 7 have poor scores as regards almost all the factors. This clearly indicates that rural based colleges have some inherent limitations and efforts should be made by the management to remove the deficiencies found in these colleges.
- None of the investigated colleges have any worthwhile research programs and these colleges are mainly concentrating on undergraduate teaching activity. All these colleges are required to pay more attention to Post Graduation Courses and R and D activity.
- Relatively New Colleges having age between 5 to 10 years show good scores especially for their teaching and learning process, which are comparable with college having age between 10 to 25 years.
- These new colleges need to establish Post Graduate, Research Programs and strengthen their interaction with Industry and other Institutions. On the whole colleges located in urban area are functioning reasonably well.
- The Benchmark College receives students with the highest CET scores and the performance of these students in the final year is also the highest.
- To know the relative significance between process quality and CET score a multiple regression analysis has been carried out. It clearly indicate that CET is predominantly important for determining the Academic Performance quality.
- The results of a linear and multiple regressions show that process quality is taken into consideration by students at the time of admission. However, subsequent academic performance in the course is predominantly determined by the academic quality at the entry level as given by CET score.
- As far as response by stakeholders is concerned, it appears that the perception of students, teachers, and management whom we may describe as internal stakeholders is in general similar.
- Whereas industry and parents who may be described as external stakeholders appear to have similar perceptions, which is less favorable than that of internal stakeholders. Probably the attachment of internal stakeholders of the college makes them give somewhat favorable scores.

GENERAL RECOMMENDATIONS:

1. It was found during the course of investigations, that Government colleges in Maharashtra have never been subjected themselves to audit by external agency. It is recommended that they should periodically carry out internal as well as external audit of their processes and performance. A suitable system such as Quality Cell should be established.
2. The multiple regression analysis carried out in present investigations defines Product Quality as the academic performance of the students in the course. However in these day of globalization, such a definition of Product Quality is not adequate, because to be employable a student must also have soft skills, personality and attitude.

Unfortunately none of the education institutions have a system for measuring these traits in the students. Therefore it is recommended that a system of grading or marking the above traits to be established in each and every colleges. The measurement of such traits should be quantifiable.

3. Every institute should also establish a Statistical Cell to continuously keep the data and upgrade & analyze it from time to time. This would help them in self evaluation. The data should cover feedback information about the overall education process including admission, teaching and learning, peer review, examination and industry employment etc.

4. The undergraduate degree program colleges are required to pay more attention to Post Graduation Courses and Research & Development activity. This will allow them to add new and latest technology based resources in the existing facility. This will help them in contributing and enhancing the quality of engineering education.