Chapter V

SUMMARY AND CONCLUSIONS

5.1 Summary

In the present work nine colleges were selected for detailed investigation. College of Engineering, Pune, COEP has been chosen as a Branded / Benchmark College. The selected colleges have been compared as regards Physical Resources, Management and Leadership, Teaching Process, Institute Shareholder Linkage and Research and Development with Branded College. The data has been collected from different stakeholders namely students, teachers, management, industry and parents. The Branded College was also investigated in respect of all the factors, because being a government college it has never been subjected to external audit.

Correlations were sought between various parameters using well established statistical tools such as Linear and Multiple Regression analysis. For this purpose additional data was collected in respect of all the colleges, the CET scores of students and also the academic performance in the final year. Three engineering branches were selected as Mechanical Engineering, Computer Engineering and Electronics and Telecommunication Engineering, as these branches are available in all the colleges. The academic performance data averaged over the period of 5 years (2001 – 2006). The CET score could be obtained for the last two years. It may be noted that the CET scores were for the individual colleges and not on the individual students.

An effort has been made to correlate the total process quality with the academic performance of the students (Product Quality) using Regression analysis. Another important factor which can greatly influence the academic performance is the quality of the student at the time of admission as given by CET score at the entry level. Therefore a correlation between a CET score and the academic performance (Product Quality) has been attempted using regression equation.

The stakeholders are likely to have different perception and preferences about the same parameters. Therefore ANOVA has been carried out for each and every college
including the Branded / Benchmark College and for all the parameters i.e. physical resources, teaching process, management and leadership etc.

Duncan Multiple Range Test (DMRT) which is more powerful than ‘F’ test has been used for the investigations. The results obtained are very interesting.

5.2 Conclusion
The findings of present work are as follows.

- The Branded College No. 10 has the highest scores in respect of all the factors and therefore the choice of COEP College as Benchmark College is justified for comparison as well as Gap Analysis.
- 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 their teaching and learning process, which are comparable with colleges 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 of Pune University, Maharashtra are functioning reasonably well.
- The Branded / Benchmark College COEP receive students with the highest
CET scores and the performance of these students in the final year is also the highest.

- Amongst the other colleges investigated, college 1, 2, and 3 show good performance score as well as the CET score. Again the colleges located in rural areas gets students with low CET score and their Academic performance is also low.
- The correlation coefficient ‘r’ comes out to be 0.80404 and coefficient of determination ‘r^2’ is 0.6464803. The low value of r^2 indicates barely satisfactory correlation between the Process Quality and Academic Performance (Product Quality).
- The correlation coefficient ‘r’ has been calculated to be 0.87737 and coefficient of determination ‘r^2’ is 0.7697781. This shows a good correlation and it will be seen from the values of r^2 that CET score is more correlative with academic performance as compared to total process score.
- To know the relative significance between process quality and CET score a multiple regression analysis has been carried out. The multiple regression equation comes out to be

\[ Y = 20.7976 - 0.00306X_1 + 0.39838X_2 \]

Where X_1 is the total score process quality and X_2 is the CET score.

- In multiple regression equation output, the coefficient of determination ‘r^2’ comes out to be 0.77025 which shows that the correlation is good but not very significant.
- In multiple regression equation the values of the coefficients b_1 (A) -0.00306 for total process score and b_2 (C) 0.39838 for CET scores, clearly indicate that CET is predominantly important for determining the Academic Performance quality (Product Quality) ‘Y’.
- A correlation was also sought between CET and total process score, even though CET is not dependant on process score. This correlation also comes out to be very good as indicated by coefficient of determination ‘r^2’ to be
0.85717. Thus it may be concluded that the students take into account the overall standing of the college as given by the total process score while taking admission.

- The results of a linear and multiple regression show that whereas process quality is taken into consideration by students at the time of admission. However, then subsequent academic performance in the course is predominantly determined by the academic quality at the entry level as given by CET score.

- The values of the DMRT means obtained invalidate or rejects the null hypothesis in each and every case, that means the different means are not the same i.e. \( \bar{Y}_1 \neq \bar{Y}_2 \neq \bar{Y}_3 \) etc.

- 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.
5.3 Specific Contributions

1. The thesis is an attempt to use micro-level measurement and analysis of factors responsible for quality in degree engineering education in India.

2. The study provides better insight for the perspectives of stakeholders of the engineering education system about quality in education.

3. A large number of stakeholders have been contacted to receive information and data collection on different aspects of engineering education process.

4. Regression analysis and ANOVA have been applied and attempt has been made to find perspectives differences within stakeholders.

5. The gap analysis has been carried out and percentage deviations are generated for the factors responsible in quality of education process.

6. Large volume assessment of the quality of engineering education has been attempted.

7. The results have been validated using correlation coefficient, coefficient of determination and analysis of variance.

8. Multiple regression equation has been established.

5.4 General Recommendations

1. It was found during the course of investigations, that Government colleges in Maharashtra have never 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 days 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. The input regarding traits has been gathered through personal discussion with different stakeholders. Unfortunately none of the education institutions has a system for measuring these traits in the students. Therefore it is recommended that a system of grading or marking the above traits
be established in each and every college. The measurement of such traits should be quantifiable.

3. Every institute should also establish a statistical cell to continuously keep the data and upgrade and 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 and 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 quality of engineering education.

5.5 Future Scope of Work

1. Large volume assessment by taking large sample size with more number of institutions may be useful in devising better insight at the planning stage to get help in policy decisions.

2. Design and development of computational aids for multi criteria and large volume assessment of quality in education sector may be carried out.

3. Extend present studies to all the engineering colleges in the State of Maharashtra and probably the entire country.

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