



---

## **Parameters for Relative Grading of Select Technical Institutions and Associated Libraries**

M. Sultan Omer  
Librarian

M.M.A.J. Academy of International Studies  
Jamia Millia Islamia, New Delhi  
omars.jmi@gmail.com

M. Rafat  
Professor

Department of Applied Science and Humanities  
Faculty of Engineering and Technology  
Jamia Millia Islamia, New Delhi

### **Abstract**

Parameters for indices of institutions and libraries have been recommended to gauge their quality. This has been done by carrying out a survey of technical institutions of three states, namely, Haryana, U.P. and Delhi. The institutions and libraries have been graded on a 100 point scale and an index I (for Institutions) and B (for Libraries) has been defined which indicates the status of each particular institution. The co-relations between the institutions and their associated libraries have also been studied. Concludes that overall library status in the three regions seems to be at satisfactory level, which is by and large uniform.

**Keywords:** Institution profile, Library profile, Correlation study

### **1 Introduction**

Technical Institutions and the libraries associated with them have substantially increased in recent years. In India this trend is visible in all urban centers with significant population. Partly it can be attributed to the impact of globalization. There is a need to have parameters which can be used to compare institutions with one another. In the present investigation an attempt has been made to recommend suitable parameters for this purpose. The method has been applied to three states of rural India. Libraries can be similarly graded.

### **2 Literature Review**

India has now a significant number of educational institutions imparting technical education. Invariably, these institutions have libraries associated with them which may have books, journals and other materials. These libraries are the focus of the present



---

study. Lancaster (1977) have reported similar investigations in their book and have applied research methodology to the areas like accessibility and availability of materials and catalogues in Institutions

Ministry of Skill Development and Entrepreneurship conducted a study which was carried out to ensure the quality checks of these institutes. It decided to grade the ITIs on the basis of some key parameters. ICRA has recently extended its Grading services to include Grading of Engineering Colleges/Universities (ECUs). The extension of service was aimed at promoting standardization of infrastructure and practices within the engineering education institutes. The idea was to address the perceived need among students and their stakeholders. The procedure and conclusions have been described in the study. Windsor (1977) reports a study where a Committee was formed in a meeting of Chicago council to take up the question of standardization of Libraries and Librarians. The University of the State of New York had in 1894 adopted a statement of "Minimum requirements for (a) proper library standard". These ideas and follow up have been examined in the above reference.

Orr (1973) reported that "The literature of the last few decades reflects a steadily increasing concern with quantitative assessment of libraries and their services. This concern is both the result of, and a reaction to, growing pressures from within and without the library profession to adopt the tools of the management sciences. The pressures are generated by many factors including the success of these tools in other fields and their adoption by the organizations supporting libraries. The increasingly explicit character of competition for funds at all levels, the complexity of decisions about new options created by emerging technology and by formalization of library networks, have encouraged proper quantitative evaluation of quality of library services."

### **3 Objectives**

- i. To survey existing technical libraries in North India
- ii. To find out quality of technical Libraries
- iii. To quantify Institutions and Libraries by using suitable indices
- iv. To find out correlation between quality of the institution and Libraries

### **4 Methodology**

#### ***4.1 Formula source***

The formula to find out correlation coefficients is taken from Handbook of Mathematics (available on Google and explained as 'Correlation Coefficients'). This is also known as Pearson correlation coefficient and often referred to as the Pearson R test, is a statistical formula that measures the strength between variables and relationships. To



determine how strong the relationship is between two variables, you need to find the coefficient value, which can range between -1.00 and 1.00.

**4.2 Criteria of Selection**

The criteria for selecting Institutions for the study was their long standing. Further these were chosen as select institutions in three states of Haryana, Uttar Pradesh (UP) and Delhi. These are well known and popular in their particular geographical regions.

The questions to be studied were based on

- a) Features of an institution
- b) Features of the library
- c) Co-relation and evolution with time

Data was collected by survey method using questionnaires for

- 1. Librarians
- 2. For library users

**4.3 Profiles of Institutions**

Following information was collected about technical institutions which are typical of the region of Delhi, Haryana, Uttar Pradesh.

The indexes were developed expecting that a particular book will be used by a number of users. A reasonable estimate of the expected number of books below the required level (as estimated by the index) is useful for the library which may plan to purchase additional books and journals.

Institutions profiles were based on the inputs given below:

i. No. of academic Programmes	4 Points for each	Max = 20
points		
ii. No. of Fields	2 points each	Max = 20 points
iii. E = Enrolment index	2 (Enrolment in Th.)	Max = 20
points		
iv. Book Availability Index	$= \frac{\text{No. of Books}}{10 \times \text{Enrolment}}$	Max = 20 points
v. Journals availability index	$= \frac{\text{No. of Journals}}{2}$	Max = 20 points



On the basis of the above interpretation the index characterizing the status of an institution was calculated.

This index will be denoted by the symbol I. This will characterize the status of a given institution at a point of time. The grading is done on a scale of 100 so that the maximum value of I is 100.

#### 4.4 Profiles of Libraries

Similar to the index defined above, another index characterizing the status of a particular library has been defined. The symbol is B and that is based on the following information about a library. The name of this index is library status index.

$$\text{i. Enrolment Index} = \frac{\text{Library enrolment}}{\text{Institution enrolment}} \times 20 \quad \text{Max} = 20 \text{ points}$$

$$\text{ii. Book Availability Index} = \frac{\text{No. of Books}}{5 \times \text{Enrolment}} \quad \text{Max} = 20 \text{ points}$$

$$\text{iii. Journal availability Index} = \frac{\text{No. of Journals}}{\text{Enrolment}} \quad \text{Max} = 20 \text{ points}$$

$$\text{iv. Circulation Index} = \frac{\text{Books Circulated per day}}{5\% \text{ of Library Enrolment}} \times 20 \quad \text{Max} = 20 \text{ points}$$

$$\text{v. Books Procurement Index} = \frac{\text{Books procured annually}}{3\% \text{ of the present No.s of Books}} \quad \text{Max} = 20 \text{ points}$$

Carpenter Ray L has reported in his analysis has shown the status of college libraries he has used the number of books and strength of staff to meet the Association of College and Research Libraries, American Library Association, standards<sup>3</sup>

In our work grading is done on a 100-point scale so that the maximum value of B is 100.

#### 4.5 Correlations

Between two variables x and y which are expected to be correlated it is possible to define a coefficient of correlation (r). This coefficient has a value between -1 and +1 and indicates the extent of interdependence of the phenomenon represented by the



variables x and y. A very low value would employ that the phenomenon are uncorrelated. We will calculate the correlation between I and B. Where the indices I and B have been defined in the previous sections. For any pair of variables x, y, the coefficient of the variables is defined as follows

$$r = \frac{\sum(ab)}{\sqrt{\sum (a)^2 \times \sum (b)^2}}$$

Where a = x -  $\bar{x}$

b = y -  $\bar{y}$

$\bar{x}$  = average value of x

$\bar{y}$  = average value of y

#### 4.6 Institution index

This index will be devised by the symbol I. This will characterize the status of a given institution at a point of time. The grading is done on a scale of 100 so that the maximum value of I is 100.

### 5 Data Collection and Tabulation

#### 5.1 Institutions Index

Tables 1.1, 1.2, 1.3, bar chart figures 1.1, 1.2, 1.3 and graph figures 1.1.1, 1.2.1, 1.3.1 are shown representing the values of I in State of Haryana, U P and Delhi

Table 1.1  
Institutions Profiles of Haryana State

		INSTITUTION PROFILE				
HARYANA						
			Al FalahEngg. C	NIF Management	YMCA	Anangpuria
			Points accumulated			
1	No.of Acad. Programme	Certificate – 04				
		Diploma - 04				
	4 points each.	Degree - 04	4	4	12	12



	Max. 20 points	Masters - 04 Research - 04				
2	No. of Fields	Civil Electrical Electronics Mechanical Computer Instrumentation Applied Science -	10	8	8	20
	2 points to each Max. 20 points					
3	Enrolment Index Max. 20 points	2(Enrolment in Th.)	3	0.14	4	3.6
4	Books Availability Index Max. 20 points	No. of Books 10 x Enrolment	0.6	20	2	1.38
5	Journal Availability Index Max. 20 points	No. of Journals 2	20	20	20	20
		<b>Total</b>	<b>37.6</b>	<b>52.14</b>	<b>46</b>	<b>56.98</b>

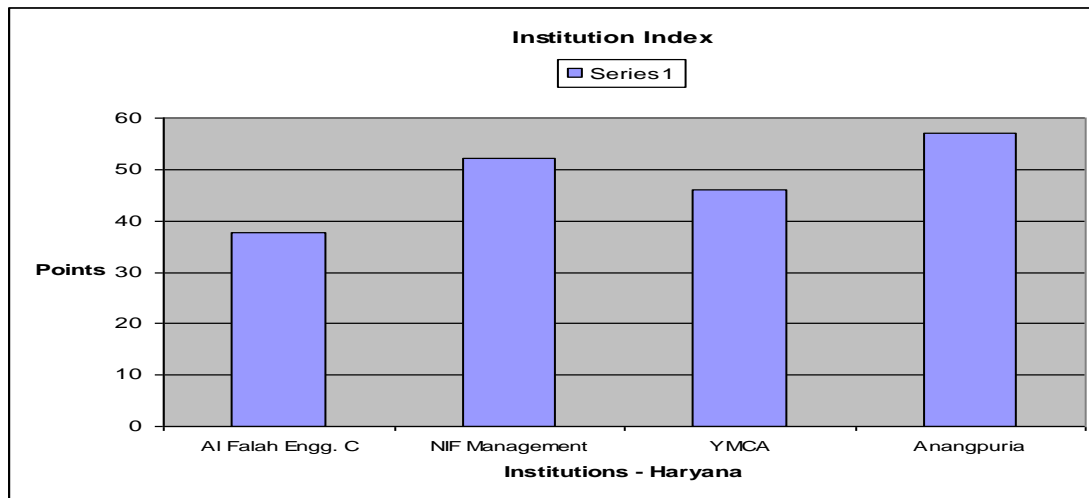


Fig. 1.1

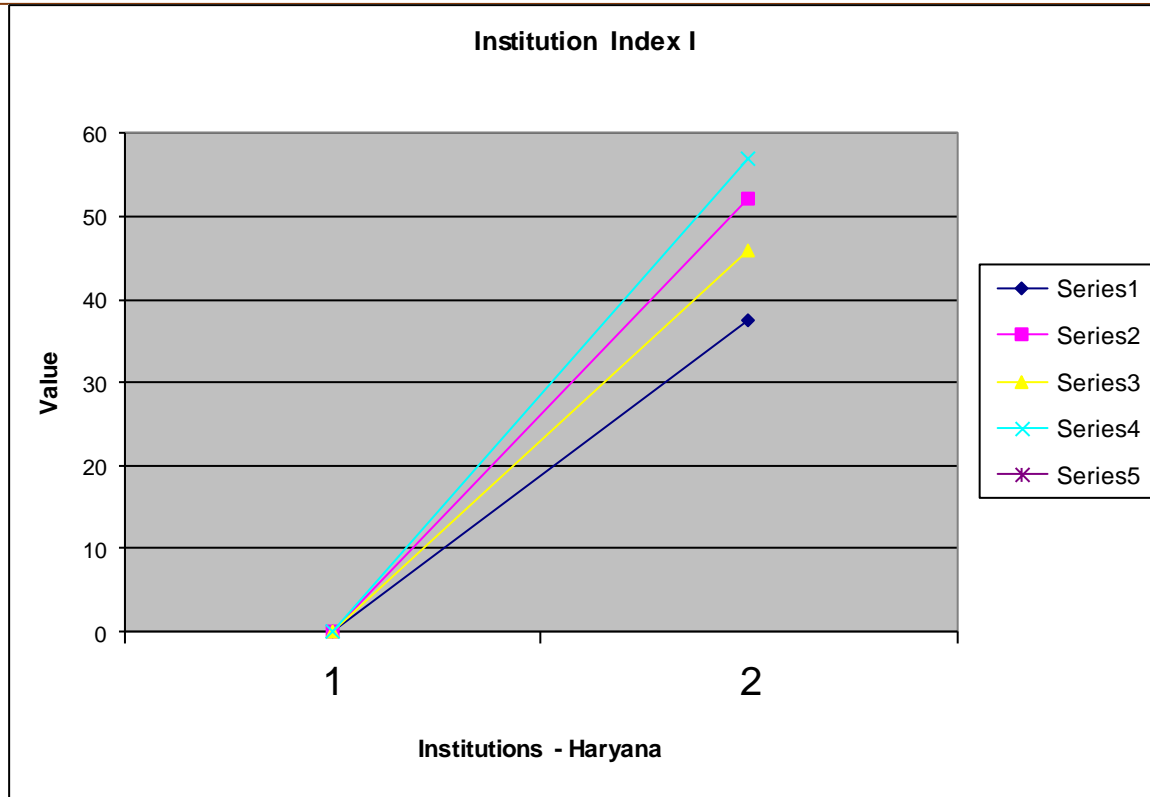


Fig. 1.1

Table 1.2  
 Institutions Profiles of UP State

		INSTITUTION PROFILE				
UP						
			JIM	J S S A	IM T	AKG EC.
1	Number of Academic Programmes	Certificate – 04				
		Diploma - 04				
		4 points each. Degree - 04	8	8	8	8
		Max. 20 points Masters - 04				
		Research - 04				
2	No. of Fields	Civil				
		Electrical				
		2 points to each Electronics	10	18	16	16



	Max. 20 points	Mechanical				
		Computer				
		Instrumentation				
		Applied Science				
		-				
		-				
3	Enrolment Index	2(Enrolment in Theory)	0.5	6	2	4
	Max. 20 points					
4	Books Availability Index	No. of Books	1.88	0.76	2.7	0.9
	Max. 20 points	10 x Enrolment				
5	Journal Availability Index	No. of Journals	20	20	20	20
	Max. 20 points	2				
		<b>Total</b>	<b>40.38</b>	<b>52.76</b>	<b>48.7</b>	<b>48.9</b>

Fig. 1.1.1

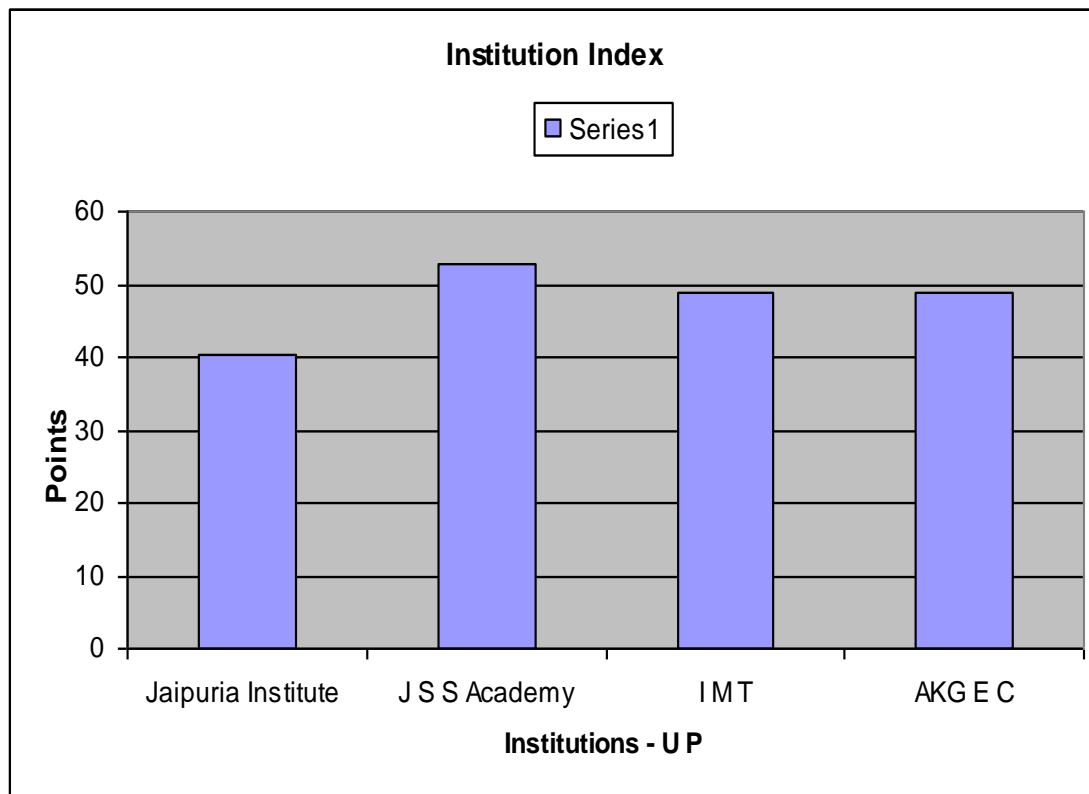


Fig. 1.2



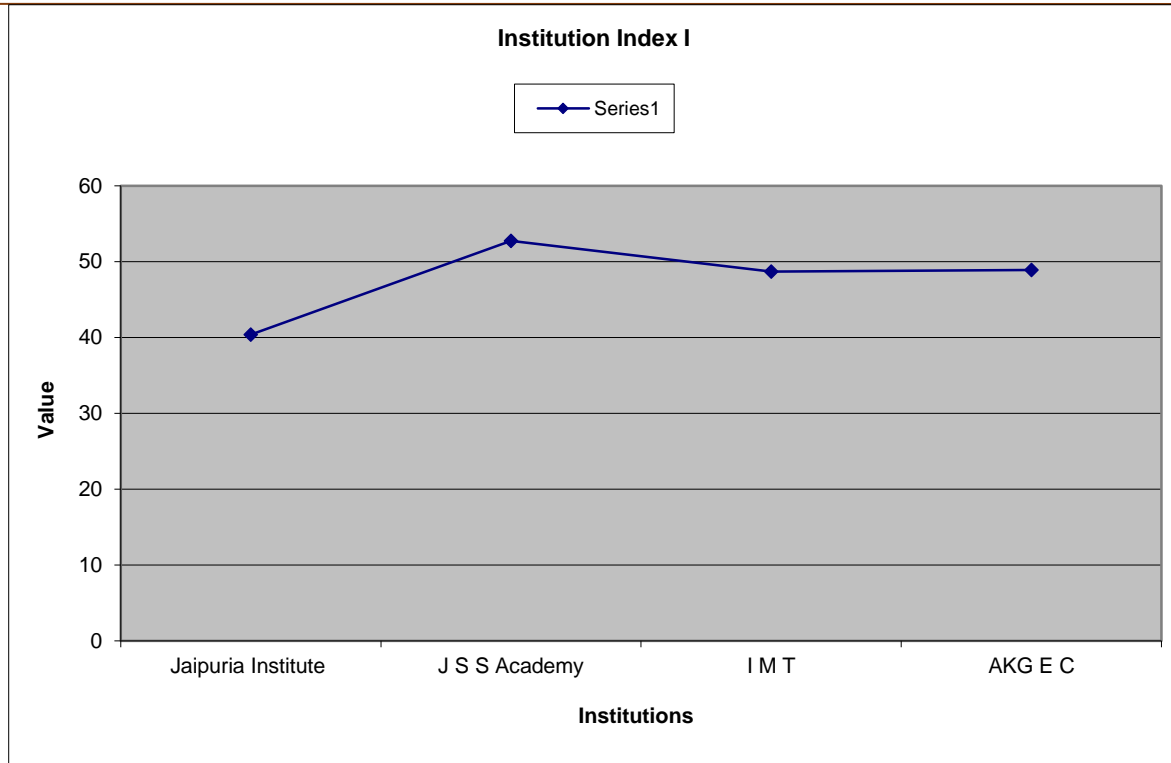


Fig. 1.2.1

Table 1.3  
 Institutions Profiles of Delhi State

		INSTITUTION PROFILE				
DELHI		I H M	DCE	APEEJAY	IILM	TERI
No. of Acad. Programme	Certificate - 04					
	Diploma - 04	16	12	16	16	8
4 points each.	Degree - 04					
Max. 20 points	Masters - 04					
	Research - 04					
No. of Fields	Civil					
	Electrical					
2 points to each	Electronics	14	18	20	8	6
Max. 20	Mechanical					



points						
	Computer Instrumentation					
	Applied Science					
	-					
	-					
Enrolment Index	2(Enrolment in Theory)	1.4	7	3	1.5	0.6
Max. 20 points						
Books Availability Index	Number of Books	0.71	3.57	1	2.66	8.3
Max. 20 points	10 x Enrolment					
Journal Availability Index	No. of Journals	12.5	20	20	20	20
Max. 20 points	2					
	<b>Total</b>	<b>44.61</b>	<b>60.57</b>	<b>60</b>	<b>48.16</b>	<b>42.9</b>

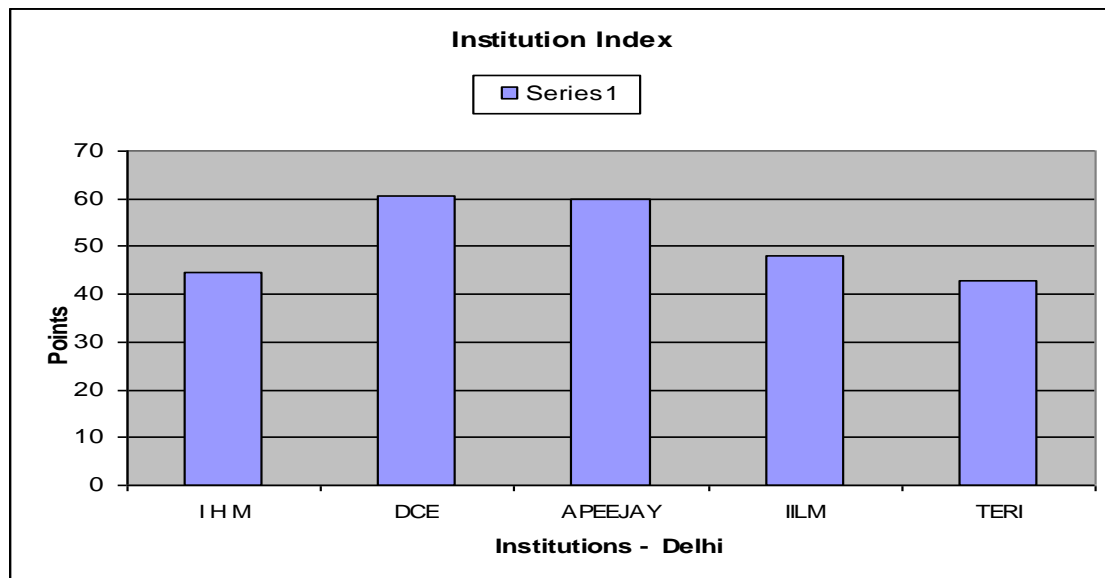


Fig. 1.3.1

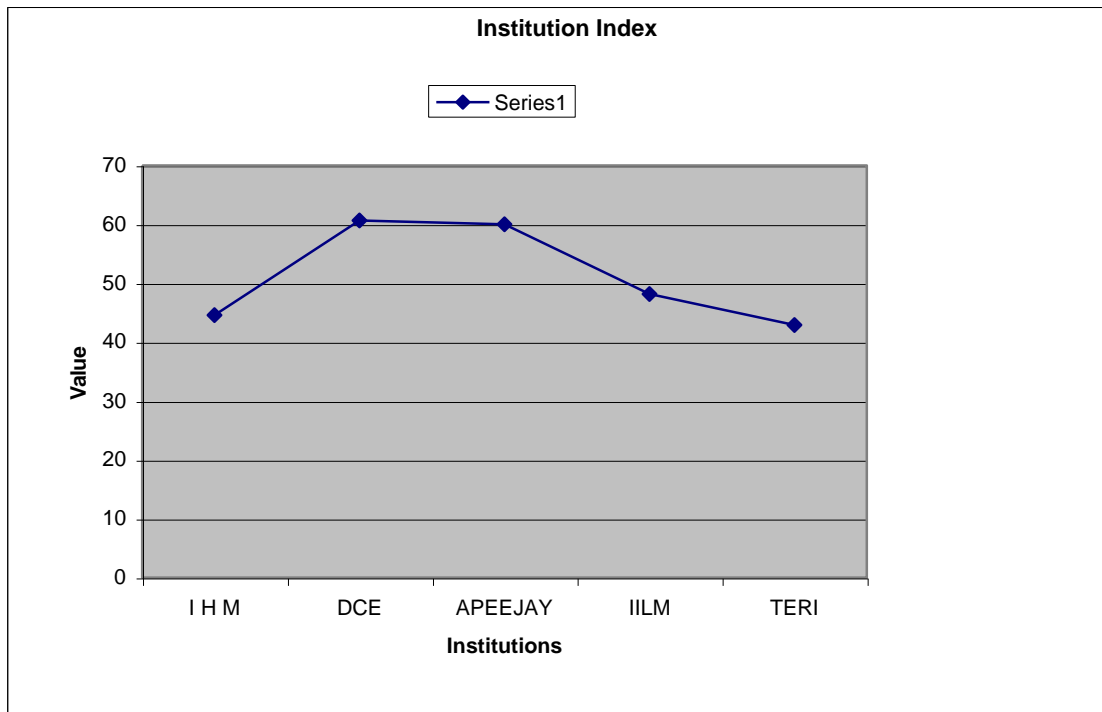


Fig. 1.3.2

### 5.2 *Library status index*

Index characterizing the status of a particular library has been defined. The symbol is B and that is based on the following interpretations about a library. The name of index is library status index. Same 5 parameters mentioned in Profile of Libraries have been used.

Tables 2.1, 2.2, 2.3; bar chart figures 2.1, 2.2, 2.3 and graph figures 2.1.1, 2.2.1, 2.3.1 are shown representing the values of B in State of Haryana, U P and Delhi.



Table 2.1 Library Status Index of Haryana State							
Haryana	Library	Status	Index	B			
	Enrolment Index	Books Av. Index	Journal Av	Circulation Index	Procurement Index	Total Points	
	Lib. Enrl x 20	No. of Books	No of Journals	Books Circulated/Day x20	Bks Procured Anually x 20	<b>B</b>	
	Inst. Enrl	5 x Enrl. Inst.		5% of the Library Enrl.	3% of Present No. of Bks		
<b>Haryana</b>							
1	B S AnanguriaInst of M & T	1800 x 20	25000	71	800 x 20	5000 x 20	
	1800 =20	5 x 1800		90 = 177.7	750 = 133.33		
	<b>20</b>	<b>2.77</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>82.77</b>
2	YMCA Inst. Of Engg.	2000 x 20	40000	65	600 x 20	5000 x 20	
	2000 = 20	5 x 2000 = 4		100 = 120	1200 =		
3		<b>20</b>	<b>4</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>84</b>
	Ansal Institute of Tech.	400 x 20	6000	8	125 x 20	1000 x 20	
4		400 = 20	5 x 400 =3		20 = 125	180 = 111.11	
		<b>20</b>	<b>3</b>	<b>8</b>	<b>20</b>	<b>20</b>	<b>71</b>
5	Al Falah Inst of Tech	1500 x 20	12000	80	500 x20	1500 x 20	
	1500 = 20	5 x 1500 = 1.6		75 = 75	360 = 83.33		
	<b>20</b>	<b>1.6</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>81.6</b>



	NIF Management	70 x 20	30000	160	30 x 20	1500 x 20	
		70 = 20	$5 \times 70 = 85.71$		3.5 = 171.4	900 = 33.33	
		<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>100</b>

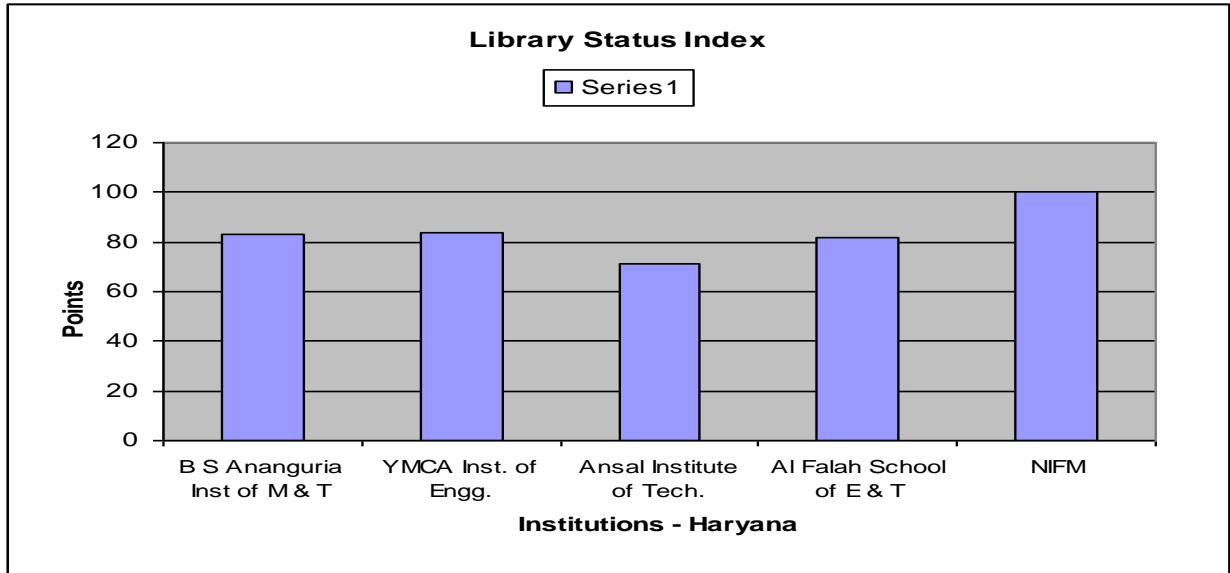


Fig. 2.1

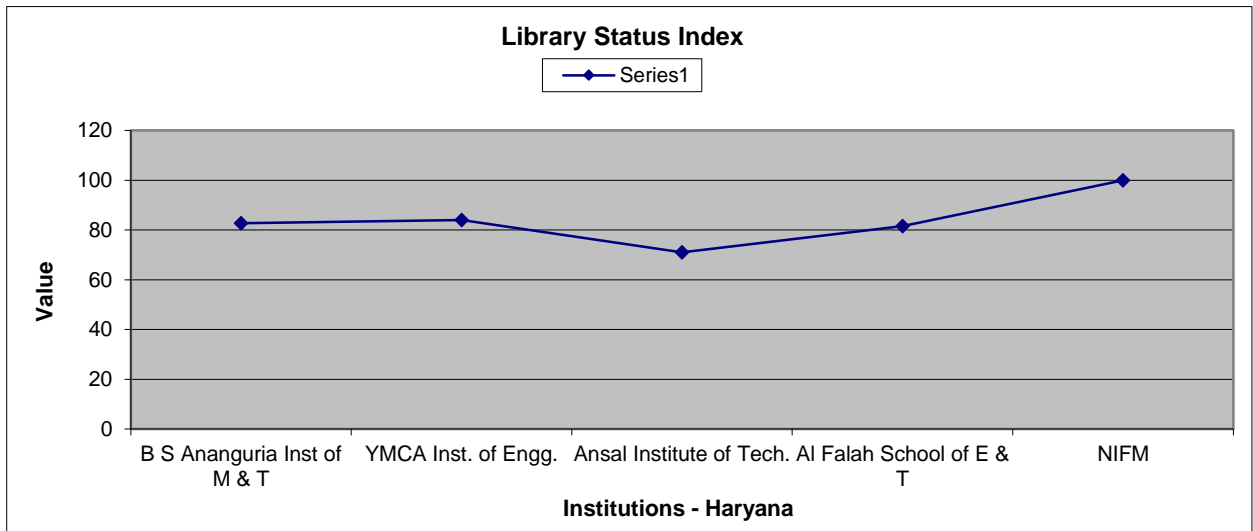


Fig. 2.1.1



**Table 2.2**  
**Library Status Index of UP State**

UP	Library	Status	Index	B	Total Points
Enrolment Index	Books Av. Index	Journal Av	Circulation Index	Procurement Index	
Lib. Enrolment x 20	No. of Books	No of Journals	Books Circulated/Day x20	Books Procured Anually x 20	
Inst. Enrl	5 x Enrolment Inst.		5% of the Library Enrl.	3% of Present No. of Bks	
1	Galgotia Institute of Tech				
2000 x 20	10000	40	350 x 20	1000 x 20	
2000 =	5 x 2000		100 =	300 =	
<b>20</b>	<b>1</b>	<b>20</b>	<b>70</b>	<b>66.67</b>	<b>81</b>
2	J S S Academy				
3000 x 20	23000	90	550 x 20	3000 x 20	
3000 =	5 x 3000 =		150 =	690 =	
<b>20</b>	<b>1.53</b>	<b>20</b>	<b>73.33</b>	<b>86.96</b>	<b>81.53</b>
3	Jaipuria Institute of Tech				
265 x 20	5000	70	60 x 20	2000 x 20	
265 =	5 x 265		14 =	150 =	
<b>20</b>	<b>3.77</b>	<b>20</b>	<b>85.71</b>	<b>266.67</b>	<b>83.77</b>
4	I M T				
1000 x 20	27000	195	225 x 20	1200 x 20	
1000 =	5 x 1000		50 =	810 =	
<b>20</b>	<b>5.4</b>	<b>20</b>	<b>90</b>	<b>29.63</b>	<b>85.4</b>
	AKG College of Engg.				
2000 x 20	18000	76	350 x 20	1500 x 20	
2000 =	5 x 2000		100 =	540 =	
<b>20</b>	<b>1.8</b>	<b>20</b>	<b>70</b>	<b>55.56</b>	<b>81.8</b>

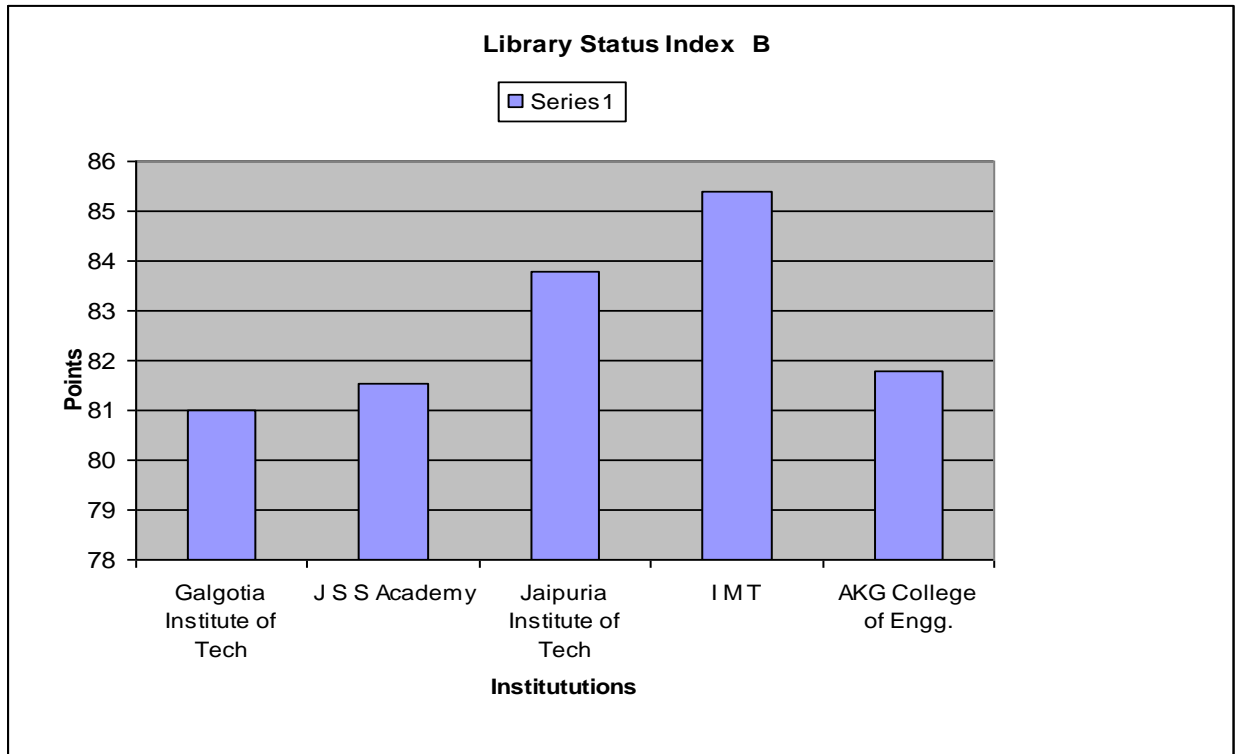


Fig. 2.2.1

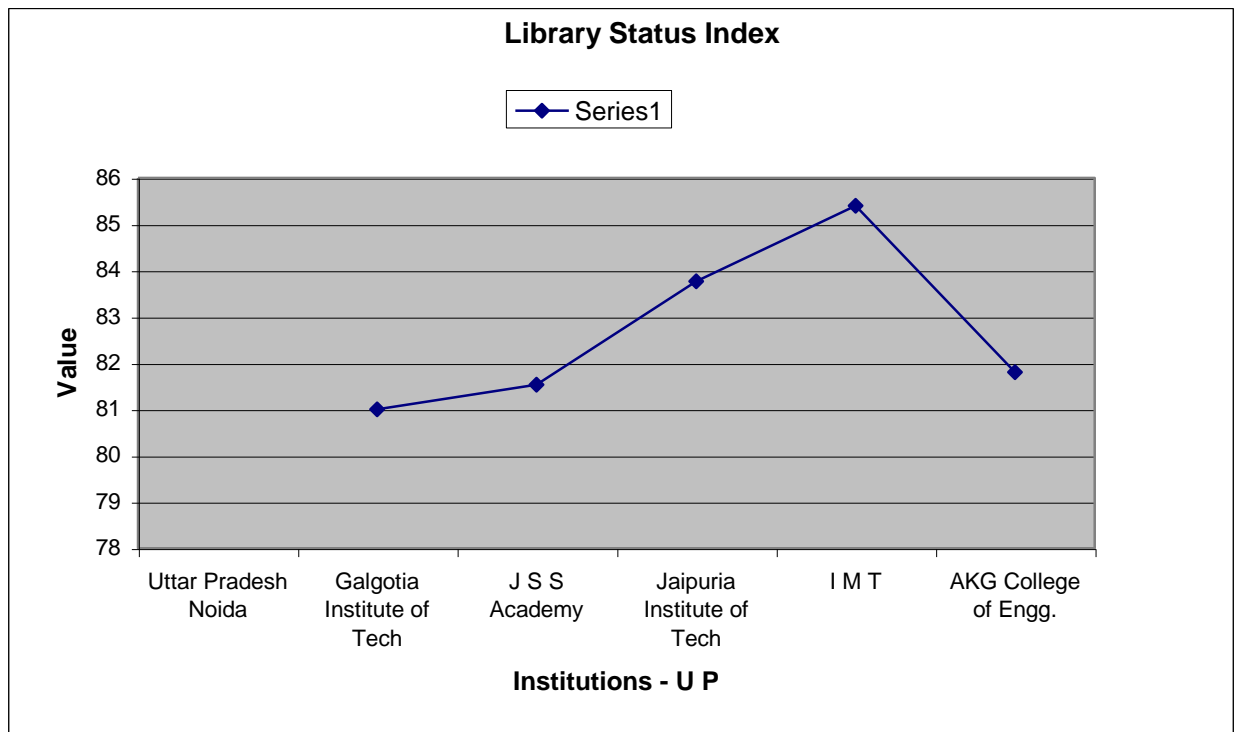


Fig 2.2.1



**Table 2.3**  
**Library Status Index of Delhi State**

Delhi	Enrolment Index	Library Books Av Index	Status Journal Av	Index Circulation Index	B Procurement Index	Total Points
	Lib. Enrl x 20	No. of Books	No of Journals	Books Circulated/Day x20	Bks Procured Anually x 20	
	Inst. Enrl	5 x Enrl. Inst.		5% of the Library Enrl.	3% of Present No. of Bks	
1 Institute of Hotel M	700 x 20	5000	25	100 x 20	400 x 20	
	700	5 x 700		35 = 57.14	150 = 53.33	
	<b>20</b>	<b>1.43</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>81.43</b>
2 Delhi College of Engg	3500 x 20	125000	48	500 x 20	10000 x 20	
	3500	5 x 3500		175 = 57.14	3750 = 53.33	
	<b>20</b>	<b>7.14</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>87.14</b>
3 D Inst of P Sc& R	1000 x 20	60000	23	300 x 20	1000 x 20	
	1000	5 x 750		50 = 120	1800 = 11.11	
	<b>20</b>	<b>16</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>96</b>
4 JamiaHamdard	3100 x 20	70000	124	550 x 20	3000 x 20	
	3100	5 x 3100		155 = 70.97	2100 = 28.57	
	<b>20</b>	<b>4.52</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>84.52</b>
5 C R R I	300 x 20	40000	175	60 x 20	2000 x 20	
	300	5 x 300 = 26.67		15 = 80	1200 = 33.33	
	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>100</b>
6 ApayjeeInst of M& IT	1500 x 20	15000	95	150 x 20	500 x 20	
	1500	5 x 1500		75 = 40	450 = 22.22	
	<b>20</b>	<b>2</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>82</b>
7 IILM, Lodi Road	750 x 20	20000	110	200 x 20	1500 x 20	
	750	5 x 750		38 = 105.26	600 = 50	
	<b>20</b>	<b>5.33</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>85.33</b>





8	GGSIU	2500 x 20	22000	90	450 x 20	1700 20	
		2500	5 x 2500		125 = 72	660 = 56.67	
		<b>20</b>	<b>1.76</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>81.76</b>
9	Sch of Planning & A	700 x 20	16000	111	150 x 20	1200 x 20	
		700	5 x 700		35 = 85.71	480 = 50	
		<b>20</b>	<b>4.57</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>84.57</b>
10	TERI	300 x 20	25000	750	80 x 20	1200 x 20	
		300	5 x 300		15 = 106.67	750 = 32	
		<b>20</b>	<b>16.67</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>96.67</b>

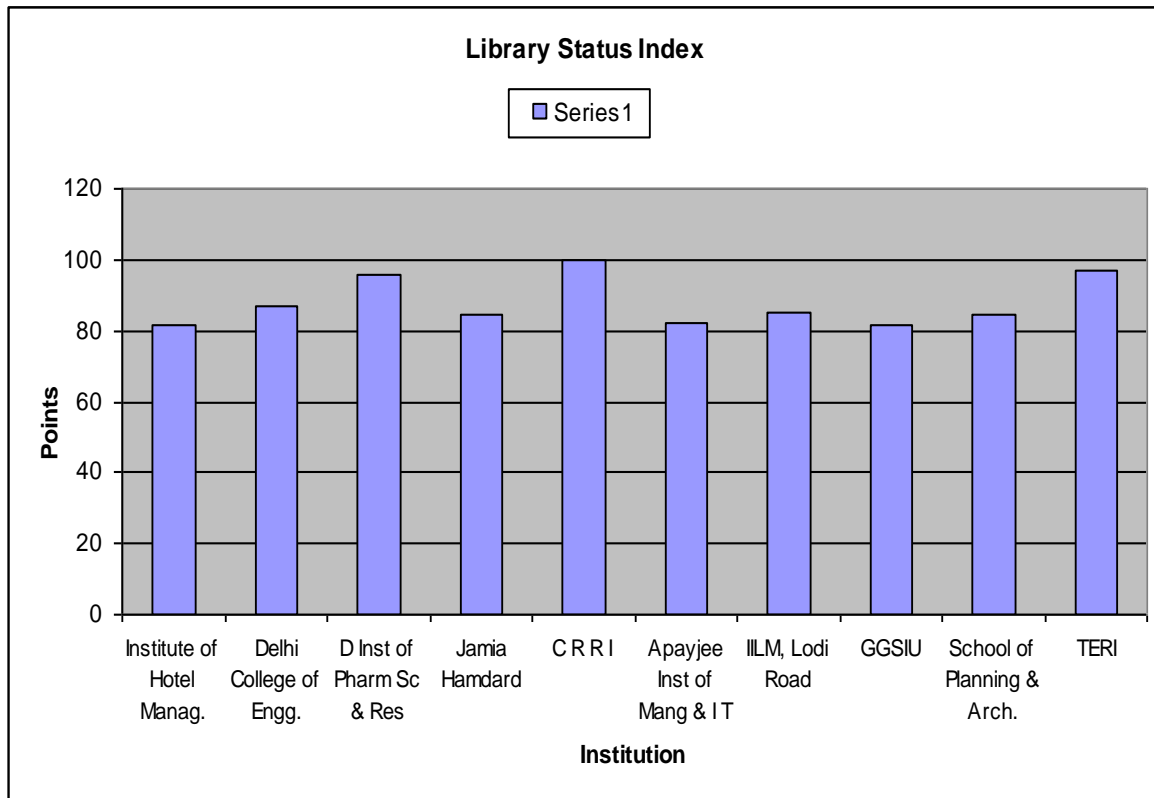


Fig. 2.3

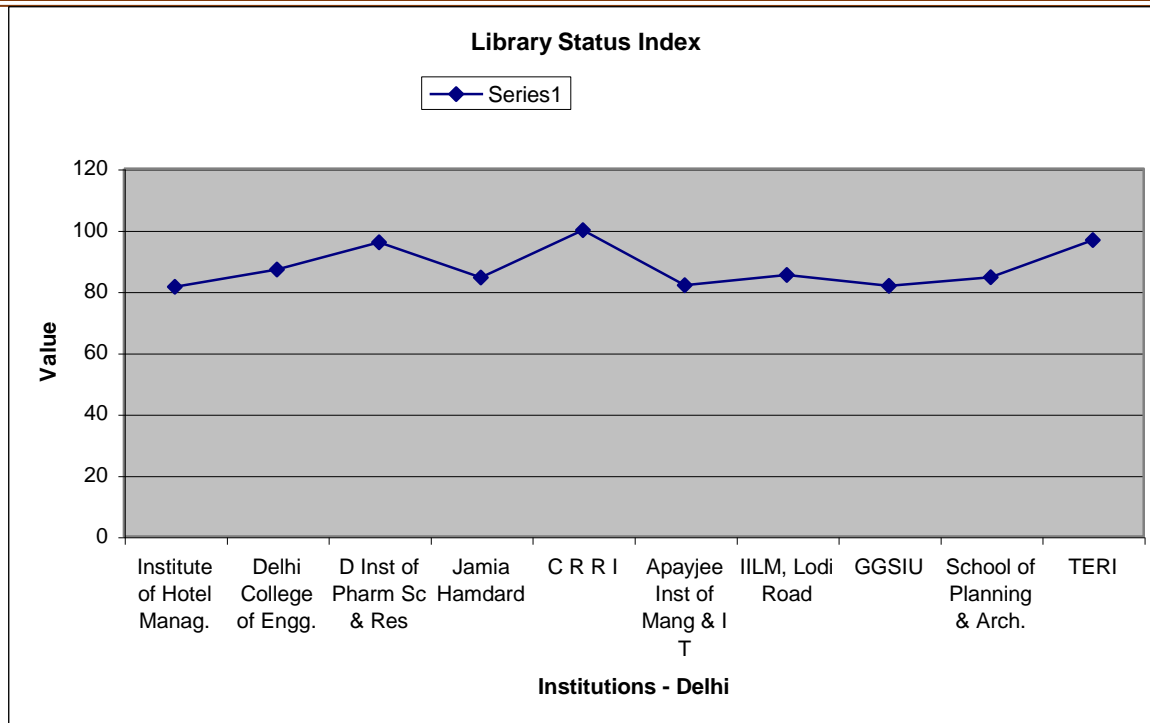


Fig. 2.3.1

5.3 Correlation between Institutions and their Libraries

Table 3.1  
Co-relation between I and B for Haryana State

HARYANA							
	B	I	$B - \bar{B} = a$	$I - \bar{I} = b$	$a^2$	$b^2$	$ab$
B S Ananguria Inst. Of M & T	83	57	83-87	57-48	16	81	-36
			-4	9			
B							
YMCA Inst. Of Engineering.	84	46	84-87	46-48	9	4	6
			-3	-2			
Al Falah Inst. Of Tech.	82	38	82-87	38-48	25	100	50
			-5	-10			
NIF Management	100	52	100-87	52-48	169	16	52



			13	4	219	201	0
	349	193					
	349/4=87	193/4					
$\bar{B}$ =Average of Column B	87	--					
$\bar{I}$ = Average of Column I	--	48					

Calculations

$$r = \frac{\sum ab}{\sum(\sqrt{a^2}) \times \sum(\sqrt{b^2})}$$

$$= \frac{72}{\sqrt{219} \times \sqrt{201}} = \frac{72}{14.7 \times 14.1}$$

$$= 0.34$$

Haryana

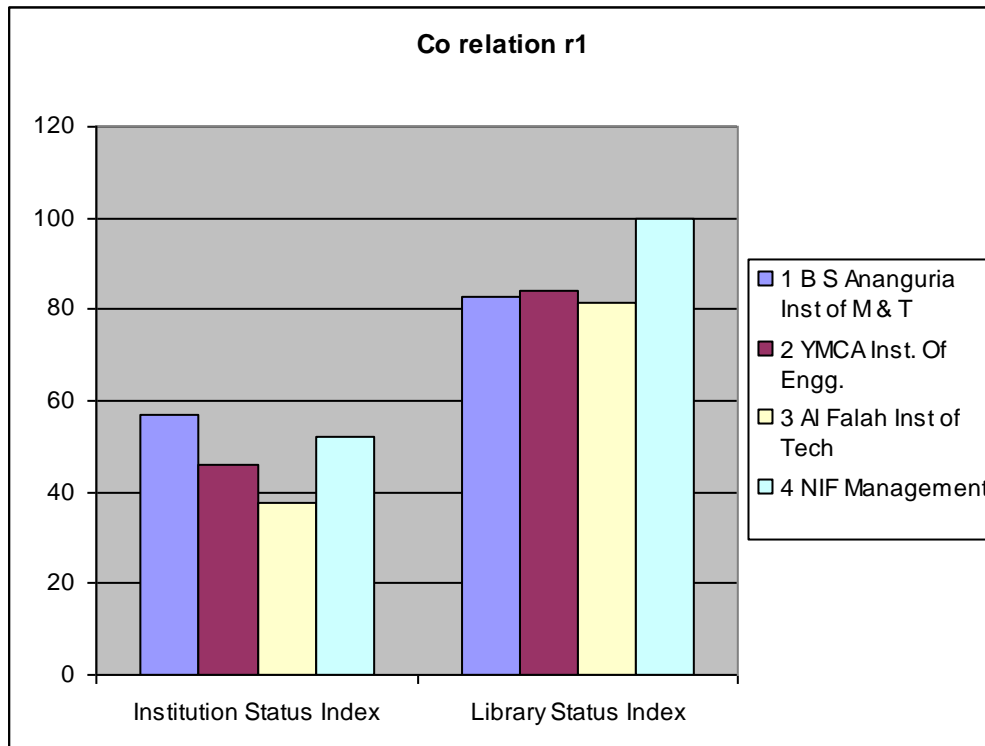


Fig. 3.1

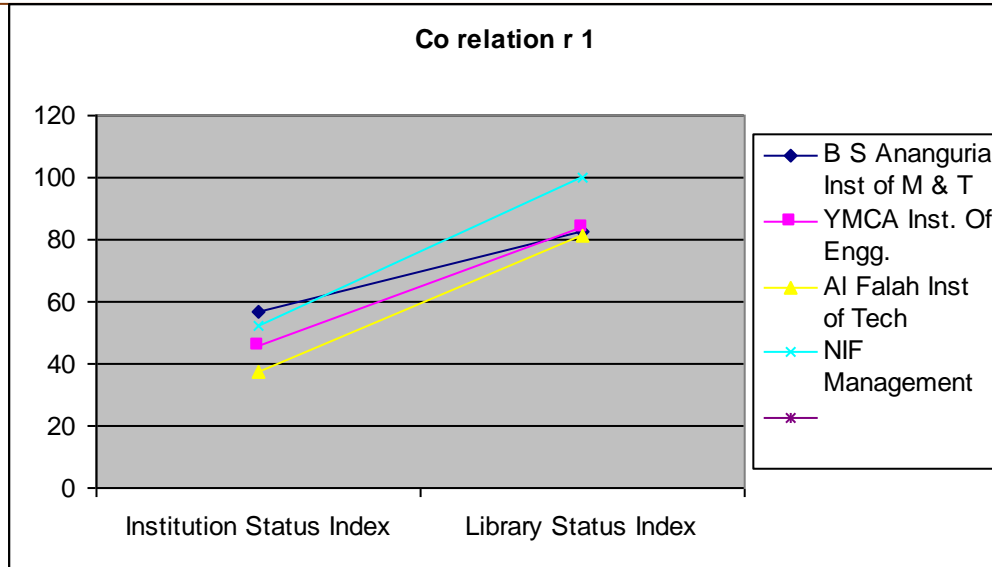


Fig. 3.1.1

Table 3.2

Correlation between I and B for U P State

UP	B	I	$B - \bar{B} = a$	$I - \bar{I} = b$	$a^2$	$b^2$	$Ab$
J S S Academy	82	53	$82-83 = -1$	$53-48 = 5$	1	25	-5
Jaipuria Institute of Technology	84	40	$84-83 = 1$	$40-48 = -8$	1	64	-8
I M T	85	49	$85-83 = 2$	$49-48 = 1$	4	1	2
A K Garg Engg. College	82	49	$82-83 = -1$	$49-48 = 1$	1	1	-1
				Total	7	91	-12
	349	193					
	$333/4$	$191/4$					



$\bar{B}$ = Average of Column B = 83	83	--					
$\bar{I}$ = Average of Column I = 48	--	48					

Calculations

$$r = \frac{\sum ab}{\sum(\sqrt{a^2}) \times \sum(\sqrt{b^2})}$$

$$= \frac{-12}{\sqrt{7} \times \sqrt{91}} = \frac{-12}{2.6 \times 9.5}$$

$$= -0.48$$

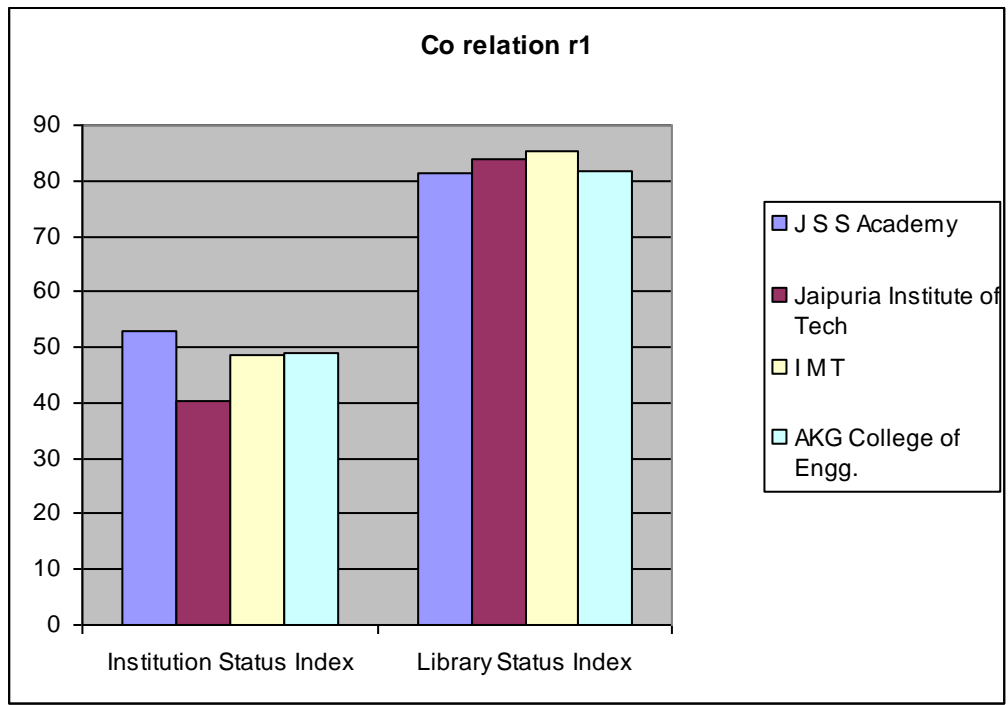


Fig. 3.2

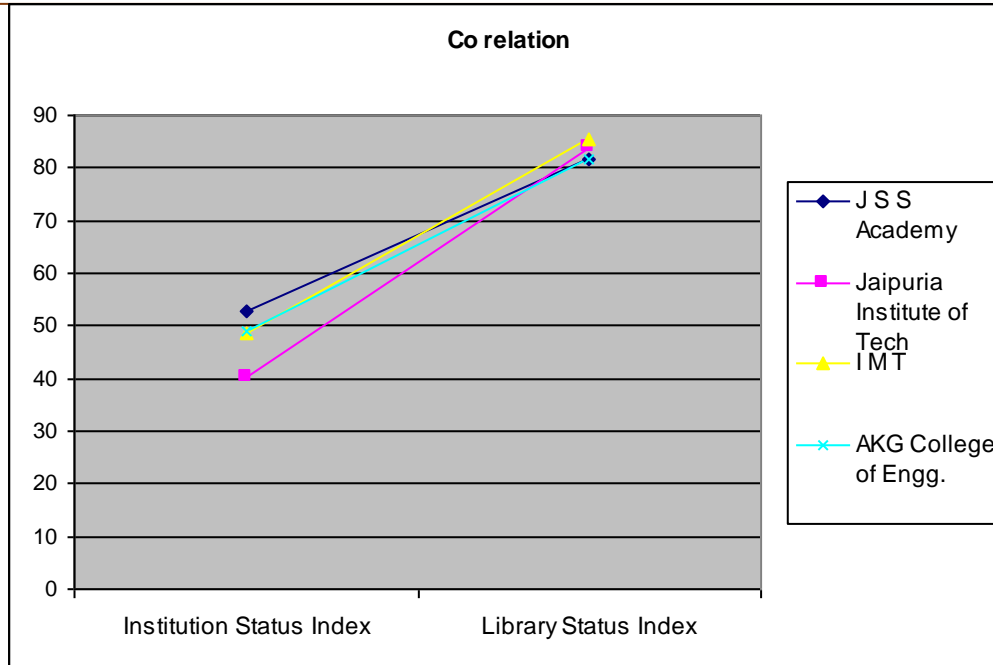


Fig. 3.2.1

Table 3.3  
Correlation between I and B for Delhi State

Delhi	B	I	$B - \bar{B} = a$	$I - \bar{I} = b$	$a^2$	$b^2$	Ab
Institute of Hotel Management	81	45	$81 - 86 = -5$	$45 - 51 = -6$	25	36	30
Delhi College of Engg.	87	61	$87 - 86 = 1$	$61 - 51 = 10$	1	100	10
Apayjee Inst. Of Management & I T	82	60	$82 - 86 = -4$	$60 - 51 = 9$	16	81	-36
IILM, Lodi Road	85	48	$85 - 86 = -1$	$48 - 51 = -3$	1	9	3
TERI	97	43	$97 - 86 = 11$	$43 - 51 = -8$	121	64	-88
				Total	164	290	-81
	432	257					



	432/5	257/5					
$\bar{B}$ = Average of Column B = 86	86	--					
$\bar{I}$ = Average of Column I = 51	--	51					

Calculations

$$r = \frac{\sum ab}{\sum(\sqrt{a^2}) \times \sum(\sqrt{b^2})}$$

$$= \frac{-81}{\sqrt{164} \times \sqrt{290}} = \frac{-12}{12.8 \times 17}$$

r = 0.37

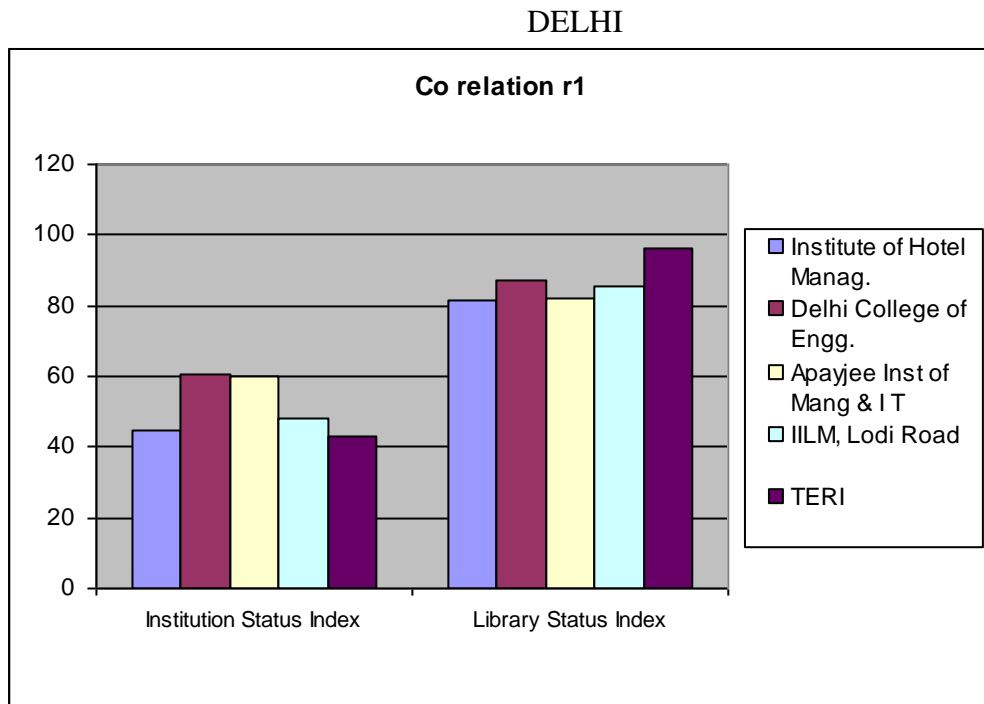


Fig. 3.3

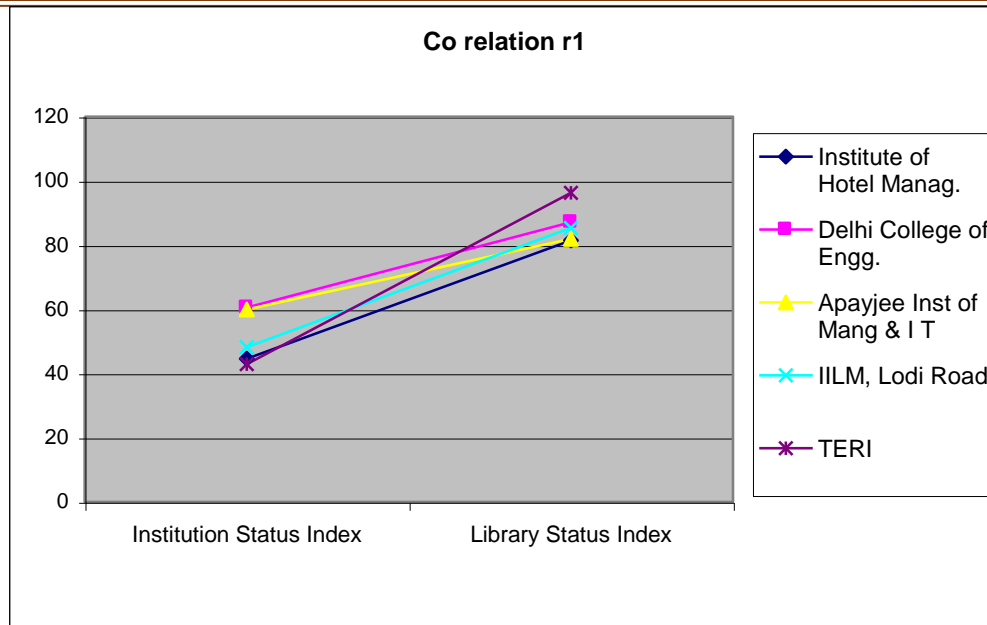


Fig. 3.3.1

## 6 Analysis

### 6.1 Technical Institutions

An index has been developed to gauge the quality of institutions and their libraries. Three regions namely Haryana, Delhi and U.P. were selected and an index was developed for study of the impact of information technology on technical library system. Institutions were graded on a 100 point scale and an index I was defined which indicates the standard or Status of a particular institution. The grading was done as mentioned in section 4.1, 'The Profile of Institutions'.

For the state of Haryana, it was found that the values of index I varied over a small range. The average value for this state was 48 points and the technical institutions were in a range of + 10 from this average value. As far as U P is concerned, the range was narrower. The average value of index I was again 48 but the variation was only +8. In Delhi state the values tended to be slightly higher. The average of this region was 51 and the maximum variations form this average was 10.





---

It was found that the technical institutions tended to be at about the same level (of about 50 on a 100 point scale). Therefore, the institutions need to make planned efforts to improve their status.

## **6.2 Libraries**

Libraries associated with technical institutions were also graded on a 100 point scale. An index B was defined as described in section 2, 'Profile of Libraries'

In the state of U.P, the average value of the index B was found to be 83. The variation was minor (+2). This indicates that library quality is encouraging and its benefits need to be more widely available.

In the state of Delhi the values of index B characterizing the status of a library were found to be higher. The average of the region was 88 with a variation of 12 point on either side. The situation is similar to that obtaining in U.P. but somewhat better. In Haryana, the average value of the index B was found to be 84 with a maximum variation of 16 points from this average. The overall library status in the three regions seems to be at satisfactory level, which is by and large uniform.

## **7 Conclusion**

There is a need to grade the various regions in India to gauge the spread of technical education in them. An attempt has been made in this direction in the present paper. Such evaluation provides valuable input for planning which may ensure wider reach of technical education. Similarly the institutions and the libraries associated with them can be graded. This also has been done in this paper for typical institutions representing three states. The methodology adopted, however, may be applied to any state and may also serve to compare the various libraries, institutions and regions with one another.



## References

Grading of Industrial Training Institutes (ITIs) Framework and methodology: Directorate General of Training Ministry of Skill Development and Entrepreneurship Government of India. <http://gitigknl.com/resources/70-17.pdf>

[https://www.google.com/search?source=hp&ei=oOVGW7D0PISR9QPuo6jICg&q=formula+of+correlation+coefficient+between+x+and+y&oq=formula+of+co+relation&gs\\_l=p sy-](https://www.google.com/search?source=hp&ei=oOVGW7D0PISR9QPuo6jICg&q=formula+of+correlation+coefficient+between+x+and+y&oq=formula+of+co+relation&gs_l=p sy-)

ICRA Grading of Engineering Colleges/ Universities. [www.icra.in](http://www.icra.in)

Lancaster, P.W. (1977) *The measurement and evaluation of library services*. Washington, DC: Information Resources Press

Orr, R.H. (1973) 'Measuring the goodness of library services: a general framework for considering quantitative measurements'. *Journal of Documentation*. 23, 315-332

Windsor, P. L. (1917) Standardization of libraries and certification of librarians. *Bulletin of the American Library Association*, Vol. 11, No. 4, Papers and proceedings of the thirty-ninth annual meeting of the American library association (July 1917), pp. 135-140