FACTORS INFLUENCING QUALITY OF TECHNICAL EDUCATION IN INDIA – A STUDY OF TECHNICAL INSTITUTIONS IN KARNATAKA[1]

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Abstract

One of the main triggers for growth in Indian economy is the explosion in the IT sector. In order to sustain the current growth rates in the new knowledge economy sectors, the pool of technical talent needs to continue to grow, which is attracting private players into the sector. With the increasing role of private institutions in technical education, quality assurance becomes more and more critical. External audit mechanisms include several accreditation agencies. While the certification by the external accreditation agencies is an official endorsement, the perception of students with respect to the quality of the programmes offered by these technical institutions plays an important role in their success. There are many factors that contribute to these perceptions as well as the delivery of high quality education. This paper attempts to identify the factors that differentiate those institutions which are perceived as of high quality from those which are perceived as those of low quality. This paper is part of a wider study covering the quality aspects of a number of technical institutions in the state of Karnataka in India.

Keywords: Quality in Technical Institutions, Technical Education, Quality in Education, Factors of Quality Education

1. INTRODUCTION

The factors that influence economic development of any country depend on the stage of development of that particular country. At the initial stages of development, the factors that are important are the effective use of basic inputs such as land, labour and capital. As the countries advances, the factors that influence the economic development are higher reliance on international trade and attracting FDI. As countries reach high income status, they need to generate high levels of innovation and commercialization of new technologies (Porter, Sachs and Macarthur, 2001).

The major trigger for growth in Indian economy is the explosion in the IT sector. It has opened up enormous opportunities in different arenas of science and technology, as well as service sectors. This in turn has led to development of human capital through various modes. The human capital coupled with technological advancements has made India as number one investment proposition for other countries. (Heeks, 1996 and Arora et al, 2002).

In order to sustain the growth rates of the economy, especially in the new knowledge economy sectors, the pool of technical talent needs to continue to grow. There had been a significant increase in the number of graduates coming out of the technical institutions in India over the past five years. India, today produces more than 430,000 engineering graduates annually. The Hyderabad region alone produces more than 25,000 engineering graduates, with another 46,000 in the Karnataka state (AICTE, 2006). While some of these graduates are of a high calibre, many do not have the requisite skills needed for large multinationals. There is a strong move by the local governments and the university authorities to increase the number of graduates coming out of these regions. Nevertheless, the wage rates, especially for those positions requiring higher skill levels, have been continuously increasing. The statistics pertaining to number of institutions and intake in 2004-05 in engineering institutions in different regions in India is presented in Table 1.

Kapu and Mehta argue that higher education in India is being de facto privatized on a massive scale. But this privatization is not a result of changing ideological commitments but, a result from a breakdown of the

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state system and an exit of Indian elites from public institutions, to both private sector institutions within the country as well as abroad. Private philanthropy in higher education, which was supportive of public institutions in the past, is also increasingly withdrawing its support. Consequently the ideological and institutional underpinnings of this form of privatization remain exceedingly weak (Kapu and Mehta, 2004).

TABLE 1. NUMBER OF TECHNICAL INSTITUTIONS AND INTAKE (2004-05)

Region	State/Union Territory	Number of Institutions	Intake
Central	1. Madhya Pradesh	61	20210
	2. Chhattisgarh	14	4020
	3. Gujarat	37	12965
	Total	112	37195
Eastern	1. Mizoram	1	120
	2. Sikkim	1	525
	3. West Bengal	54	15477
	4. Tripura	1	180
	5. Meghalaya	1	240
	6. Arunachal Pradesh	1	210
	7. Andaman & Nicobar	-	-
	8. Assam	3	750
	9. Manipur	1	115
	10. Nagaland	-	-
	11. Orissa	41	13014
	12. Jharkhand	10	3385
	Total	114	34016
North	1. Bihar	8	1905
	2. Uttar Pradesh	89	28953
	3. Uttaranchal	9	1440
	Total	106	32298
North-West	1. Chandigarh	5	800
	2. Haryana	38	12785
	3. Himachal Pradesh	5	1260
	4. Jammu& Kashmir	5	1545
	5. New Delhi	14	4330
	6. Punjab	45	14880
	7. Rajasthan	41	15045
	Total	153	50645
South	1. Andhra Pradesh	236	82970
	2. Pondicherry	6	2370
	3. Tamil Nadu	254	80417
	Total	496	165757
South-West	1. Karnataka	118	46375
	2. Kerala	89	24413
	Total	207	70788
West	1. Maharashtra	155	48250
	2. Goa	3	740
	3.Daman & D.Dadar,N.H.	-	-
	Total	158	48990
Grand Total		1346	439689

Source: AICTE, http://www.aicte.ernet.in/ApprovedInstitute.htm

In this context of increase in the demand and supply of technical education and increasing role of private institutions as well as individuals, quality assurance becomes more and more critical for the success of technical education in the country. External audit mechanisms including accreditation agencies such as All India Council for Technical Education (AICTE), the National Board of Accreditation were established in 1994. Also, international quality certifications ISO have enhanced the status of many organizations including educational institutions as quality performers.

At the same time, a more informal assessment of "good performance" results when prospective students arrive at their judgments with regard to the "quality" of the institution under consideration for purposes of admission. While the certification by the external agencies such as AICTE and NAAC (National Assessment and Accreditation Council) is an official endorsement, the perception of potential students with respect to the quality of the programmes offered by these technical institutions plays an important role in their success. Such perceptions are in a sense self perpetuating. As students start perceiving a particular institution to be better, high quality students will get attracted to the institution. Consequently, the academic performance of the student body as a whole will improve which will result in better placement for the students as well as improvement in the reputation of the institution. This will naturally attract still better students for the next set of admissions. The same self-perpetuating cycle could also work in the reverse direction in the sense that if there is a drop in the perceived quality of the institution, the slide could continue to push the reputation downwards.

Thus, it is important to create a positive perception in the minds of the students as well as other stakeholders of the institution. There are many factors that contribute to the perceptions as well as the delivery of high quality education to the students. This paper attempts to identify the factors that differentiate those institutions which are perceived as of high quality from those which are perceived as those of low quality. This paper is part of a wider study covering the quality aspects of a number of technical institutions in the state of Karnataka.

2. OBJECTIVES

The following are the specific objectives of the study

- To identify best practices contributing to quality
- To identify the efforts of the institutions in putting such practices in place
- To determine the replicability of such practices

3. METHODOLOGY

As already mentioned, Karnataka is one of the few states in India which has a large number of technical institutions. The process of admission into these institutions in Karnataka is known to be highly transparent and known to provide complete choice of selection to the students. All the applicants are ranked based on a "Common Entrance Test (CET)" as well as their performance in the pre-degree course. All the applicants for all the technical institutions are invited to a "counseling" meeting in the order of their rank. In other words, the applicant with the first rank has the complete choice of the institution as well as the branch of specialization. The availability of the seats (vacancies) in each institution as well as the branch of specialization is displayed in the form of a matrix which is updated on a real-time basis. Any candidate appearing for the counseling at any point of time has the complete information with respect to the availability of the seats in any particular institution under any specific branch of specialization. With this type information availability, the students with better ranks will naturally have a chance of selecting the better institutions (according to their own perception) and those with lower ranks are left with only the lower grade institutions. These perceptions of the students are generally based on the academic

performance of the student body as a whole (as determined by the final examination results), faculty resources, placement of graduating students of the institution, average salaries offered to the graduating students as well as infrastructure available for academic and co-curricular activities. It is assumed that those institutions which are selected by the top ranked applicants are perceived to be of high quality and those institutions which are available to the lower ranked students are of low quality.

The following procedure was adapted to rank the technical institutions based on the quality perceptions. Initially a sample of 48 technical institutions was selected for the study. The rank-wise options exercised by all the students for the academic year 2006-07 (based on the CET of 2006) were obtained. Out of all these students, the top 10,000 were selected for creating the quality index of the institutions. Initially, the top ranked student was given a weightage of 1. The weightage of the second ranked student was reduced by a factor of $10{,}000^{th}$. Thus the weightage of each subsequent student (based on the rank) was reduced by $10{,}000^{th}$. This weightage is referred to as "Rank Weightage". Similarly, a Course Weightage is calculated separately. The course weightage is simply the proportion of students opting for a particular branch of specialization out of the top 10,000. For example, if 3155 students selected Electronics branch, a course weightage for Electronics branch was 0.3155. Then the product of Rank Weightage and Course Weightage was calculated to arrive at a Weighted Index for each student. This weighted index is a measure of the preference of the student based on his rank as well as his/her preference for a particular branch of specialization. The sum of the students' weighted index for all students opting for a particular institution is calculated to obtain the overall quality index for the institution. An examination of the Institutional Quality Index revealed that there are natural breaks. Based on these natural breaks in Institutional Quality Index for the institutions are classified into 3 categories namely Top Category, Average Category and Low Category. There are 12 institution each in the Top and Average categories and 22 in the Low category.

The categorization of the institutions based on the selection by the students was reflected in the performance of the students in these institutions. While 34 percent of the students in the Top category institutions have secured distinction over the past three years, only 15 percent of the low category students were able to achieve this. On the other hand, only 22 percent of the students from the Top category institution had secured second class (securing less than 60 percent marks in the examination) where as the corresponding percentage of the students from the low category colleges was 36 percent. In other words, the performance of the students in the respective institutions has an impact on selection of institutions by the students. Table 2 presents the performance details of the students for the past three years for all the sample institutions.

TABLE 2. PERFORMANCE OF STUDENTS IN THE THREE CATEGORIES OF INSTITUTIONS

Category	Performance	Year			Total
		2004	2,005	2,006	Total
Top	Distinction	41.14%	41.79%	23.10%	34.44%
	First Class	33.61%	29.92%	31.64%	31.67%
	Second Class	22.40%	23.58%	22.34%	22.75%
Average	Distinction	27.78%	27.16%	12.69%	22.05%
	First Class	40.43%	37.39%	35.15%	37.47%
	Second Class	28.20%	31.09%	25.85%	28.32%
Low	Distinction	22.14%	17.80%	6.67%	15.23%
	First Class	41.65%	37.30%	28.85%	35.67%
	Second Class	33.41%	40.72%	34.67%	36.36%

5. RESULTS AND DISCUSSION

Data was collected on various aspects of the sample institutions. These aspects included infrastructure as well as academic facilities. In addition, data was also collected on placement details of the students and opportunities extended to the faculty for professional development.

All the sample institutions have sufficient infrastructural facilities such as classrooms, seminar halls, laboratories and computing facilities. Students in almost all the institutions have access to internet. Thus the 'hardware" facilities such as buildings and related infrastructure is more or less similar in all the institutions. On the other hand, the "softer" aspects of the institutions appear to be the distinguishing factor across the three categories of institutions.

Table 4 presents the distribution of faculty members based on their educational background. The Top category institutions are able to attract a large number of faculty with doctoral degrees. Almost 13 percent of the faculty in this category of institutions have doctoral degrees where as the corresponding percentage in the Low category institutions is only 5 percent. Similarly, more than 42 percent of the faculty members of the Low category institutions have only an undergraduate degree as compared to less than 35 percent in the Top category. The Top category institutions adopt a number of strategies in order to attract these faculty members with better qualifications. Table 5 presents the incentives offered to the faculty members of the three categories of the sample institutions.

TABLE 4. DISTRIBUTION OF FACULTY MEMBERS BASED ON EDUCATIONAL QUALIFICATIONS

Item	Category		
	Top	Average	Low
Total Faculty strength	2,358	1,474	1,681
Number with Doctoral Degree	305	164	83
Number with Masters Degree	1,146	789	958
Number with undergraduate degree	813	526	719

TABLE 5. INCENTIVES OFFERED TO FACULTY MEMBERS OF SAMPLE INSTITUTIONS (%)

S. No.	Strategy	Category		
		Top	Average	Low
1	Freedom in conduct of Courses	63.64%	45.45%	45.45%
2	Monetary incentive for better performance	50.00%	50.00%	50.00%
3	Flexi Teaching hours (to pursue higher education)	75.00%	50.00%	54.55%
4	Awards/Citations for excellence	66.67%	16.67%	18.18%
5	Opportunity for Consultancy service	66.67%	66.67%	54.55%
6	Special Coaching for underachievers (students)	66.67%	33.33%	54.55%
7	Accelerated promotion on higher qualification	66.67%	91.67%	100.00%
8	Sponsorship for higher education	83.33%	100.00%	95.45%
9	Sponsor to attend conference/Seminars	91.67%	91.67%	95.45%
10	Sponsor to Training programmes	75.00%	83.33%	90.91%
11	Offer salary higher than mandated	33.33%	75.00%	59.09%
12	Exclusive Computer provided	66.67%	81.82%	57.14%
13	Staff Quarters provided	16.67%	41.67%	36.36%

It can be seen from Table 5 that almost all institutions sponsor their faculty to attend seminars and conferences in order to help them in networking as well as to develop professionally. Similarly, many institutions sponsor them for higher education. While almost all the institutions are willing to sponsor their faculty for higher education, the Top category institutions differentiate themselves by offering "flexi-

teaching" hours. Flexi-teaching hours allow the faculty members to choose their teaching hours as per their convenience. With flexi-teaching, the faculty members will be able to pursue higher education (attending classes for their own higher studies) while continuing to teach in the institution where they are employed. Without such flexi-teaching, the faculty members will have to either go on long leave or sacrifice higher education. Thus, the combination of sponsorship to higher education and flexi-teaching is a differentiating strategy for the Top category institutions.

Fifty percent of the institutions in all the three categories offer monetary incentives for better performance. But, two thirds of the Top and Average category institutions provide opportunities for consulting to their faculty members. As is well known, the consulting privileges for faculty enable them to relate their knowledge to practical situations in additions to improving their monetary compensation. The consulting experience will enable them to bring more practical orientation to their teaching and also brings visibility to the institution.

Very few of the Top institutions offer salaries higher than those mandated by the University Grants Commission of India. But, only the Top category institutions appear to be actively involved in recognizing excellence through awards and citations. They also offer freedom to their faculty for conducting courses based on their interest and convenience. These Top category institutions also provide special coaching to the students who are academically weak. What is important is that those faculty members who are involved in the special coaching are also rewarded monetarily and this coaching is also part of flexi-teaching.

The Low category institutions do provide opportunity for accelerated promotions on acquiring higher qualifications. This is definitely a positive incentive for faculty members to acquire higher qualifications. Similarly, a higher percentage of the Low category institutions encourage their faculty members to attend training programmes.

The details of infrastructure facilities including library space as well as books and journals available, are presented in Table 6.

TABLE 6. INFRASTRUCTURE FACILITIES BY CATEGORY OF INSTITUTIONS (AVERAGE VALUES FOR THE CATEGORY)

Item	Category			All
	Top	Average	Low	
Built-up Area (Sq. Meters)	84040	118594	32995	67941
Built Area per student	33.05	53.71	26.56	35.44
No. of students	2,543	2,208	1,242	1,917
No. Of Houses for faculty	13.50	20.33	9.71	14.47
No. of Seminar Halls	5.75	4.08	2.59	3.80
Total seating capacity of Seminar Halls	1,093.33	687.50	482.27	695.22
No. of Class Rooms	58.25	37.75	26.32	37.63
Library Area (Sq. Meters)	5,024.25	1,768.33	1,297.86	2,392.70
No. books in stock	102,666	37,094	25,602	48,704
No. of national journals subscribed	69.73	64.17	50.52	59.05
No. of international journals subscribed	59.80	47.67	23.05	38.47
Library seating capacity	313.50	297.92	163.00	240.84
Expenditure	1562818	820865	528420	970701
Budget	1797822	871921	664829	1111524
Percentage of Expenditure	86.93%	94.14%	79.48%	87.33%
Computers per student	0.23	0.26	0.29	0.27

The Average category institutions appear to concentrate on larger built-up area and housing for faculty members. On the other hand, the Top category institutions have a much larger area available for library facilities. Consequently, they are able to provide larger seating capacity in the library for the students. They subscribe to larger number of national and international journals. They also have much larger number of books available in the library. Same is the case with the number of classrooms and seminar halls. The emphasis of the Top institutions on the library facilities is also reflected in their budget allocation. The average annual allocation for the library is about Rs. 1.8 million as compared to Rs. 0.87 million for the Average Institutions and Rs. 0.66 million for the Low category institutions. Similarly, the percentage of budget utilization in the Top and Average category institutions is much higher than that of Low category institutions.

One of the recent strategies of the technical institutions is to get themselves rated by specific external agencies such as ISO certification, BITES (The Board for Information Technology Education Standards) or national agencies such as National Board of Accreditation of AICTE. Here also, the Top category institutions have an edge over the others. Two-thirds of the Top category institutions in the sample have been rated by external agencies where as the corresponding percentages for Average and Low category institutions were only 50 percent and 32 percent.

All the above distinguishing factors of the Top category institutions appear to result in much better performance of their students. This is also reflected in the placement of the students. While all the institutions in the sample claim to provide placement opportunities to their students, the reality is that the placement record of the Top category institutions is much better. The average salaries offered at the time of final placement across the three categories of institutions are presented in Table 7. These values are presented for the minimum, maximum and average salaries offered for the institutions.

TABLE 7. DETAILS OF SALARIES OFFERED TO STUDENTS ACROSS DIFFERENT CATEGORIES OF INSTITUTIONS

Salary at Final Placement	Category			All	F-Value	Sig
	Top	Average	Low			
Minimum Salary	13308	11742	11674	12128	0.816	0.4490
Average Salary	24133	17942	16365	18914	7.009	0.0024
Maximum Salary	38750	30783	22794	29179	10.612	0.0002

The result of ANOVA carried out on the average, minimum and maximum salaries offered to the three categories of institutions showed that there is a significant difference in the average salaries offered across the three categories. The only exception is with respect to minimum salary. As mentioned earlier, the Top category institutions, with their strategies are able to attract better students who in turn are improving the academic performance of the institutions leading to better placement of the graduating students. This cycle is self-perpetuating in the sense that these institutions are able to further attract still better quality students.

It is not at all difficult to implement these strategies adapted by the Top category institutions in any technical institution. There is a need to emphasize the “softer” aspects such as faculty members with high quality as well as higher qualifications, access to latest developments through better library facilities as well as encouragement to faculty through “flexi-teaching” and attendance to seminars and conferences etc.

6. SUMMARY AND CONCLUSIONS

It can be concluded from the discussion on various indicators that there are some quality practices which give the Top category institutions an edge over the Average and Low category institutions. The Low category institutions appear to concentrate on accelerated promotions for faculty as well as deputing

them to training programs. The “soft” aspects of the institutions appear to the most distinguishing factor across the three categories. While all the three categories of institutions surveyed sponsor faculty to attend seminars and conferences to build their professional capacities, the major distinguishing features of the Top category institutions are the ‘Flexi-time’ facility offered to its faculty and special coaching to academically weak students. Another important feature that distinguishes the Top category institutions is the access to the latest knowledge to students and faculty through a well-stocked library with subscriptions to a large number of national and international journals. In addition, Top and Average category institutions provide consulting opportunities for the faculty members. These practices along with other factors such as state of the art infrastructure, modern teaching-learning practices, incentives for faculty, facilities for students and faculty to participate in seminars/conferences, strategy of getting rated by external accreditation agencies, computer and internet facilities for students and faculty, placement of students, seem to attract students and other stakeholders to these institutions. The very profile of the Top category institutions has some predictors for success which are easily replicable.

REFERENCES

AICTE (2006), http://www.aicte.ernet.in/ApprovedInstitute.htm

Arora, A. and Athreye, S. , “The Software Industry and India’s Economic Development”, *Information Economics and Policy*, Vol 14, 2002, 253-273.

Heeks, R. India’s Software Industry, State Policy, Liberalization, and Industrial Development, Sage Publications, New Delhi, 1996.

Kapu, Devesh and Pratap Bhanu Mehta, Indian Higher Education Reform: From Half-Baked Socialism to Half-Baked Capitalism, CID Working Paper No. 108 September 2004, available at http://www.cid.harvard.edu/cidwp/pdf/108.pdf

Porter, M. E., J. Sachs, J. W. Mcarthur, Executive Summary: Competitiveness and Stages of Economic Development, 2001, available at http://www.weforum.org/pdf/gcr/ExecSumm_Final.pdf

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