A Tracer Study of the Graduate, Post-Graduate and Doctorate Alumni of Indian Institute of Technology, Kharagpur - A Report on the Placement, Nature of Work and their Impact on Society and Economy

Final Draft

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Chapter 1

Introduction

The Indian Institute of Technology, Kharagpur established in 1952 is the premier of all IIT's. In its four decades of existence it has roled into eminence and has been recognised as a centre of excellence in the fields of science and technolgy education - the world over. IIT Kharagpur has played a pivotal role in India's tryst with technology and its students have provided leadership in setting the course of this development. From a moderate start in the dilapidated Hijli building, IIT Kharagpur has been engaged in virtually a continuous process of advancement and change. For Pandit Nehru it has been a dream come true because in his first convocation address he said

> Here in the place of that Hijli Detention Camp stands this true monument of India's future in the making. This picture seems to me symbolic of changes that are coming to India.

Over the years, the IIT Kharagpur has developed 18 departments undertaking undergraduate and post-graduate teaching and research, as well as 6 centres concentrating on research in interdisciplinary and emerging areas, sponsored research and post-graduate teaching. The oldest of the IIT's also now happens to be the largest in terms of number of departments and centres. A faculty of about 500 and a supporting staff of about 2200 provide the academic and administrative base for the institute.

It was envisaged that IITs should lay more or less equal emphasis on undergraduate and post-graduate education and that the number of graduates should roughly equal the number of post-graduates. The Institute's present population of 2800 consists of equal number of undergraduate and post-graduates. Annually about 435 are admitted to undergraduate courses, 430 to post-graduate courses and 80 to the Ph.D. programme. On an average the IIT Kharagpur awards degrees annually to 850 students of which 460 obtain B. Tech., B.

Arch., and M.Sc. degrees, 372 M.Tech., MCP / M.Arch. degrees, and approximately 40 Ph.D. degree.

The B. Tech. and M.Tech. programmes of IIT Kharagpur are extra-ordinary in terms in both diversity in the areas of specialization, as well as the number of out turns. The IIT Kharagpur offers largest number of fields of specialization at the undergraduate and post-graduate levels: 17 for B.Tech., 1 for B.Arch., 5 for M.Sc., as many as 53 for M.Tech. and 26 for Ph.D.

IIT Kharagpur has turned out between 1955 and 1984, 8239 graduates - the largest among all IITs. Its contribution in the out-turn of post-graduates during 1977 - 1983, was 1773, the highest among all IITs. The IIT Kharagpur produced 641 doctorates in Engineering and Science during 1974-84. It has been estimated that five IIT's together produced 48% of doctorates in Engineering and Technology in India during 1978-81.

The institute is an autonomous body and is financed by the Government of India the amount being to the tune of Rs. 20 crores per annum currently. Every student here receives an education that currently costs the exchequer about Rs. 47,000/- (undergraduate) and Rs. 54,000/- (post graduate) per year. Over the years the number of IIT alumni has grown up to 23,000 and they are playing a significant role in spearheading India's mission.

However, in the background of the present economic and sociopolitical scenario it has become absolutely necessary to take a stock of the situation. Accountability has become the buzz word in a very sphere of actuity in today's life and IIT Kgp cannot shirk its responsibilities in this regard. It has to justify the necessity and purpose of each rupee being spent in development and in the development of technical and scientific manpower or whether the money amounting to Rs. 20 crores spent by the state exchequer is worth. The IIT's motto is set-up with the distinct purpose of providing the country - the essential requirements of its economic recognition - a new breed of engineers with a high level of competence, who can overcome all obstacles in finding a new way for Indias passage from poverty to prosperity from dependence to self-sufficiency.

The present study attempts to make an assessment regarding the fruitfulness of the states expenditure i.e., a study of the inherent cost-benefit analysis, which definitely constitutes an important component of the evaluation process.

With these ends in view the objectives of the study have been framed.

1.1 Objectives in detail

The proposed study will have four specific objectives as detailed below:

- To obtain and analyse data relating to the careers of the graduate, post-graduate and doctorate alumni of the IIT Kharagpur.

- To ascertain the extent and nature of migration to other countries by the alumni of the IIT Kharagpur.

- To have a feedback from alumni on the curricula they had gone through at IIT Kharagpur and determine the need for any review of the same.

- To find out the details of the nature and extent of impact of alumni of the IIT Kharagpur on the national economy in the given period.

1.2 Plan of action

The study will be based on data obtained mainly through responses of the Alumni of IIT Kharagpur to a common questionnaire, from Annual Reports of IIT Kharagpur and reports on similar studies completed in India and abroad.

1.2.1 Methodology

The methodology for implementation of the project consists of nine steps. They are as follows :

Step 1 Collection of names and home addresses of the alumni

Step 2 Computerisation of the same.

Step 3 Sending envelopes to home addresses to get the present contact addresses.

Step 4 Updating of the address list after getting the current contact addresses

Step 5 Preparation of the questionnaire.

Step 6 Mailing of questionnaire to the alumni whose current addresses have been obtained.

Step 7 Creating a data base system

Step 8 Developing the model for impact analysis.

Step 9 Data entry and structuring of information

Step 10 Analysis of the information obtained through the questionnaire

Step 11 Preparation of the draft report.

In Step 1, the students section, the Halls of Residence, the Departments and different Alumni Associatios have been contacted and requested to prepare a detailed list of the

names and addresses of alumni for the period 1974-83. A more or less exhaustic list of names and addresses have been acquired. This took about 2 months time.

Step 2 was initiated as soon as we got the first lot of addresses. The names and addresses had been serialised with appropriate codes and entered in the computer. The entire process of computerisation, printing, correcting and taking final prints were completed so as to start Step 3.

Based on these final prints Step 3 was carried out. As the present whereabouts of alumni, specially those who have passed out 15 or more years back are totally unknown, envelopes containing a letter (see Annexure 1) and a self-addresses postcard have been sent to the permanent addresses to get the current addresses of alumni. Rate of response for the earlier years, however, is not that encouraging, but for the later years the picture seems to have improved.

Step 4 consisting of updation of addresses were carried out the moment we received the current contact addresses of the alumni.

Step 5 A questionnaire was prepared for the collection of data. It was structured so as to include questions on personal information, academic career and training, job-profile, current work, feed back on academic programme of the IIT Kharagpur, background information and those relating to the Gross Domestic Product of the Public and Private Sector enterprise employing the alumni or of new enterprise started by them.

Step 6 The questionnaire was then mailed to the alumni whose current addresses have been obtained.

Step 7 A data-base system was developed to store the data in a structured form and to make it analysis friendly.

Step 8 The model for impact analysis was developed considering various types of impact and based on the Group Statistical Analysis and determining correlation and regression coefficients.

Step 9 Validation of the data obtained through questionnaires. The information gathered from the questionnaire after show discrepancies because of hte lacuna in understanding some questions on the part of hte alumnies.

Step 10 The information obtained through the questionnaire was fed in the computer for analysis.

Step 11 Preparation of the draft report.

1.3 The Questionnaire

The questionnaire has been structured to trap the three most vital issues like (a) placement and nature of work of the Graduate, Post Graduate and Doctorate Alumni (b) impact of IIT alumni on the economy and society and (c) relevance of the IIT curriculum to the job.

It has six distinct sections, which are

(A) Personal Information

(B) Educational Information

(C) Professional Information which deals with the nature of job, placement features etc. Further this section is subdivided in a number of subsections. The versatile professional career of the IIT alumni has directed the need for such a classified information collection scheme. Questions have been designed appropriately to suit the alumni who are

* in the Industry
* in the Research Institute
* in the Government Administration
* Self employed
* Consultant / Architechts
* Others

There are open ended as well as close ended questions. Attempts have been made to make questions more close ended so as to make it more objective. However open ended questions were deliberately included to have a subjective assessment of certain pertinent issues like relevance of curriculum to the job and like.

The questionnaire would take about half an hour of concentrated effort. The questions have been made as lucid as possible so as to make it universally acceptable and easily answerable.

The questionnaire has been enclosed in Annexure 2.

1.4 Target population and sample size to be covered

The total number of alumni to be approached with a questionnaire is estimated to be 6280 which includes about 2855 graduate, 2785 post-graduate and 640 doctorate cutturns of the IIT Kharagpur for the period from 1974 to 1984.

1.5 Reference period of the data to be covered in the study

The time frame of the study encompoases the Fifth and Sixth Five Year Plan periods. The two plan periods were chosen as they witnessed a rapid expansion of Public and Private Sectior enterprises, on account of priority given to higher productivity by the Industrial Policy Statement of 1973. There is a special reason to select 1984 to end the study. This will allow the most recent alumni to be covered in this survey not only to settle down in their career but also to come upto middle management positions. There views and comments are expected to be constructive and useful.

The study will render atleast three benefits which are important from soacio-economic point of view.

First, the survey of the views of the alumni on the usefulness of the curricula of the IIT Kharagpur will indicate if the curricula had distanced themselves from the requirements of the industries. Such a finding will help the IIT Kharagpur to re-orient its curricula, if necessary, to make them more relevant. Such an adjustment will be economically important in view of the large financial investment involved in the IIT education, in the past and future.

Second, the study will establish beyond doubts the actual extent of migration of the alumni of the IIT Kharagpur to other countries in the period studied. Such a finding will be beneficial to all concerned with technical education. The question of any corrective measure will be desirable and will have a great social significance.

Third, the study will clearly assess the impact made by the alumni of the IIT Kharagpur on the economic development of the country in a period which witnessed rapid expansion in the public and private sector industries.

Chapter 2

The Target Alumni

2.1 The universal set versus the sample set

The alumni output during the period 1974-1983 was of the order of 5947. The yearwise breakup of B.Tech, M.Tech, MCP, MRP, M.Sc & Ph.D alumni has been given in Table 2.1 .

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Convocation	20	21	22	23	24	25	26	27	28	29
B.Tech, B. Arch	279	283	234	257	231	319	285	306	282	217
M.Tech, M. Arch, M.C.P.,M.R.P.	137	164	191	215	203	228	184	196	243	287
M.Sc.	68	60	72	69	54	53	63	56	68	56
Ph.D.	56	50	52	44	58	51	60	67	80	68
D.Sc.	0	0	0	0	0	1	0	0	0	0
Total	540	557	549	585	546	652	592	625	673	628

Total alumni output = 5947

Table 2.1: Alumni output of I.I.T. Kharagpur for the years 1974 to 1983 (10 Years)

Though the outturn was nearly six thousand, all relevant sources could provide home addresses for 4450 alumni. The students section provided the maximum but some were missing. The missing ones had been filled up to some extent through contacting other students of the same batch and through consulting alumni chapters.

Letters had been sent to 4450 alumni for their current contact addresses out of which 1860 responded. Of 1860 respondents 350 were abroad. Response rate was not hopeless as

	Year										
Category	74	75	76	77	78	79	80	81	82	83	Total
B.Tech	28	28	19	16	23	35	25	27	31	17	249
M.Tech	22	15	29	17	37	46	35	31	27	36	295
Ph.D	9	8	10	6	11	7	10	16	15	11	103
Total	59	51	58	39	71	88	70	74	73	64	647

Table 2.2: Year-wise distribution of B.Tech, M.Tech and Ph.D Alumni as obtained from Replies

it meant around 40% of the universal set.

All the 1860 alumni were further contacted through questionnaires. At this stage however response was not encouraging. 647 alumni had returned the filled in questionnaire. Repeated reminders did not lead to any improvement in the response level. The 647 alumni constituted of 249 B.Tech, 295 Masters and 103 Ph.Ds. The year wise breakup of replies received have been provided in Tables 2.2 for B.Tech, Masters and Ph.D. alumni. Fig 2.1 also presents this feature.

2.2 The Overall Scenario

The entire study at this stage has been based on the 647 samples received out of which B.Techs constitute 38.5% while M.Techs and Ph.D's consist of 45.5% and 16% respectively.

The departmentwise breakup of the target alumni has been presented in Table 2.3.

The regional profile of the alumni indicate that there is definitely a bias for selecting IIT KGP by the students of Eastern India which might be due to the locational advantage. The alumni of Eastern India including North-Eastern states constitute the bulk of the students which is nearly 59.05 % followed by the states of southern India which constitutes 21.75% whereas for both the Northern and Western states it is less than 10%. Further out of the states of Eastern India West Bengal provides the highest share.

The age structure is more or less uniform for the B.Tech gradutaes and it falls in the range of 22-24 yrs with a few exceptions. While the age of obtaining degree varies for M.Tech alumni drastically depending on the nature of the alumni - fresh passout or sponsored Table 2.4 shows the pattern of age deviations for the M.Tech alumni.

The nature of shift from IIT to other institutions and vice versa is another important

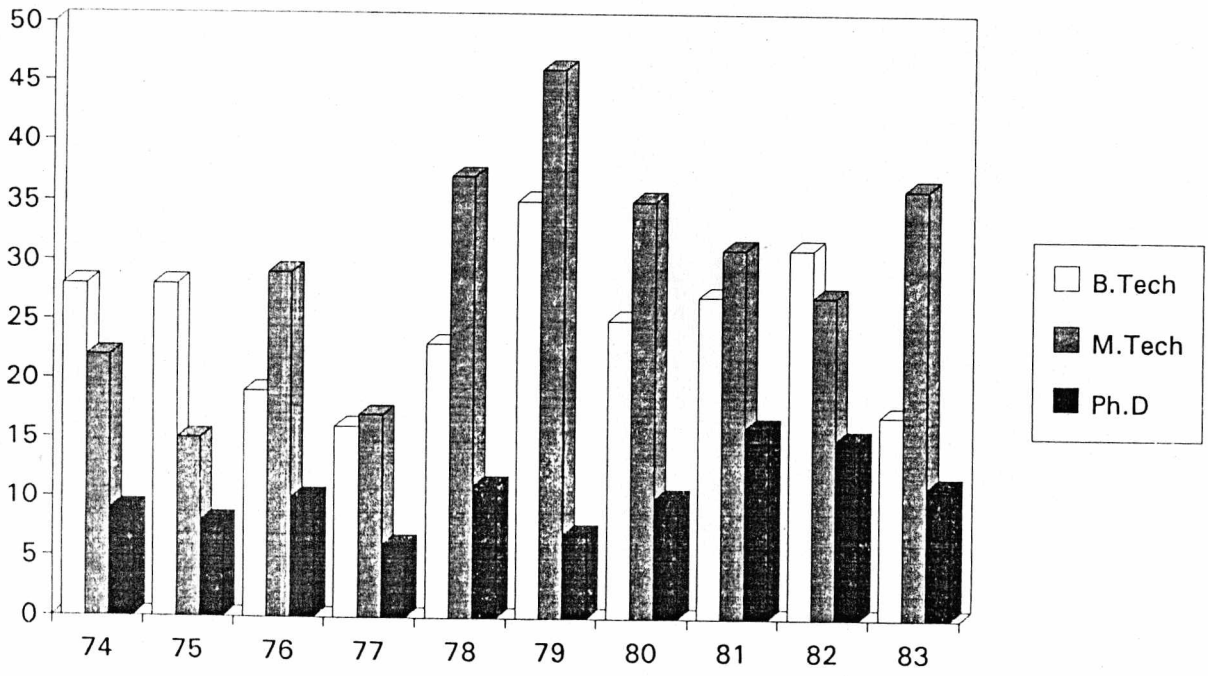

Figure 2.1: Year-wise distribution of B.Tech, M.Tech and Ph.D Alumni as obtained from Replies

Code	Department	Count
11	Aerospace Engineering	11
12	Agricultural Engineering	73
13	Architecture & Regional Planning	40
14	Chemical Engineering	38
15	Chemistry	30
16	Civil Engineering	53
17	Computer Science & Engineering	8
18	Electrical Engineering	43
19	Electronics & Electrical Communication Engineering	50
22	Geology & Geophysics	40
25	Mathematics	14
26	Mechanical Engineering	78
27	Metallurgical Engineering	32
28	Mining Engineering	11
29	Naval Architecture	22
30	Physics	19
50	Rubber Technology	3
51	Industrial Engineering & Management	4
52	Material Science	32

Table 2.3: Distribution of alumni based on department

	Year		
Age	74-77	78-81	82-83
< 25	141	199	81
25-29	43	57	31
30-34	12	25	9
35-39	9	16	13
≥ 40	0	6	3

Table 2.4: Age Structure of M.Tech Alumni

feature to be noted. Though students completing B.Tech accounts for nearly 70% of the students comprising our target alumni there are yearwise variations. While students from other institutions in IIT joining M.Tech courses in IIT were only 20% of the total M.Tech outturn in 1974 it increased to 33.33% in 1978 and 36% in 1981. In 1983 the percentage of students joining IIT from other institutes was more than that of the students of IIT joining M.Tech in IIT. The students of the former class accounted for 56% of the total M.Tech passouts.

2.3 The Professional Scene

Students passing out from IIT KGP are basically in the four sectors - Government, Public sector, Private Sector and Others - of which Private Sector has been the first choice from the very beginning for the IIT B.Techs. More than 50% of the B.Techs join the private sector followed by public sector where the percentages of the order of 20%. This is mainly because of the high salary level in private firms as compared to the public sector industries which attracts B.Techs and the level of confidence that the B.Tech alumni have in securing an alternative job. On the other hand, the non-B.Techs have an inclination for public sector jobs. As revealed from data more than 60% opt for government or public sector jobs while their representation in the private sector is around 20%. The 'others' category which included enterpreneurs, other self employed professionals is around 15-20% for both IIT B.Techs and IIT M.Tech & Ph.D alumni.

Table 2.5 portrays this feature

The yearwise breakup of B.Tech and Non-B.tech alumni in the different types of organisation are presented in Tables 2.6 and 2.7. Fig 2.2 and 2.3 gives a visual representation.

While they are in four types of organization their professional status and nature of job vary widely. IIT alumni serve as Practising Engineers, Research Scientists, Executives / Managers, Industrialist / Enterpreneur, Academic Researcher / Teacher, consultant / Architect and their nature of job varies accfording to their professional status. There are again differences in domination of alumni in professional status categories based on the level of education. While both B.Techs and Non-B.Techs are mostly in the executive class, B.Tech alumni also serve as engineers in a substantial number. M.Tech and Ph.D's on the other hand feature significantly as Teachers and Research Scientists. The fact is that people in the industry seldom go for higher academic degrees rather they go for relevant trainings and professional degrees. Even though they undertake the masters programme almost none of them go for a doctorate.

Type of Organisation	B.Tech	Non-B.Tech
a	36%	63%
b	51%	20%
c	13%	17%

a Government & Public Sector
b Private Sector
c Others(self employed etc)

Table 2.5: Representation of B.Tech & Non-B.Tech Alumni in different types of organisation

Year	Type of Organisation		
	a	b	c
74	10	12	3
75	6	12	1
76	7	8	1
77	5	6	0
78	8	9	1
79	10	13	4
80	8	8	3
81	10	5	2
82	11	8	6
83	4	5	1

a Government & Public Sector
b Private Sector
c Others (self employed etc)

Table 2.6: Yearwise Breakup of B.Tech Alumni in Different Types of Organisation

Year	Type of Organisation		
	a	b	c
74	21	4	5
75	10	5	5
76	23	6	7
77	17	2	4
78	31	7	5
79	29	13	5
80	29	8	7
81	29	7	8
82	23	6	9
83	25	9	5

a Government & Public Sector
b Private Sector
c Others (self employed etc)

Table 2.7: Yearwise Breakup of Non B.Tech Alumni in Different Types of Organisation

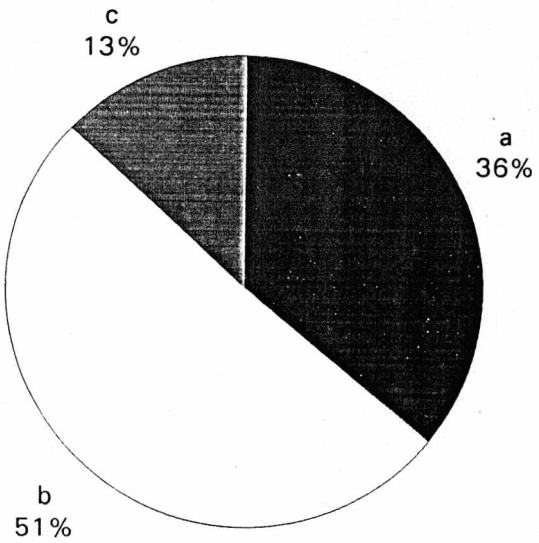

Figure 2.2: Representation of B.Tech Alumni in different types of organisation

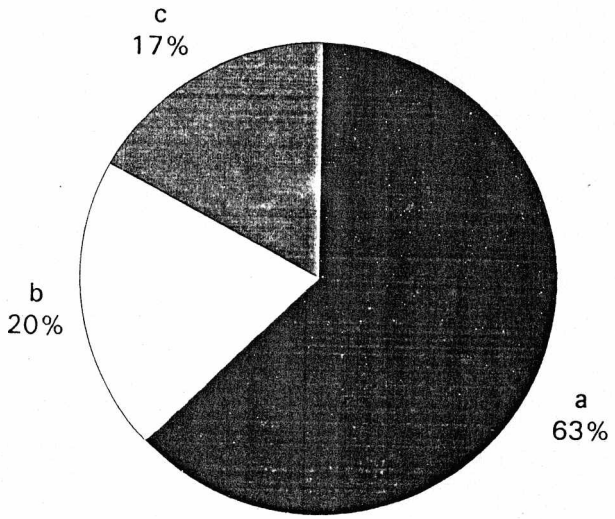

Figure 2.3: Representation of Non-B.Tech Alumni in different types of organisation

Again alumni having an inclindation for joining teaching or research jobs definitely obtain the M.Tech and Ph.D. degrees as it is often a prerequisite for their professional flourish. Table 2.8 and Figures 2.4 and 2.5 portrays this feature and Tables 2.9 and 2.10 provide the yearwise distribution of B.Techs and Non-B.Techs in different professional categories.

Category	Professional Status						
	a	b	c	d	e	f	g
B.Tech	19.3%	7.0%	47%	8.5%	5.8%	4.8%	7.6%
Non-B.Tech	7.1%	23.9%	30.8%	2.2%	27.8%	0.8%	7.2%

a Practising Engineer
b Research Scientist/Engineer
c Executive/Manager
d Industrialist/Enterpreneur
e Academic Researcher/Teacher
f Consultant (Self employed)
g Others

Table 2.8: Breakup of B.Tech & Non-B.Tech Alumni in different catagories of Professional Status

The batchwise average income have been computed for the alumni. This was a tremendously difficult task as income vary substantially between type of organisation, the nature of organisation, the scale of organisation etc. However grouping has been done quite scientifically and the median as well as the mean has been calculated to obtain the best result. Table 2.11 provides the decadal average income figures. Fig 2.6 shows the pattern of change The income pattern shows that though the period of study spans 10 years there is not a significant difference in their current income for the alumni of different batches. This is mainly because management prefers fresh professionals at higher pay scales rather than hiking of the responsibility and salary of the middle professional cadre. Disaggregated income figures for varying professional status and type of organisation show that executives and managers are the best paid professionals followed by practising engineers. On the other hand private sectors pay manifold higher than public sector industries or public sector undertakings.

An interesting aspect could be mentioned at this stage. IIT KGP Graduates also feature

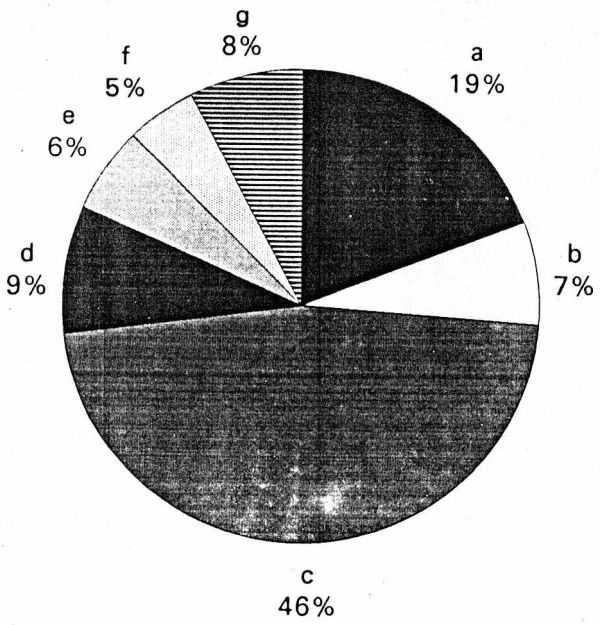

Figure 2.4: Breakup of B.Tech Alumni in different catagories of Professional Status

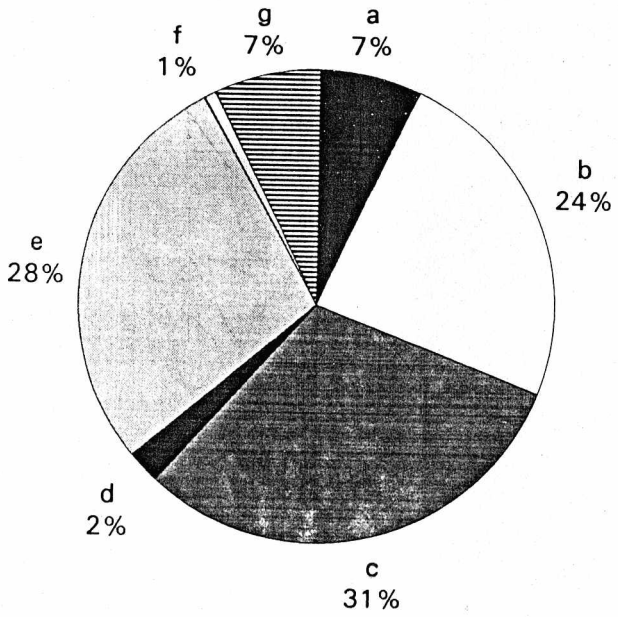

Figure 2.5: Breakup of Non-B.Tech Alumni in different catagories of Professional Status

Year	Professional Status						
	a	b	c	d	e	f	g
74	5	3	8	6	1	2	3
75	6	2	13	1	2	2	2
76	7	0	5	2	1	2	2
77	4	2	8	1	0	1	0
78	5	6	9	2	1	0	0
79	2	3	17	1	4	5	3
80	6	1	7	1	4	2	4
81	6	4	12	1	3	0	1
82	3	0	17	4	5	1	1
83	3	2	7	0	1	1	1

a Practising Engineer
b Research Scientist/Engineer
c Executive/Manager
d Industrialist/Enterpreneur
e Academic Researcher/Teacher
f Consultant (Self employed)
g Others

Table 2.9: Yearwise breakup of B.Tech Alumni in different professional status

Year	Professional Status						
	a	b	c	d	e	f	g
74	2	10	10	0	7	1	1
75	3	3	5	1	8	1	2
76	3	11	10	0	10	0	5
77	1	8	4	2	8	8	0
78	5	15	14	1	11	0	2
79	7	9	16	3	13	0	4
80	2	11	15	0	13	0	4
81	4	8	13	1	16	0	5
82	7	5	15	1	10	0	4
83	5	13	14	1	13	1	0

a Practising Engineer
b Research Scientist/Engineer
c Executive/Manager
d Industrialist/Enterpreneur
e Academic Researcher/Teacher
f Consultant (Self employed)
g Others

Table 2.10: Yearwise breakup of Non-B.Tech Alumni in different professional status

Year	Average income	Count
74	138941.18	17
75	129937.50	16
76	117461.54	13
77	112800.00	10
78	104968.75	16
79	117947.83	23
80	112895.53	17
81	112750.00	16
82	99130.43	23
83	93800.00	10

Table 2.11: Year-wise average income

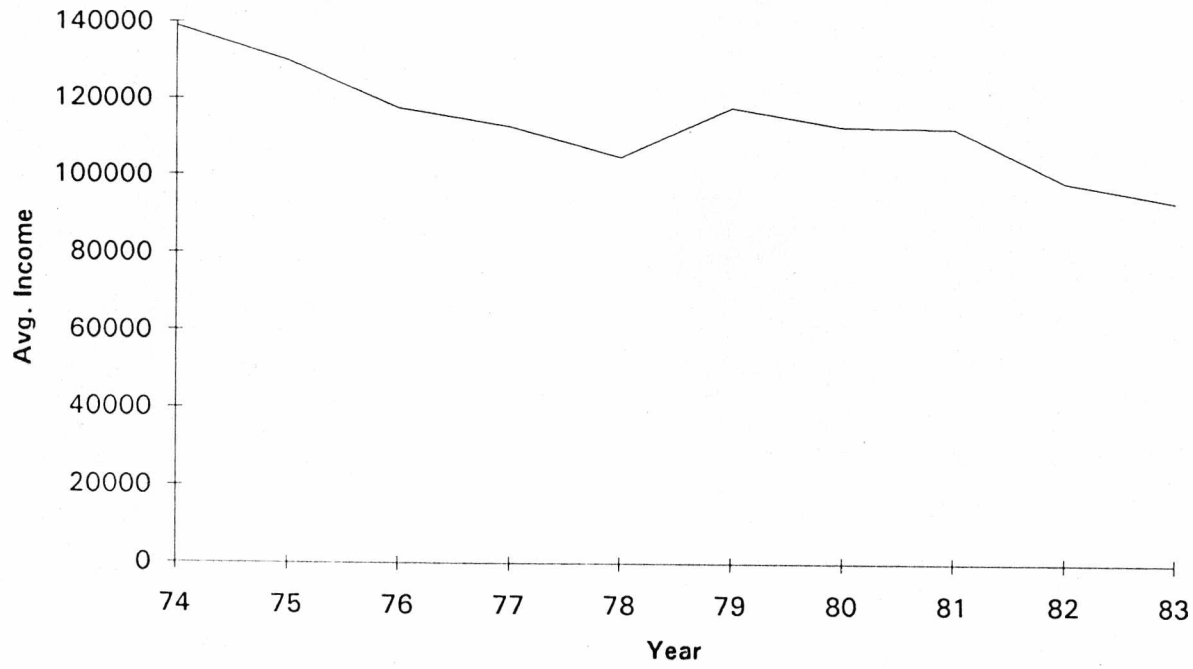

Figure 2.6: Year-wise average income

ID	Profession
1/21/220	Social, Editor, Polit
1/25/294	Writer in Marathi
2/74/177	Publ. of Finance. Data
2/75/081	Religion Movement
2/80/055	Commissioning
2/80/234	Teachership
2/81/114	Consultancy in Dairy
2/81/139	Inspection of Boiler
3/75/161	Merchant Banking
3/79/068	Development Profess.
3/79/213	Managerial Assign.
3/80/025	Enhancing livelihood
3/81/249	Engineering Const.
3/82/225	Politician
3/83/159	Project Mgmnt. & Con.

Table 2.12: Diversities in profession of alumni

in different domains of the society's work force. They serve as politicians, religious leaders and various other off-beat professionials Table 2.12 provides the list of such professionals.

The diverse profession and job nature of the IIT alumni direct one to make an assesment of the extent of Relevance of IIT education to their current job and Relevance of other degrees to their job. The opinion of the alumni have been recorded and tabulated for B.Tech and Non-B.Tech alumni. Alumni count has been obtained for the set who feel relevance to be significant i.e. Relevance >5 on a 0-1 scale specific to the professional categories.

The greater the count the greater the number of alumni feel it to be relevant to their profession. In both the cases for B.Tech and Non-B.Tech alumni more number of Managers / executives feel it is relevant along with other degrees. B.Tech practising Engineers also have the same opinion. For other professional categories the level of relevance varies for B.Techs and Non-B.Tech. Tables 2.13 & 2.14 depicts this feature and Figs 2.7 and 2.8 substantiates this.

Category	Professional Status*						
	a	b	c	d	e	f	g
B.Tech	34	19	62	13	18	8	10
Non-B.Tech	22	72	74	7	93	3	13

* Refer code as given in Table 2.8

Table 2.13: Relevance of IIT degree to the current job - alumni count based on Professional Status

Category	Professional Status*						
	a	b	c	d	e	f	g
B.Tech	12	11	40	6	17	4	3
Non-B.Tech	9	45	45	5	73	3	11

* Refer code as given in Table 2.8

Table 2.14: Relevance of NON-IIT degree to the current job - alumni count based on Professional Status

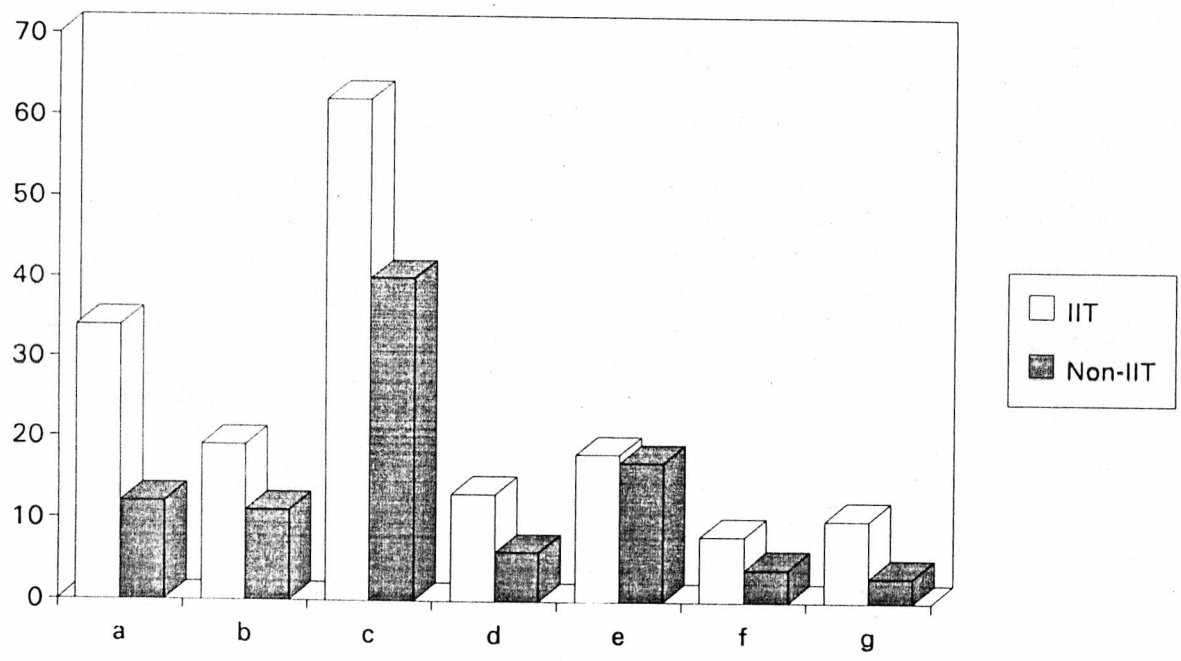

Figure 2.7: Relevance of IIT and NON-IIT degrees to the current job for B.Tech. - An alumni count based on Professional Status

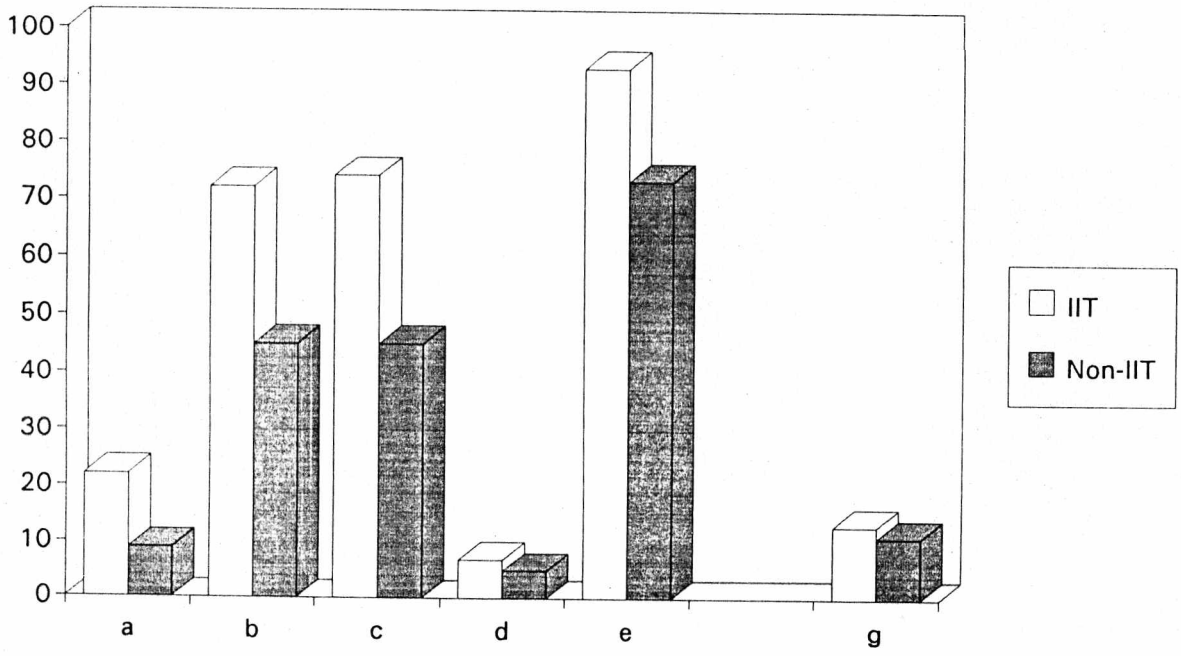

Figure 2.8: Relevance of IIT and NON-IIT degrees to the current job for Non-B.Tech. - An alumni count based on Professional Status

2.4 Brain Drain

Brain drain is one of the much talked about thing which is cited by the people who are allergic to the roaring success of the IIT while they have a reason to argue about the justification of money being spent by the Indian tax payers in training the students of IIT settled abroad for developing technologies whose benefit remain out of reach of the Indians. Without arguing much on this it is thus necessary to ascertain the extent of braindrain over the years, its nature and pattern. The quantum of brain drain or the percentage of alumni abroad has been tabulated yearwise for our sample set. Table 2.15 provides the percentage of brain drain considering the sample set. As evident it shot up in some discrete years with a peak in 1983. In 1983 it was 15.6% followed by 14.8% in 1981. 1977 also showed a significant extent of braindrain.

	Year									
	74	75	76	77	78	79	80	81	82	83
Count	3	5	1	4	5	6	4	11	2	10
%	5%	9%	1.7%	10.2%	7.0%	6.8%	5.7%	14.8%	2.7%	15.6%

Table 2.15: Brain Drain

Further the total number of alumni abroad in each year has been classified into B.Tech, M.Tech & Ph.D classes and has been provided in Table 2.16. Fig 2.9 also shows this.

This table however does not represent the motion of brain drain as short visits and in-job trainings have also been considered to earmark an alumnus as being abroad. Thus while M.Techs stand out under such considerations the fact may be that a significant number of them have been overseas for about a year or less on official assignments which does not reflect the extent of braindrain. To substantiate this feature, the stage of leaving and the objective of leaving the country has been obtained for the target alumni. Table 2.17 provides the stage specific count of the alumni left for abroad and Table 2.18 gives the objective of going abroad. As evident the maximum number of alumni in the period under study have been abroad for studies. The rest have gone on professional assignments or due to some other reason not specified. The alumni who have been abroad for studies have expressed their views on the standard of academics in their place of of study as compared to IIT KGP. Though a large number of the alumni have not clearly resonded to it, almost all of the respondents have mentioned that IIT standard was comparable or even better

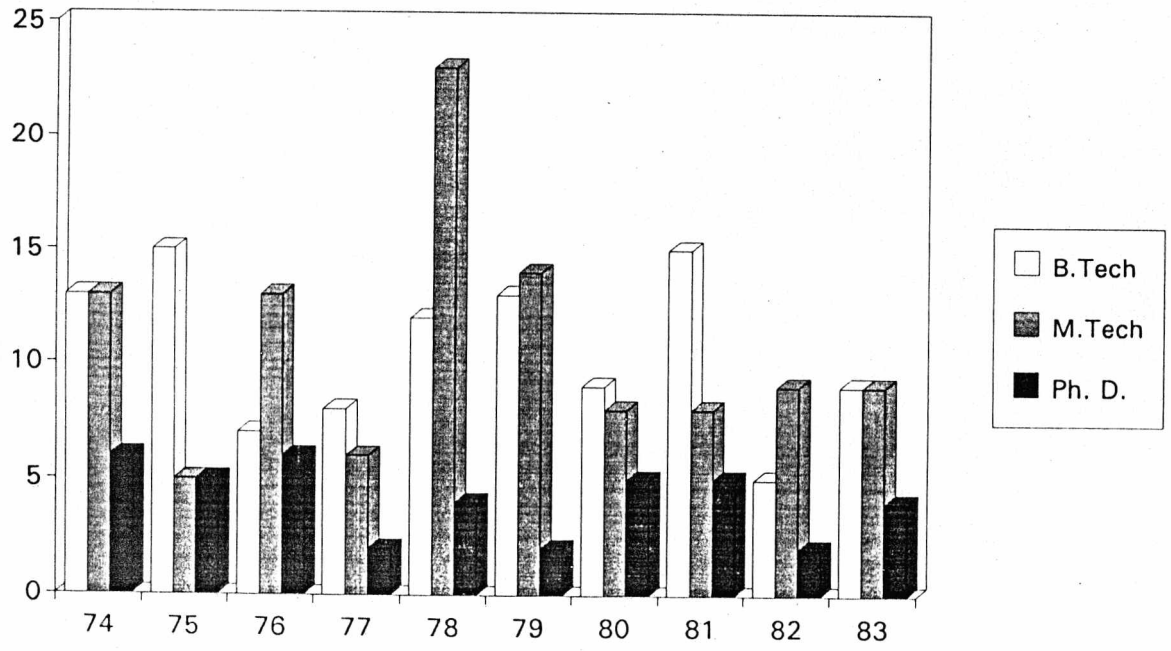

Figure 2.9: Yearwise break-up of B.Tech, M.Tech, Ph.D Alumni abroad

Batch	B.Tech	M.Tech	Ph.D
74	13	13	6
75	15	5	5
76	7	13	6
77	8	6	2
78	12	23	4
79	13	14	2
80	9	8	5
81	15	8	5
82	5	9	2
83	9	9	4

Table 2.16: Yearwise break-up of B.Tech, M.Tech, Ph.D Alumni abroad

than that in the universities abroad. Table 2.19 gives the actual number in terms of view expressed. The opinion could be to some extent driven by their sentimental attachments with IIT but it has been assumned they are critical enough to judge the positive and negative aspects of the quality of academics in both the cases.

Again views regarding IIT KGP's contribution in achievement relating to higher studies have been compiled. In this case however most of the alumni feel that IIT did not contribute directly to their achievement. It was their individual aspirations and effort that had led to their outcome. The number of alumni for and against this view has been tabulated in Table 2.20 .

Stage	Count
After B.Tech	44
After M.Tech	40
After Ph.D	30
While Serving	134
No Response	8

Table 2.17: Stage of leaving

As already mentioned all of the alumni who are being considered for the study on braindrain are not the residents of an overseas country. Many of them have returned after

Objective	Count
Studies	99
Training	74
Job	30
Business	19
Others	27
No Response	7

Table 2.18: Objective of leaving country

Standard	Count
Better than IIT/KGP	65
Comparable with IIT/KGP	54
Worse than IIT/KGP	2
No Response	135

Table 2.19: Comparative standard of academics of the place of study abroad with IIT

Answer	Count of Alumni
Yes	111 (43.4%)
No	145 (56.6%)

Table 2.20: Whether IIT Kharagpur has contributed in achievements relating to higher studies

being there for a short or a reasonably long duration. Table 2.21 shows the yearwise distribution of returned alumni.

Batch	B.Tech	M.Tech	Ph.D
74	9	8	5
75	8	4	5
76	4	9	7
77	4	6	1
78	8	16	3
79	8	12	2
80	4	7	3
81	6	5	4
82	2	8	2
83	3	6	2

Table 2.21: Yearwise break-up of alumni who have returned after being abroad

The study of the reasons put forward by the alumni for returning back indicate that a multiple factors have been responsible for this decision. While the sense of national pride has been the prime cause, factors like adequate availability of suitable job in India, family responsibility and cultural reasons have been crucial factors in driving them back home. The factors under the category 'others' include,

* start an enterprise in India,
* official bond,
* personal choice etc.

and a sizeable number of alumni fall under this class. Table 2.22 gives the count of alumni specific to their consideration regarding the reason behind their return.

However most of the alumni do not regret returning back and do not wish to go and settle abroad either. About 10-12% feel the otherway mostly because of the disatisfacction in their current job. Regarding their views on the change in orientaiton towards career after return about 50% tallied with it while the remaining 50% negated it. Tables 2.24, 2.25 & 2.23 provides the counts based on different views.

This table however does not represent the motion of brain drain as short visits and in-job trainings have also been considered to earmark an alumnus as being abroad. Thus while M.Techs stand out under such considerations the fact may be that a significant number of them have been overseas for about a year or less on official assignments which

Resons	Count
a	28
b	4
c	21
d	36
e	45
f	19
g	2
h	84

Table 2.22: Reasons for returning back to country - Alumni count based

Response	Count
Yes	83
No	89

Table 2.23: Whether there was change in orientation toward career after return from abroad

Response	Count
Yes	20
No	150

Table 2.24: Whether regrets returing to India

Response	Count
Yes	62
No	110

Table 2.25: Whether intends to go back

does not reflect the extent of braindrain. To substantiate this feature, the stage of leaving and the objective of For the alumni who have settled abroad, the decision for staying back was in most cases circumstantial. A lesser number of them had planned for it beforehand Table 2.26. This table however does not represent the motion of brain drain as short visits and in-job trainings have also been considered to earmark an alumnus as being abroad. Thus while M.Techs stand out under such considerations the fact may be that a significant number of them have been overseas for about a year or less on official assignments which does not reflect the extent of braindrain. To substantiate this feature, the stage of leaving and the objective of This is very natural, as after a certain period of stay people get attracted by the fast materialistic affluent nature of society, job satisfaction which drives them to take such a decision.The professional status of such alumni has been fabulated in Table 2.27. The alumni serve as research scientists, teachers or executives in general. However, almost all of them wish to come back to their country at some point of time (Table 2.28). This opinion is to some extent driven by cultural factors, national pride, family responsibilities etc. However certainty of such decisions are to be tested against time.

Response	Count
Planned	16
Circumstantial	30
No Response	5

Table 2.26: Whether decisions regarding settling abroad was planned or circumstantial

2.5 The Socio-cultural Features

2.5.1 Background Information

The alumni belong to different regions, different economic classes and have different family background. A study of the background profile reveals certain very interesting facts. The parental income, parental educaition and profession give a clue to the socio-economic standing of the alumnies Parental education for the B.Tech and Non B.Techs have been provided in Table 2.29 and 2.30. As natural, fathers are mostly either graduates or postgradutes for the B.Techs while educational qualification of a large section of mothers fall

Professional Status	Count
a	9
b	10
c	14
d	1
e	12
f	1
g	2

* Refer code as given in Table 2.8

Table 2.27: Professional Status of alumni staying abroad

Response	Count
Yes	27
No	4
Not known	15
No response	5

Table 2.28: Whether plans to come back to India

in the below high school category and are housewifes.

Educational Level	Father	Mother
a	48	14
b	102	45
c	56	77
d	40	108

a Post Graduate
b Graduate
c High School
d Below High School

Table 2.29: Education of Parents : Count of B.Tech Alumni based on educational level

Educational Level*	Father	Mother
a	65	11
b	125	37
c	99	91
d	89	237

* Refer code as given in Table 2.29

Table 2.30: Education of Parents : Count of Non-B.Tech Alumni based on educational level

The profession of parents differ for B.Tech and M.Tech / Ph.D alumni. While for B.Techs, fathers profession fall in the engineiring and other professional categories, a significant number of fathers of the Non B.Tech alumni are in the primary sector. Tables 2.31 and 2.32 depicts this feaature and Fig 2.10 and 2.11 gives a visual exposition.

Another factor which indicates the background of the alumni is the years of Stay in different places like village, town, city & Metropolis. Of the B.Tech & Non B.Tech alumni a sizeable number come from the rural areas. However this trend has been changing over the years over the recent past hardly any B.Tech is from a village. This is because the

Parental Profession	Father	Mother
a	21	5
b	42	0
c	10	0
d	3	1
e	21	13
f	1	0
g	9	0
h	2	3
i	136	223

a Agriculture
b Engineering
c Medical
d Law Practice
e Teaching
f Social Science
g Science
h Art and design
i Others

Table 2.31: Count of B.Tech on profession of parents

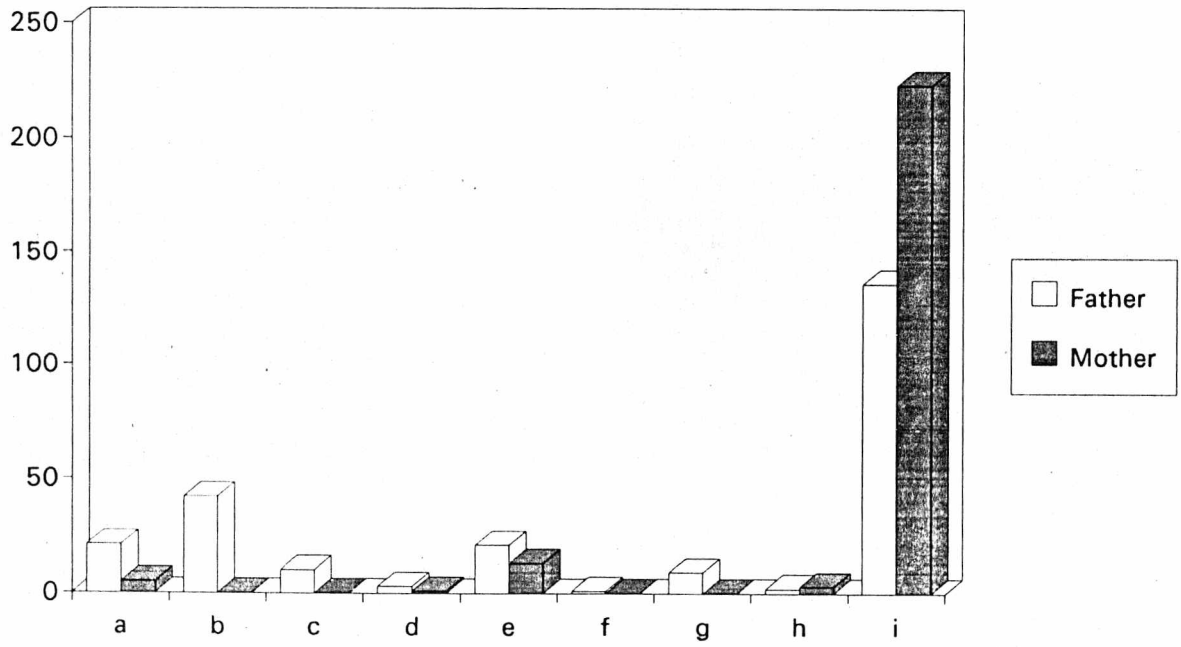

Figure 2.10: Count of B.Tech on profession of parents

Parental Profession	Father	Mother
a	92	13
b	23	2
c	28	2
d	11	1
e	47	17
f	1	1
g	7	35
h	1	0
i	170	350

a Agriculture
b Engineering
c Medical
d Law Practice
e Teaching
f Social Science
g Science
h Art and design
i Others

Table 2.32: Count of Non-B.Tech on profession of parents

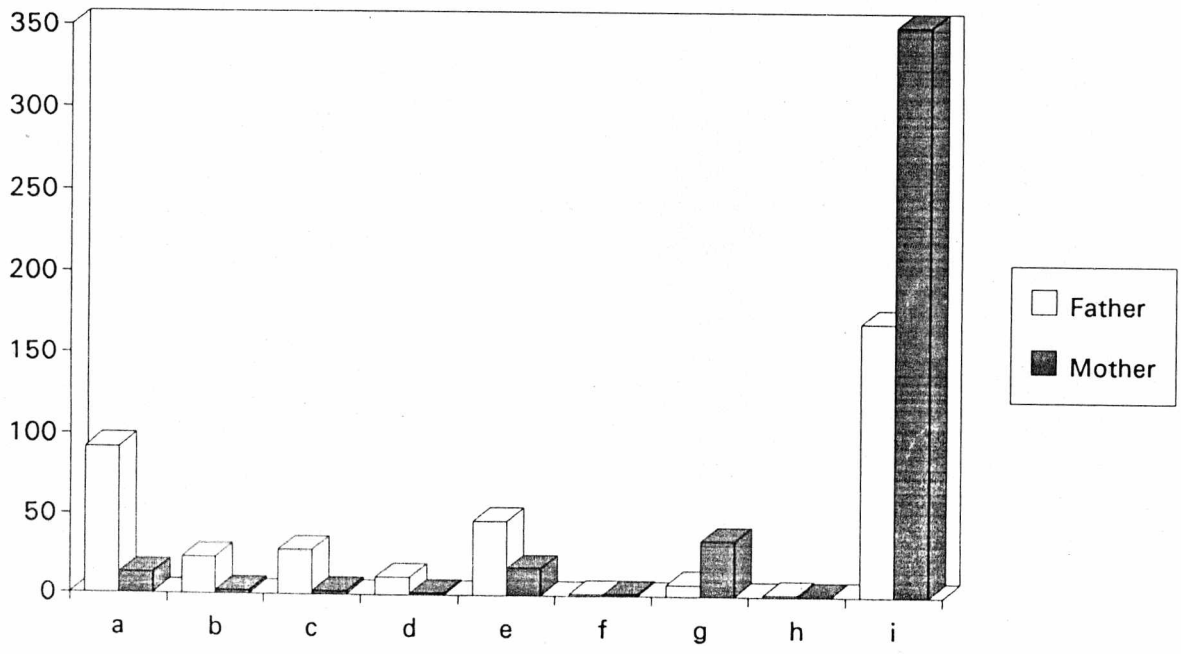

Figure 2.11: Count of Non-B.Tech on profession of parents

highly competitive nature of the entrance examination requires specialised coaching which is not possible in rural areas. The maximum number of alumni have spent most of their years in the city followed by metropolis and town. Tables 2.33 and 2.34 substantiates this aspect Fig 2.12 and 2.13 shows this.

Year	Village	Town	City	Metropolis
74	5	0	11	11
75	0	0	12	16
76	2	0	8	9
77	1	0	4	11
78	6	0	10	7
79	8	0	11	4
80	7	1	9	8
81	2	2	10	13
82	6	1	9	13
83	4	1	4	8
Total	41 (17%)	5 (2%)	88 (36%)	110 (45%)

Table 2.33: Year-wise count of Stay in Village, Town, City and Metropolis for B.Tech

Presently majority of them have nuclear families. In some cases it was intended while in some others it was unintended. A large number of them did not respond to this query. Alumni housewives are mostly graduates or postgraduates and about 10 to 15% are professionals.

2.5.2 Attitude and Values

The alumni have expressed their open views on sensitive issues like women working for money, wife working, intercaste marriage, intercountry marriage, interstate marriage, interreligion marriage, abolition of the dowry system etc. They have also indicated the extent to which their stay in IIT has influenced them in shaping their opinion. While almost all feel that women should work according to their capability some are quite conservative about their wives working. They do encourage intersect marriage but are quite sceptic about interreligion bondages. The views of the alumni have been compiled in Table 2.35 .

The alumni have been categorised into four classes (a) Opinion value >5 and relevance of IIT stay >5 (b) Opinion Value >5, relevance <5 (c) Opinion Value <5, relevance >5

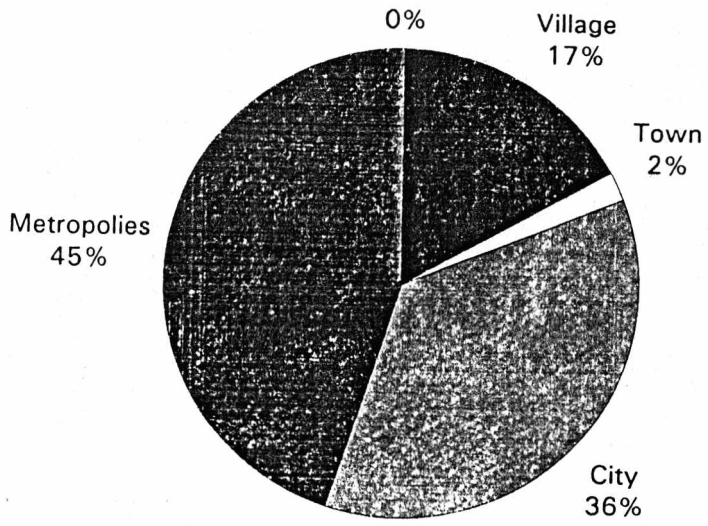

Figure 2.12: Year-wise count of Stay in Village, Town, City and Metropolis for Non-B.Tech

Year	Village	Town	City	Metropolis City
74	2	2	18	8
75	2	0	10	10
76	3	1	25	10
77	5	0	13	4
78	11	3	25	8
79	10	2	28	10
80	10	2	24	6
81	10	0	30	6
82	13	4	17	6
83	15	1	25	5
Total	81 (21%)	15 (4%)	215 (56%)	73 (19%)

Table 2.34: Year-wise count of Stay in Village, Town, City and Metropolis for Non-B.Tech

Opi-nion	Rele-vance	Cate-gory	W-Work	S-Work	IC-Mar	IN-Mar	IS-Mar	IR-Mar	AB-Dow
>5	>5	B.Tech	93	67	96	59	97	71	78
		Non-B.Tech	131	93	117	70	125	84	109
>5	<5	B.Tech	61	62	65	49	57	50	87
		Non-B.Tech	94	81	90	52	70	73	118
<5	>5	B.Tech	1	5	7	11	6	11	0
		Non-B.Tech	4	13	10	17	12	13	4
<5	<5	B.Tech	22	44	19	63	20	57	24
		Non-B.Tech	36	87	54	143	68	117	55

W-Work	Women working for earning
S-Work	Your wife working for earning
IC-Mar	Intercaste marriage
IN-Mar	Intercountry marriage
IS-Mar	Inter-state marriage
IR-Mar	Inter-religion marriage
AB-Dow	The abolition of the dowry system

Table 2.35: Attitude and Values : Count of Alumni having different levels of opinion & different levels of relevance of IIT-Stay in shaping there opinion

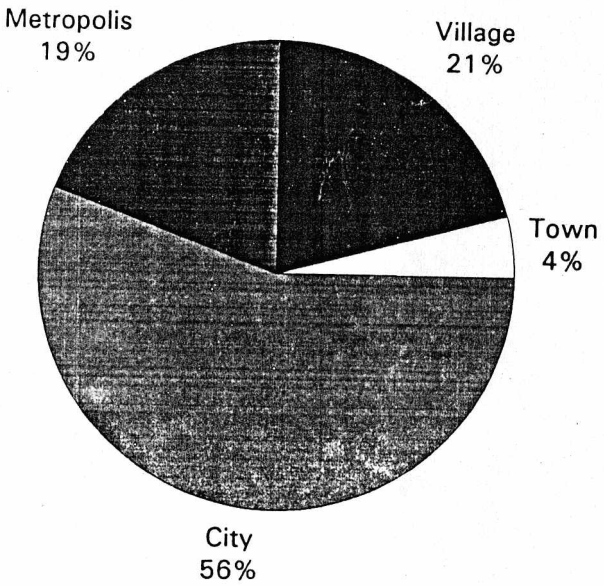

Figure 2.13: Year-wise count of Stay in Village, Town, City and Metropolis for Non-B.Tech

(d) Opinion value <5, relevance <5.

The extent to which they support these facets of societal nature has been represented by scaling it between 0-1. Similarly relevance value has also been scaled between 0-10. For e.g. if they support intercaste marriage it gets a OP score of 8. The alumni's perceptions have been noted in this manner.

The alumni seem to be conscious citizens of the country with varying degrees of consciousness in different spheres like social, political, cultural, literary. The alumni whose consciousness level exceeds 5 have been considered in the alumni count. On the negative side, most of the alumni posess a sense of superiority and do not consider other engineering graduates at par with their level of professional capability, innovativeness and personal abilities. Though this could be true in certain cases definitely it cannot be generalised

2.6 Personal Impact

IIT alumni feel that the environment in IIT - both academic and non academic have helped them in developing their personal self. The stay, the interactions, the cosmopolition environment, the study pattern has positively guided them in shaping their values and building up their qualities. Several indicators have been considered like.

(a) Feeling of being socially elevated
(b) Feeling of achievement
(c) Opportunity to help the country
(d) Opportunity to participate and influence important decisions
(e) Scope for betterr financial opportunities
(f) Possessing better intellectual abilities
(g) Zeal & Determination
(h) Self confidence
(i) Personal drive

and alumni have been asked to assess the impact of IIT KGP on the development of these. Their views have been quantised on a 0-10 scale. The notable fact is that about 90% have assigned values around 7 or more in each of the factors. Table 2.36 portrays this fact.

Further the alumni wish to get associated with social welfare organisations and undertake welfare activities. Some of them make regular donations in associations aiming at the welfare of the people. However, the extent of such activities and their actual effectiveness could not be ascertained.

Aspect	Count
Elevation	454
Achievement	437
Help Country	380
Decision	340
Financial	369
Intellect	489
Zeal	447
Confedence	518
Drive	461

Table 2.36: Contribution of IIT in enriching the personal qualities - Count based on alumni's perception

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Chapter 3

Views of Alumni

The alumni have expressed their strong views on the curriculum and - its relevance and provided guidelines for its change and reorientation. They have also commented on related matters like staff quality, assessment methodologies, infrastructure, hostel facilities etc. Some selective views have been compiled in this chapter and have been structured under four broad heads.

3.0.1 On The Existing Curriculum and Faculty

- Regular evaluation of instructors; Industry-institute interaction to be increased; Holier-then-thou attitude of the teachers should be discouraged. Learning should, as far as possible be project-oriented with viva voce used extensively for feedback to students and evaluation. However this is not to be done at the expense of problem oriented approach presently followed, I hope.

- Institute could also include some more courses from Humanities department to encourage students in their 1st year to cover subjects like:

  - Astronomy
  - Astrology
  - Vedant theory of Hindu philosophy

- The workshops and unit operation laboratories are outdated.

- The course contents were too theoretical.

- Once the students are selected on competitive basis they are left for self study. Although this does give a lot of freedom and choice for self advancement some of the students are not able to cope with pace and style of study. Enough monitoring is not made on the performance; evaluation is not rigorous enough. Some of students counselling and guidance will be helpful.

- Education should enable the students to start self employment which will generate further employment, create wealth and contribute for achieving self sufficiency as well as promote export. This needs more practical orientation of education rather than theoretical. Along with technical education, the education should produce patriots then only this country will progress.

- In breeding of faculty should be avoided. Only teaching staff and of repute should be appointed. It should not be used to absorb people without job. Seminars, conferences involving alumni and other institutes will help in making Departments and Centres of learning.

- – There should be a condition imposed that students should work in the country for atleast 5 years, especially after PG studies.
  – Better Social and Technical interaction between students and teaching faculty should be there.

- – Arranging guest lectures from leading organisations for the benefit of the students.
  – Plan visits during week ends.

- Students should be guided where they can get better job and they should be guided (informed) about the nature of work, they have to do in different organisations.

- – Compuslory exposure of teachers to work in field for a minimum period of 3 years to appreciate the real-life problems.
  – Only quality persons should be recruited to the faculty and not those who had no other option but to do Ph.D.

- Please try to overhaul the running department. The teaching system and the teaching staff are the worst among all the Institutes in India.

- The relevance of the course to the job is not there. A better practical experience can be obtained by allowing the students to understand and solve the problems of the

industry (instead of sending them to the industry for 2 months training each year). What is required is on-the-job practical course instead of theory. If this is provided, the student can identify the type of industry he would like to join by relating its problems and his capability.

- – Faculty members should consist of more of ex-IITians preferably with few years of Industrial experience.
  – B. Tech. project work should not be a wasteful effort. Instead of setting hi-tech projects for students who are yet to be exposed to practical field (tools and techniques) - one can start with simple practical project with some relevance to real-life-possibly, can be continued by next-year students. I understand that most of the students go in for theoretical projects and the 'thesis' is mainly copied and completed version of various books and journals and little trace of originality.

- It pains when I learn through newspaper about the deteriorating standard of my Institute. What is more pathetic to learn is that, in IIT KGP students are not involved in politics whereas teachers are.

- Faculty must update their teaching aids (notes, overheads) every year to keep in turn with latest research and development.

- Visiting professors from India or abroad should deliver lectures as a part of short time courses which are a part of the students curriculum.

- The theoretical basis of work in KGP (partly because it is cut off from the rest of the world) is that it becomes very theory oriented - what is good for someone (like me) because one has the opportunity to become academically oriented and the engineering/design emphasis helps the students to develop rationalistic Approach to design/probelm solving and it makes one analytical.

- The thesis projects should be independently done instead of a guidance from one of the faculty members. This way the student will learn to do a project independently which is what he/she is required to do in real life. The final interview was a joke. It should be done away with. No one can remember everything that one has learned in the last 4 or 5 yrs. Instead there should be a rigorous interview on the students line of specialization.

- Professors need to change their attitude to respect students and treat them at equal level. This was the biggest difference in academics in USA.

- When I was at IIT KGP, I felt that some of the classes (exp. in the earlier years) over-emphasized rote learning. Its possible this depended on individual teachers than on the courses themselves. Many of the labs (again exp. in the 1st and 2nd years) were not taken too seriously either by the students or by the teachers. Not surprisingly I didnot learn as much from these courses of labs as I should have.

- Recruitment should not be limited to foreign qualification as well as to internal candidates. Hybridization in recruitment policy at lower level will help the Institute to build a better image.

Sum up

The curriculum was too theoretical and lacked the practical orientation.
Faculty members as well as students should have industrial exposure.
Project should more practical and useful.
Laboratories should be updated.

3.0.2 On New Directions to Curriculum Modification

- The institute final year students should take up orientation programme for 6 months at different Industry and Research Organization.
- There must be continuous dialogue with private as well as public sector industries to change and modify the curriculum so that it better satisfies the needs of industry.
- The institute should not spend enormous money in updating, rather send the students in small batches with a teacher to the industry like the sandwich courses of American universities.
- Many local Engg. Colleges have a scheme of sandwich training whereby the student spends 6 months in an industry which is the last lap of this curriculum. This helps him to be more practical oriented and makes his chance better for training well in interviews. I think IITs should also think including such a course.
- During the first year after entrance, give a general engineering orientation of all the subjects being offered and then select the best candidates with aptitude for the specific subjects. The aptitude and inclination of the student should fit the demands of the subject.
- The institute should recognise only quality, talent and excellence and should avoid reservation quota which dilute the standard.
- Enterpreneurship should be taught. Contact with industry needed.
- The institute curriculum must include management subjects, specially basics of:
  - Man-management
  - Financial management
  - Quality management in each departmental courses
- Expand continuing education and extensive services.
- The following topics should be thought about including at some point in time:
  - Career counselling
  - More interactive project work with the industry
  - Awareness of standards and their utility

- More emphasis to inter disciplinary courses in the first two years

- More industrial exposure, may be for a period of 5 / 6 months at a stretch during graduation. Professional training to become self-employed enterpreneurs rather than be job seekers (very important in the present open economy policy).

- In the first year of study, covering 2 semesters, there must be a subject to cover "Public speaking and Elocution" Debates / Interviews / Group Discussions etc. must form a part of this subject. There must be tutorials, mid semester and end-semester exams as is usual for other subjects.

  NCC / NSS etc. should not be marked or shown in the grade card. Instead, P.T. should be compulsory for everyone and should be conducted in the Halls and not in the Stadium. There should be some form of monthly test system in the Stadium, for eg., 100 m. race, 110 m. hurdles etc. P.T. should be strictly marked from the second semester to the last semester. As a side benefit this could also counter ragging.

- Institute should have more and more interactions with Industry, State Govt., Private enterpreneurs, both at teacher level and student level.

- Final year specialization to be based on aptitude of student viz. research / teaching / enterpreneur / service with practicals in relevant area of aptitude/interest, with say training from first year onwards in one single organisation, with sponsorship by the organisation. This would benefit the student and the employer as well.

- - Only concepts should be taught.
  - More group discussions and problem solving exercises.
  - Presentation and active participation of students encouraged.
  - Videos/Movies of subjects to enhance learning.
  - Term end exams should test fundamentals through open book style of exams.
  - Provide more time for co and extra curriculer activities as a person is growing up during this phase and needs to know more/less be subject matter being taught in classes.

  The person should learn skills for:

  - organising activities
  - team working

- leadership
- public speaking
- managing people, money and resources

- Introduce management subjects especially personnel and financial management as compulsory subjects at undergraduate level; if not already done so.

- Industrial exposure in the form of training/project work in an industry is desirable. Our company offers stipend to students coming for training/project work.

  Interaction among teacher, student and alumni can be beneficial to all the three parties. Unfortunately this is nonexistent.

- Basic computer literacy in using PC's or Mainframes with reasonable hands-on experience is a must to fit in the engineering world of today.

- Some more emphasis on developing communication skills of the students.

- - Seek change to meet today's growth and tomorow's change.
  - Develop curriculum to meet the future needs of society.
  - Do not stagnate.
  - Practising managers, Engineers, Consultants should be called for delivering talk, at various levels.

- More rigorous drill in workshop necessary - not 'a-somehow-manage-grade approach'.

- The present education system is theory based and are not found of much use when an engineer goes to site. Hence the system should be oriented in such a way that the application of theory in practical fields should be demonstrated.

  For example Design or dam is taught but most of the student has no idea of a dam, power house, surge tank, turbine etc. There is a great difference in visualising the things from drawing and practical observation of the thing. So the IIT education is perfect in theory but lacks in practical education. This is reason why most of the IITians are office workers and very few prefers to go to field.

- In the changing and growing field of electronics it is important that the subjects and topics taught be updated as often as humanly feasible.

- The curriculum could be made a little more challenging. As things stand the full academic potential of IIT undergraduates (who are perhaps some of the best students of their batch) remains under utilized. Further interaction with students from other Institutes (e.g., those doing their course work at PRL, Ahmedabad) shows us that these students have been encouraged to take up challenging work. IIT Kharagpur could benefit from an academically more stimulating atmosphere.

-
  - More practical orientation is to be introduced in every sphere of the education.
  - Two months in every year, industrial training shall be made compulsory.
  - Every department must have a separate course for Business Management in B. Tech. level.
  - Design and drawing classes shall be increased and more emphasis in that subject is necessary.

- All the examinations should be open book type. Test and Exams should not be intended to know how many formulae, derivation or values of constants, can a student remember but whether he can really apply those in solving practical and real world problems.

  It was observed that many of the teachers announce in the first lecture class of the session that the subject which he was going to teach was a very difficult and complicated one. Hereby upsetting the interest of the students in the very beginning. Teachers should impart the knowledge in such a manner that students should not get scared but become interested and inquisitive to know more. Declaring his subject a difficult one, the teacher can not derive respect from the students.

- I can't imagine how the 4 yr. curriculum is handling all students even though they are the very best there is. Are you still teaching all the things you used to in our 5 yrs. curriculum. I think you should ease up, keep only the bare minimum in the curriculum, drop all specialized electives, (let them get a M. Tech. if they so decide). Have sure industry input/interaction in the curriculum. Give students more time to broaden their horizons through social interaction, sports professional presenations, group projects. We are wonderful individually and lousy from players.

- Awareness among UG students regarding facilities available in the country in the field of R and D is poor. A closer interaction with R and D institute during summer training will be worthwhile exposure.

  - Sociology and psychology subjects must be of higher standard and made compulsory in each semester for all students irrespective of engineering and general branch.
  - Undergraduate course should have more practical training in Industry
  - Close links with industries as well as betterness related to be established for the problem of technology, scientific environment and industrial know how. The job of industrial consultancy should also be started.

- All the courses should have more laboratory work and with new and good apparatus. Use of computers, to my consideration, is must for every one. Particularly taking data of the experimental work.

-
  - To concentrate more on research oriented activities.
  - To offer more inter disciplinary subjects, in traditional engineering branch.
  - To review course sturcture and course content every 2-3 years.

  Suggestions are to emphasize the Background to design the foundations of design, historical design and more seminar oriented classes

- More mathematics should be taught to prepare people better for post graduate studies specially in controls etc. More elective should be available.

- In general, many students, particularly of IIT KGP should be trained in:

  - spoken English
  - presentation in seminar
  - team work
  - communication

  There should be more seminars and small projects in a team. Only average knowledge in any matter is required to become acceptable as an Engineer in any Industrial Organisation. But better speaking, writing and communication power is required to grow in an industry and get noticed.

- In a developing country like ours, there lies a great potential to exploit the vast human as well as other natural resources. The theories and the techniques taught at institute like IIT can be very effectively made use of both in industries and public utility

systems. However, still, the applicability of the theories taught at the Institutes is far below the extent of desirability.

The concerned departments or the Institute can invite professionals & executives from the industries or public utility / Govt. agencies to talk about the live problems faced by them and also to narrate their experiences/difficulties in encountering those problems.

It can be taken-up as a regular feature where a series of lectures/talks are arranged. It can even be formed as a part of curriculam with some credit point assigned.

- At least 50% teaching staff should be appointed among the applicants who have passed from other Indian Institutes or abroad. That will provide more variety to students and research activities. Answer books of final year students should be evaluated by senior teachers of other universities. Fundamental research activities should be avoided as far as possible and preference should be given to applied research work keeping in mind the current needs of Indian industries and Indian farmers. Brain drains are maximum from IITs. This trend should be reversed so that huge expenditure in these institutes may not be termed as wasteful.

Sum-up

More of industry-institute interaction should be introduced. Inclusion of subjects related to enterpreneurship development and management should be brought into consideration. Fundamental research as well as applied research should be given equal weightage. Specialised electives should be dropped from undergraduate level courses and should be included in the PG level.

Some training should be provided in presentation and communication skills.

3.0.3 On The IITians

- IITians are very well prepared theoretically and in most cases shine in this area (Scholastic, Research etc.) but what drives this economy is products / services which means:
  - Exposure / participation in Industry
  - Development of products / services
  - Risk taking in new avenues / projects
- The entire objective of the IITs appear to be training engineers for the US, at great expense to the Indian public. I don't see why students who can afford, shouldn't pay for their education, especially when their careers are going to be abroad.
- A person who gains so much has also to give output beneficial to the nation.
- Old boys day / meeting of ex-KGPites.

  Publication of addresses of Alumni / Association.
- Institute may live to invite ex-students from various fields to visit and shares their experience with the students.
- Since prabably as many of 90% of graduates from IIT use public-funded IIT education exclusively for more spring-board for personal career (like I too have done) and do not pay back to the naiton in any way, there should be a mechanism to recover the subsidy from the alumni with interest from his earnings later.
- Should not tend to encourage students to become managers first or computer experts first. Primary aim should be to learn the basic discipline / branch properly such as Mechanical Engineering, Electrical Engineering, Electronics etc. i.e., ENGINEERS FIRST (Plenty of time to become managers or enterpreneurs).
- I wish I could go back to the days at the institute.
- Annual get together of I.I.T. Kharagpur Alumni, have seminars and implement feed backs.
- If I can be of assistance with regard to marketing or industrial marketing courses / seminars or for future graduate students, please let me know.

- My strong feeling is that 'IIT' should allow their ex-students to do Ph.D. on correspondence base. Because of fast growing 'IT' industry, without higher study, growth is extremely difficult. 'IIT' can arrange for the interested students Ph.D. registration under 'IIT'. They can do the work at their work place.

  My sincere request 'IIT' should think in this line and give positive reply to their ex-student whoever is interested.

  - Further the needy students may earn money for their expenses during study and at the same time the Institution may release many kinds of financial support such as M.C.M. etc.

- Right now and earlier also, it is observed that IIT students (especially B. Tech. from IIT) are very much reluctant to stay in India, after completion of studies. They always want/expect a very fat salary, perks etc. As a result our India is only loosing the money in this front, without getting any benefit/return. Some people also think that they are superior to others. In order to minimise this type of attitude, to increase the belongingness towards, India, IIT has a vital role. Since IIT is directly related with Education Deptt. of Govt. of India or directly connected with Human Resource Development, only IIT can launch a programme, can initiate for the betterment of India. If we can do something else, then we can say that respect of words - "Dedicated to the Service of nation" is restored by IIT/KGP.

  I still take pride as an Ex-IITian. I say the above, only because, I believe this is an worthy effort and I am supposed to be fair and frank. I am grateful to IIT KGP and the faculty. I am nostalgic about IIT days. I miss it very much.

- I spent the best time of my life in IIT KGP.

- Need to set up organization and alumni associations in various cities in India and globally. Post graduates would like to do something for the Institute, Deptts., Professors in the country.

- Get together of alumni at the department or institute level at an interval of 3-5 yrs. Such get-together would help exchange of notes among alumni. This would give the alumni to see the advance in the institute. The departments would also be benifited through discussions with alumni.

- A directory of Alumni indicating details about their association with IIT and present status may be brought out and circulated to all Alumni which will help in reviewing the interactions among them/the Institute and the department.

- – Improved academic proficiencies.
  – Developed future professional career.
  – Evaluated everywhere specially as an IITian.

- – To feel work based.
  – Urge for scientific research.

Sum up

The IITians cherish their institute days. They feel that alumni meets should be organised on a regular basis. On the intellectual front they theoretically should but lack the practical exposure.

3.0.4 On The Institute

- Ultimately the institute must become independent financially and the students technical laboratories must be used "somehow" to generate funds.

- All the best to you all. IITs should become full fledged research university (like MIT for example in USA).

- – Keep a good quality of food.
  – Keep the show well by painting the building etc.
  – arrange alumni get together of every year students individually in IIT Kharagpur after every 5 years.

- – Ragging should be milder.
  – Food should be improved considerably.
  – Drugs should be banded.

- Students interaction with the staff was not upto the expected levels. Students & the Faculty in general was not upto the mark though there were some outstanding members.

- Closer interaction like this with the Alumni would be beneficial to the Institute.

- The institute must continue to draw students from all over India to maintain its cosmopolitan ambience. I feel atleast 60% of the students should be from other states, other than Bengal, or else the Institute begins to feel like a regional college, in culture and practice.

- Times may change. A new dynamism can come with staff handling real projects for outside agencies and delivering the products. This may also constitute to resource mobilisation and keeping the faculty upto date.

- Hostels must be administered by better manager, in better cleanliness and better food for students. The gardens etc. must be planted and their upkeep ensured so that this apex institution is in ever good shape.

- We feel proud of our institute for continuously maintaining its standard high and hope it will continue.

- Because of development of good infrastructural facilities, IITs should stop taking B. Tech. courses, Instead, with its good laboratory and teacher talents, IITs can concentrate on only M.Tech.and Ph.D. Number of students' in-take to M. Tech. and Ph.D. can be increased ten-fold or hundred fold for optimum of IIT-resource utilisation.

- – IITs are excellent Institutions. Students can gain much more knowledge by way of lectures by visiting professors from abroad on frequent visit.

- The organisational set up is such that it has failed to utilise the best out of the knowledge gained by an IITian. The knowledge gets dissipated in the run-of the nill set-up. The standard at IIT is highly beneficial and each individual, before joining the job must undergo some basic training in socio interaction and behaviour at IIT.

- – Not to allow 'politics' in either.
  – Mental level of students, these days, are completely different than of 1970-80's. Hence teachers have to adjsut accordingly.
  – To allow 'ragging' in its 'the' sense which are enjoyed. It unknowingly helps developing bondage among students undergoing ragging.

- – Fear of being ragged to be eliminated from public mind by creating such atmosphere (I think separate hostel is being provided for freshers).

- – Class IV employees and Lab. Astts. do not work. Large no. of eqpt. remain defective/under utilized.
  – Teaching faculty must serve in industry on rotation to acquire the technique of conviction and practicality.
  – Award of degree must relate to atleast finding one viable and practical solution to Industrial problem during project work. Economic benefit must be the criterion.

- – Admission to the Institute should only be on merit. There should not be of any reservation of any type.
  – The Joint Entrance Examination (JEE) for admission should only be in English medium, not in any other language.

- Great Institution, I hope my kids opt to go there when they grow up from the US educated high schools, my self-confidence and enterpreneur ships has been greatly enhanced by my years and contacts at the KGP.

- Wonderful, Sir In fact when I went to IIT Kharagpur I went with Rs. 600/- only. My father was working in fields for their livelihood. I was thinking how I still be able to complete my B. Tech. I regulated Mr. Banerjee from Finance Dept. and Mr. Chatterjee from students affairs who has always released my scholarship in time and always was doing some favour by sanctioning poor boys fund or getting job in College Library or in Gymkhana. They are real God for me. I dedicate my every development in the name of IIT Kharagpur.

- Please lets be less political and keep our institute healthy and improve its standing. Don't destroy it, please. I owe a great deal to the atmosphere of IIT and I would like that to be the way it was or better.

- Institute should advertise and provide scope for studies/research for the students of developing countries like the Asian Institute of Technology, Bangkok and Asian Institute of Management, Manila. By this, Institute can earn a lot of foreign currency and improve the financial situation of the institute.

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  - OEC, IIT Madras is the only institution in India actively involved in Ocean related research activity. N.A., IIT KGP is partly involved. As Eastcoast having vast ocean related activities, IIT KGP also should come up in big way.
  - IIT KGP, some courses should update and teach latest technological development.
  - More freedom (students) for selecting optional subjects. Too many subjects are made compulsory to go through.

- I had recently gone to the campus and felt terribly out of place. I had to agrue with the Alumi guest house to accomodate me for a night. It is hardly the kind of reception one expects from one's Alma Mater.

- Encourage small entrepreneurship and have those entrepreneurs registered through IIT.

- Institute should make aware the Central / State Governments about the course / specialization offered to students, so that States can get maximum and best out put by placing IITians on suitable post/job.

- Generally publicity work done at the dept. of IIT KGP is very poor, especially in the national dailies or other magazines compared to other IITs. Thus the general public ie, technical graduates, business people etc. donot know much about the research done at IIT KGP. Effort should be made in this respect to give publicity through newspaper/regular magazines on the developments and other achievements of IIT KGP. Even cultural activities also.

  Joining sports should be compulsory to every student so that the students may interact with others more closely.

- I think IIT, KGP should actively scout its alumni to come and give lectures in campus. Many of us visits India regularly and it will be a pleasure to go back to IIT to share our experiences and expertise with current students and try to build some professional/working relationships with the faculty at IIT.

- – Basic eligibility criteria for admission to a PG course need to be reviewed. However, it may be followed by a screening test to ensure quality of intake e.g., Information Science at PG level should not be only meant for electronics/computer science student.

- With the economic liberalisation coming up with full force the institute should concentrate on imparting training for encouragment for private enterpreneurship and self employment.

- Having stayed at Bombay during the last 13 yrs., I have seen much the greater interaction of the local and regional industries with the IIT here in this city. This has been made possible because of the very existence of so many industries here. This is one handicap faced by IIT KGP, in my opinion. The regional industries around Calcutta have dwindled gradually. Any Technical institute will not perform at the best without industrial interaction. I am not at all suggesting that IIT KGP does not have such interaction. What I am trying to Hint as it that such interactions may decline with declining number of industries in eastern region. I have no solutions to offer. I only pray that IIT KGP does not loose out in importance to other IITs.

- I would suggest that the Institute set up a good student counselling dependent to assist/guide students in selecting their career appropriate to their abilities, temperament etc.

- IIT KGP has a lot of scope for improvement. It gets the best students in the country and wastes this target. In the USA the best minds in the country are in universities.

Many of them are from IIT KGP. It shouldn't make IIT proud, but rather sorry that the institute that created this mind cannot benefit from it. I hope some use comes of this.

- The departments should organise seminars on technical subjects calling eminent people from industries, classification societies and ex-students of the department which will be very helpful.

- I think the government should build other non-technical arts colleges around the IITs. There is mostly one point of view in IIT, ie, a male oriented technical viewpoint. If there are more enrollment of women, and arts, social sciences and other disciplines the education at IIT could be more holistic.

- We had the heyday of intellectual giants in the Staff in the later 70's. We look forward to seeing IIT (KGP) in the farefront of technology. Times may change. A new dynamism can come with staff handling real projects for outside agencies and delivering the products. This may also contribute to resource mobilisation and in keeping the faculty uptodate.

- Keep it up.

- A committee of appeal be formed to hear the complaiants of research scholars regarding availability of materials, fabrication of gadgets etc. At present, the major portion of the time of a scholar is spent on organising these items which he could spent in actual research. The frustration often forces the scholar to revert to theoretical studies from experimental fields which are all important in Technology.

- – International/National Symposiums should be arragned frequently on different subjects in Science and Engineering.
  – Contracting Centre may be opened in the institute which will enable to earn the revenue.
  – The institute is housed with internationally famed professors. I surprise why the journals are not brought out! It is advisable to bring out journals on Engineering and Science.

- Recruitment should not be limited to foreign qualification as well as to internal candidates. Hybridization in recruitment policy at lower level will help the Institute to build a better image.

- For theoretical research work high speed computation is necessary. During my research work I have done my computation work at R.C.C., Jadavpur, (1979-82). Now-a-days, IIT KGP possess an efficient computer for research work. To utilize contingency grant for research work so much official work (Permission from Dean of Faculty of Science Student's Affairs) is required in IIT (naturally destroys some time). Necessary powers should be given to the supervisor and Head for utilisation of contingency grant of any research scholar.

Chapter 4

Assessment of Impact

Impact is the resultant of a stimulus that induces a change either positive or negative. In the present analysis impact would refer to a positive contribution and the negative effects would be taken care of accordingly. The impact of the alumnus on the economy and society as well as the impact of the environment on the alumni who work as agents in the socioeconomic develoment process could be broadly identified under five major heads. These are:

1. Economic
2. Technoscientific
3. Sociocultural
4. Personal and
5. Others.

Each have been discussed elaborately in the following sections.

4.1 Economic Impact

Economic impacts usually refer to the contributions to the economy in terms of direct additions to the resource pool or indirect stimulations in the process of generation in the form of decision making in production, consultancy services etc. The direct additions to the economy's resource flow indicates involvement in the production process, income generation, employment generation, investments, export earnings, foreign remittances etc. Further there could be certain indirect intangible effects like economic decision making at

the national level, human resouce development through imparting teaching and training etc.

Thus the attributes of economic impact would be the following:

4.1.1 Contribution to the economy

This is a general attribute based on the traditional theory in economics that an employee is paid according to his/her contribution to production. That is the salary would give an indication of his/her contribution. However since the salary of a professional vary between the type of the firm/organisation and the nature of its job, the relative rather than absoulute contribution is considered and is calculated by the ratio between the salary of the alumnus and the average salary of persons from the same professional status in a particular organisation.

4.1.2 Contribution to production

This would be relevant for alumni who are directly involved in the production process. The individual contribution to the process would be obtained from the questionnaire which gives a scaled value between 0-1. This however is the measure of contribution in that particular industry. The contribution of the alumnus in the production process within the economy's perspective could be obtained by multiplying this value by quantities measuring the industry's importance within the sector and sector's importance in the economy each of which are measures scaled between 0-1. That is contribution to the economy's production process could be measured as

Individual contribution to the production process	X	Industry's importance within the sector	X	Sectoral importance in the economy

Since each of these measures are values between 0-1 the contribution figure also attains the value between 0-1.

4.1.3 Contribution to decision making in production

This is measured in a similar manner as that of the preceeding one. The individual contribution rate in decision making is obtained from the questionnaire which is multiplied

successively by the values of the industry's importance within the sector and sectoral importance. Thus the meaure is

Individual contribution rate in decision making	X	Industry's importance	X	Sectoral importance

The measure attains values between 0 nd 1 since each of its components are scaled values between 0-1.

4.1.4 Contribution in terms of consultancy services rendered

This is also measured along the same line, only that proportional contribution is considered. The earnings of the alumnus in relation to the total value of the project gives a measure of relative contribution. Hence the measure would be

Av. earnings from a project divided by Av. value of a project	X	Contribution of the industry/ firm in the business	X	Importance of the business within the economy

4.1.5 Economic decision making at the national level

This is applicable in the case of government officials who are engaged in administrative jobs. The attribute is quantised by assigning a discrete value between 0-1 in correspondance with the degree of contribuiton. This again is obtained from the questionnaire.

4.1.6 Employment generation

This indicates the number of persons employed in one's business or in a project in the case of entrepreneur alumni or alumni having sponsored research funds indicates a two-fold contribution in the sense that additional labour is being put to effective use on one hand and on the other hand it is lessening the burden of employment. This again is measured in relative terms. After acquiring the data on employment generated for all relevant alumni a proportional value is obtained for each within the limits of maximum and minimum employment generation which is further scaled between 0-1.

4.1.7 Income generation

As a result of the additional employment created the salaries of these people enter the income flow leading to an accelerated pace of development. Further the net value additions in manufacturing and other sectors also add up to the total income stream.

4.1.8 Investments

This indicates the extent to which money is injected into the economy's money circulation leading to multiplier effects in generating income. The use in which money is invested dictates the efficiency of capital invested. Thus the proportional returns from capital could be considered to be a contribution rather than the absolute amount of investment. Hence the measure in this case would be

Average annual return / value of invested capital

4.1.9 Export earnings

This is applicable in the case of alumni engaged in their own business. For the present study the amount of foreign exchange from exporting the products is not considered in the analysis rather this attribute is given a binary representation (0,1) indicating 'no export earnings' and 'positive export earnings' respectively.

4.1.10 Foreign remittance

Whether an NRI remits foreign currency to India on a regular basis or not is represented by 1 or 0 respectively.

4.1.11 Human resouce development

Employment generation has two aspects

1. adding to the labour pool and

2. improving the quality of labour in tems of skill.

This attribute deals with the second aspect. The level of skill could be improved either through training or extensive teaching leading to a professional qualification. Hence for alumni who are engaged in teaching the attribute attains the value 1 and in the case of training the attribute value is 0.5.

4.1.12 NRI's contribution to the natianal economy

If the alumnus is an NRI its contribution to the national economy turns out to be negative and is assigned a score of -1.

4.2 Technoscientific Impact

The technoscientific impact implies the contribution in the field of science and technology. Contribution can be under the following heads:

4.2.1 Innovative research

It includes attributes like:

1. Papers in national journals. The scores would be

0	for no publication
0.5	for 1 to 6 papers
1	for more than 6 papers

2. Papers in international journals

0	for no publication
0.5	for 1 to 3 papers
1	for more than 3 papers

3. Chapter in edited books

0	for no contribution
1	for contribution of 1 or more chapters

4. Research monograph

0	for no publication
1	for 1 or more

5. Book

0	for no publication
1	for 1 or more

6. Presentation in scientific national conferences

0	for no presentation
0.25	for 1 or more presentations

7. Presentation in scientific international conferences

0	for no presentation
0.5	for 1 or more presentations

8. Other publications

0	for no publication
1	for more than one publications

4.2.2 Other products

This may include:

1. Patents
2. Experimental prototypes of devices; instruments, components etc.
3. Experimental materials such as fibre, glass, metal, alloy, chemicals etc.
4. Algorithms, computer programmers etc.
5. Design
6. Any other.

For each of these either 0 or 1 value is attached depending on no contribution or positive contribution.

4.2.3 Technology transfer

Here again the measure attains values 0 or 1 corresponding to no contribution or positive contribution.

4.2.4 S & T inputs for technology missions

This includes various technological inputs for improving the quality of life. No contribution gets the value 1.

4.3 Sociocultural Impact

The socio cultural impacts indicate the resulting changes on different components of the society. Here again the effect could be direct or indirect depending on the element. The different elements include the class hierarchy, family structure, values & attitudes, social welfare, regional integration etc. Thus the attributes of social impact are the following:

4.3.1 Working as agents in upward social mobility

Social mobility is the movement of individuals, families and groups from one social position to another. The changes in social position relevant to the theory of social mobility are primarily variations in occupation, prestige, income, wealth, power etc. i.e., variations in the possession of goods (values) desired by most of the members of the society. The change from a lower rank to a higher rank (ranking being based on some predecided criteria) is viewed as success in life. Social mobility could thus be measured in terms of the following indicators:

1. Parental income vis-a-vis alumnus income
2. Parental occupation vis-a-vis alumnus occupation
3. Parental education vis-a-vis alumnus education

Ranks are designated to different income categories. The present discounted value of parental income is compared with the alumnus' income to get the rank difference. For occupation and education, ranks are assigned to the existing classifications Ranks are designed to different income categories. The present discounted value of parental income is compared with the alumnus's income to get the rank difference. For occupation and education ranks are assigned to the existing classifications (e.g., primary - 1, secondary - 2, tertiary - 3 and school level -1, graduate -2, pg - 3 etc.) and the parent's attribute value is compared to the offspring's. The cumulative measure gives the value for upward social mobility.

4.3.2 Values and attitudes

The impact in this case refers to the change in values and attitudes that grossly have a positive effect on the society. This could be judged by opinion study on different socially sensitive issues like:

1. Women working for money
2. Your wife working
3. Intercaste marriage
4. Inter country marriage
5. Inter state marriage
6. Inter religion marriage
7. Abolition of the dowry system

This opinion of each alumnus could be scaled between (0-1) where 0 indicates strongly against the idea and 1 indicates strongly for the idea.

4.3.3 Attitude towards non-IIT graduates

This implies an elated complex or a sense of superiority of the IIT graduates over other graduates which IITians often possess due to the environmental influences. This however has negative implications on the society. Hence alumnus who possess such an attitude gets a score - 1 for this attribute and 1 is assigned to those who do not have such a feeling.

4.3.4 Participation in social welfare activities

This indicates a direct positive impact on the society. Involvement in social welfare activities, to whatever extent possible, means a rehabilitation of a deprived section of people who constitute a major component of the social composition. The different factors or elements for assessing the degree of involvement are the following:

1. Members of social welfare organisations
2. Participate in activities of welfare organisations
3. Contribute, in terms of money, for the development of the organisation

All these factors attain values 0 or 10 for 'no' and 'yes' respectively.

4.3.5 Agents in regional and social integration

This couldbe measured by assigning the issues like:

1. Having friends from different states and whether the alumnus had friends hailing from different states before joining IIT. The values would be of the following nature:

0	for no friends from different states
0.5	for presently having such friends and had such before joining IIT also
1.0	for developing such friendship after passing out or while studying in IIT

2. Having friends from different social starta and income class - In this case the values would be either 0 for negative or 1 for having such friends.

4.4 Personal Impact

Personal impacts refer to the enrichment and flourishment of the inner instincts and inherent qualities. Enrichment of the institutes and qualities though directly influence the individual, having definitive impacts on the society and economy since individual alumni are the elements of the social structure and economic fabric. Whether the stay or education in IIT, KGP has influenced such traints could be determined through the study of issues like:

1. Feeling of being socially elevated
2. Feeling of being important
3. Feeling of achievement
4. Zeal and Determination
5. Self confidence
6. Personal drive
7. Opportunity to help the country
8. Scope for better financial opportunities
9. Opportunity to participate and influence important decisions
10. Possessing better intellectual abilities

Each these attain value between 0-1 depending on the degree to which IIT KGP environment has had an impact on these issues. The measure is obtained from the questionaire and is based on the individual assessment of the alumni.

4.5 Other Impact

Under this head various factors, where the alumni have shown promising achievement and which resulted in a direct or indirect influence of IIT KGP, could be accommodated. Such factors are:

1. Awards to the credit of the alumnus;

2. Other achievements;

3. International recognition;

4. Member of international commision or apex body;

5. Member of editorial board of journals;

6. Member of professional bodies;

7. Foreign interactions.

Each of these would be assigned values 1 or 0 for positive contribution and no contribution respectively.

The attributes could be calculated in the following manner. Further the correspondences of the factors with the questionnaire entries have also been enlisted below :

4.6 Economic Impact

	Attribute	Definition	Questionnaire Correspondence
a	Contribution to the Economy	Income of the alumnus/Average income of aluminus in a particular professional category	C2.5 C5
b	Contribution to production	Individual contribution x Industry's contribution x Sectoral contribution Individual Contribution = Income of alumnus / Average income of the alumnus in that professional category and organisation	C2.5 C5 C10.12 (Externally provided figure)
c	Contribution to decision making in production	(Insividual contribution in decession making) x (Industry's importance) x (Sectoral importance)	C10.5 C10.12 (Externally provided figures)
d	Contribution in terms of consultancy services rendered	(Average earning from a project)/(Average value of a project) x Contribution of the organisation in the business) x Importance of the business within the economy	C2.5 C14.10 C15.2 C14.13 C15.5 (Externally provided figure)
e	Economic decision making at the national level		C13.2
f	Employment generation		C14.6
g	Income Generation		C14.7
h	Investment	Average annual returns / value of invested capital	C8.2 C8.3
i	Export earnings		C14.15
j	Foreign remittance		Alumni Stay : D6.6.2
k	Human resource development		C12, C10.7
l	NRI's contribution		D6

4.7 Technoscientific Impact

	Attribute	Definition	Questionnaire Correspondence
a	Research contribution		C10.6.4, C11.6, C12.2, C13.6, C14.8, C15.6 C16,5

4.8 Socio-cultural Impact

	Attribute	Definition	Questionnaire Correspondence
a	Attitude		E2.1, E2.2, E2.3 E2.4, E2.5, E2.6

4.9 Personal Impact

	Attribute	Definition	Questionnaire Correspondence
a	Personal attributes		E2.14

That is each attribute under each section viz. economic, technoscientific, socio cultural, personal and others, are assigned values conveniently between 0 and 1 to ease the additivity operation. A summing up of the scores under each heading gives a total value of impact in that particular domain. However, since the attributes specific to a section are of different importances a weighted average rather than simple summing up, is considered to represent the level of impact where the weights are the relative importances of attributes within a section, once again scaled between 0 and 1. Hence for the five sections one would obtain five such values calculated on the basis of weighted average of the attribute scores and representing the degree of impact in five different domains of the economy and society.

The next step involves the establishment of a relationship between the degrees of impact and the factors specific to the stay and education in IIT KGP. This could be achieved by building up a multiple regression model with the impact scores as dependent variables and the identified factors as independent variables. The following section deals with this aspect.

4.10 The Model for Impact Assessment

Steps in the formulation of the model:

1. Assign scores for each attribute under each section viz. Economic, Technoscientific, Socio cultural, Personal and Others. This would be obtained either directly from the questionnaire or by carrying out certain simple operations on the quantities available in the questionnaire.

2. Determine the relative importance of the attributes within each section. This would be to some extent subjectively defined based on opinion polling or purely on the notions of the researcher.

3. Determine the relative importance of the sections in the context of the present study. This would again be based on the notions of the researcher.

4. Determine the weighted average of the section specific attribute scores, weights being the relative importance, to obtain measures representing the degree of impact in the

different sections. That is

$$E = \frac{e_1E_1 + e_2E_2 + ... + e_ME_M}{e_1 + e_2 + ... + e_M} = \frac{\Sigma_{1\leq i\leq m} e_iE_i}{\Sigma_{1\leq i\leq m} e_i}$$

where e_i's are the weights and E_i's are the attributes scores under the section Economic Impact.

$$T = \frac{\Sigma_{1\leq i\leq n} t_iT_i}{\Sigma_{1\leq i\leq n} t_i}$$

where t_i's are the weights and T_i's are the attribute scores under the section Techno-scientific Impact.

$$S = \frac{\Sigma_{1\leq i\leq r} s_iS_i}{\Sigma_{1\leq i\leq r} s_i}$$

where s_i's are the weights and S_i's the attribute score under the section Sociocultural Impact.

$$P = \frac{\Sigma_{1\leq i\leq q} p_iP_i}{\Sigma_{1\leq i\leq q} p_i}$$

where p_i's are the weights and P_i's are the attribute scores under the section Personal Impact.

$$O = \frac{\Sigma_{1\leq i\leq s} o_iO_i}{\Sigma_{1\leq i\leq s} o_i}$$

where o_i's are the relation loadings of the attributes and O_i's are the attribute scores within the section Other Impacts.

5. Determine the composite index for impact considering all the weighted average figures for the five sections. The composite index would again be a weighted average of E, T, S, P, O, weights being their relative importances,

   Thus,

$$CI = \frac{eE + tT + sS + pP + oO}{e + t + s + p + o}$$

   where e, t, s, p, o are the relative loadings of the factors.

6. Identify the independent variables - The independent variables would be those factors which characterise the stay and education of IIT Kharagpur and which have a direct bearing on the impact structure.

   The variable in this case would be:

   (a) Level of Education or Degree (Degree)
   - 1 B. Tech, B.Sc.
   - 2 M. Tech, M.Sc., MRP
   - 3 Ph. D.

   (b) Years of stay in IIT/KGP (Stay_IIT)

   (c) Years of stay in other institutes (Stay_Others)

   (d) Relevance of IIT degree to the current profession (Rel_IIT)

   (e) Relevance of other degrees to the current profession vis-a-vis IIT's degree (s) (Rel_Others)

   (f) Years of stay in Village_Town, (Y_vill_town)

   (g) Years of stay in City & Metropolitan City (Y_city_mcity)

7. Regress the independent variables identified on each of E, T, S, P, O and CI to determine the relationship of the factors with the degree of impact.

   The nature of the functions would depend on the type of data representing the independent variables and their relationships.

   The entire operation (Step 1 to Step 7) would be applied to different sets of data indicating different sets of alumni to obtain comparisons between the sets and the nature of differential impacts. The sets here are defined based on professional classification since it was conceived that impacts are conditioned by professional differences.

   The following chapter analysis this feature :

(a) All alumni etc.

(b) IIT KGP graduates

(c) Other graduates

(d) IIT KGP graduates and post graduates

(e) Doctoral alumni

(f) Graduates from different disciplines

The impact factors for responding alumni are compiled in the following tables. (Impact Indices)

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
1/20/012	0.25	0.80	0.39	0.91	1.00	0.67
1/20/016	0.25	0.79	0.57	0.76	0.67	0.61
1/20/019	0.24	0.00	0.65	0.78	0.33	0.40
1/20/024	0.31	0.30	0.85	0.84	0.67	0.59
1/20/025	0.34	0.30	0.55	0.32	0.33	0.37
1/20/108	0.22	0.38	0.59	0.76	0.67	0.52
1/20/500	0.27	0.70	0.47	0.70	0.67	0.56
1/20/545	0.21	0.20	0.57	0.56	0.33	0.37
1/20/546	0.21	0.30	0.56	0.44	0.33	0.37
1/21/215	0.28	0.72	0.70	0.82	0.67	0.64
1/21/216	0.28	0.22	0.30	0.00	0.00	0.16
1/21/221	0.22	0.29	0.50	0.74	0.33	0.42
1/21/362	0.22	0.10	0.65	0.72	0.33	0.40
1/21/381	0.22	0.72	0.68	0.66	0.33	0.52
1/21/549	0.27	0.29	0.53	0.80	0.67	0.51
1/21/550	0.26	0.00	0.80	0.89	0.00	0.39
1/22/031	0.22	0.29	0.50	0.44	0.33	0.36
1/22/034	0.22	0.79	0.58	0.89	0.67	0.63
1/22/035	0.29	0.80	0.76	0.99	1.00	0.77
1/22/036	0.24	0.70	0.69	0.94	0.67	0.65
1/22/039	0.26	0.22	0.80	0.67	0.33	0.46
1/22/135	0.20	0.07	0.57	0.41	0.00	0.25
1/22/225	0.26	0.22	0.49	0.90	0.00	0.37
1/22/387	0.32	0.70	0.55	0.79	0.33	0.54
1/22/463	0.31	0.22	0.41	0.89	1.00	0.57
1/22/505	0.16	0.30	0.51	0.77	0.67	0.48
1/23/041	0.24	0.80	0.71	0.86	1.00	0.72
1/23/230	0.27	0.07	0.53	0.71	0.33	0.38
1/23/290	0.31	0.15	0.59	0.77	0.33	0.43
1/23/396	0.26	0.57	0.57	0.78	0.67	0.57
1/23/507	0.29	0.72	0.55	0.78	0.67	0.60
1/23/508	0.26	0.30	0.47	0.41	0.67	0.42
1/24/045	0.29	0.93	0.75	0.80	0.33	0.62
1/24/047	0.26	0.15	0.61	0.67	0.33	0.40
1/24/049	0.24	0.72	0.61	0.80	0.67	0.61
1/24/142	0.25	0.20	0.54	0.88	0.33	0.44
1/24/143	0.27	0.00	0.58	0.38	0.00	0.25
1/24/146	0.17	0.22	0.57	0.56	0.33	0.37
1/24/318	0.24	0.22	0.65	0.86	0.67	0.53
1/24/404	0.20	0.07	0.84	0.89	0.00	0.40
1/24/473	0.23	0.22	0.60	0.73	1.00	0.56
1/24/477	0.26	0.90	0.65	0.82	0.33	0.59
1/25/149	0.29	0.15	0.54	0.56	0.00	0.31
1/25/236	0.25	0.22	0.58	0.69	0.67	0.48
1/25/237	0.31	0.15	0.55	0.68	0.00	0.34
1/25/238	0.31	0.22	0.61	0.56	1.00	0.54
1/25/264	0.16	0.25	0.75	0.68	0.00	0.37
1/25/294	0.31	0.50	0.70	0.82	0.33	0.53
1/25/512	0.28	0.40	0.55	0.70	0.33	0.45
1/26/157	0.26	0.38	0.87	0.82	0.00	0.47

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
1/26/321	0.33	0.15	0.58	0.79	0.33	0.44
1/26/324	0.20	0.00	0.54	0.66	0.33	0.35
1/26/415	0.38	0.07	0.65	1.00	0.00	0.42
1/26/416	0.27	0.30	0.79	0.51	0.33	0.44
1/26/417	0.22	0.00	0.71	0.54	0.33	0.36
1/26/515	0.29	0.30	0.74	0.73	0.67	0.55
1/26/519	0.23	0.20	0.56	0.67	0.33	0.40
1/26/530	0.20	0.40	0.47	0.08	0.33	0.30
1/26/563	0.30	0.72	0.36	0.42	0.67	0.49
1/27/067	0.33	0.38	0.73	0.77	0.33	0.51
1/27/068	0.21	0.00	0.77	0.70	0.00	0.34
1/27/075	0.25	0.20	0.51	0.47	0.33	0.35
1/27/161	0.33	0.00	0.62	0.63	0.00	0.32
1/27/163	0.23	0.07	0.40	0.52	0.00	0.24
1/27/165	0.34	0.20	0.58	0.91	0.00	0.41
1/27/242	0.23	0.29	0.51	0.73	0.33	0.42
1/27/303	0.18	0.07	0.37	0.53	0.00	0.23
1/27/325	0.19	0.10	0.64	0.83	0.00	0.35
1/27/326	0.22	0.22	0.61	0.52	0.33	0.38
1/27/329	0.19	0.10	0.37	0.54	0.00	0.24
1/27/330	0.28	0.72	0.36	0.73	0.67	0.55
1/27/360	0.34	0.25	0.73	0.80	0.67	0.56
1/27/369	0.34	0.15	0.48	0.90	0.67	0.51
1/27/430	0.26	0.22	0.67	0.87	0.33	0.47
1/27/487	0.32	0.38	0.29	0.77	0.33	0.42
1/28/006	0.27	0.15	0.45	0.83	0.67	0.47
1/28/076	0.33	0.79	0.66	0.57	0.67	0.60
1/28/174	0.14	0.07	0.60	0.89	0.00	0.34
1/28/178	0.48	0.20	0.62	0.97	0.33	0.52
1/28/273	0.27	0.15	0.31	0.19	0.00	0.18
1/28/277	0.27	0.22	0.51	0.60	0.33	0.39
1/28/336	0.29	0.60	0.73	1.00	0.33	0.59
1/28/340	0.24	0.20	0.35	0.79	0.67	0.45
1/28/344	0.23	0.30	0.64	0.87	0.33	0.47
1/28/443	0.21	0.15	0.43	0.66	0.33	0.36
1/28/574	0.17	0.30	0.62	0.47	0.67	0.45
1/28/576	0.18	0.15	0.65	0.68	0.00	0.33
1/28/579	0.20	0.22	0.67	0.87	0.33	0.46
1/28/587	0.29	0.20	0.75	0.96	0.67	0.57
1/29/090	0.31	0.65	0.85	0.98	0.33	0.62
1/29/185	0.24	0.07	0.49	0.42	0.33	0.31
1/29/248	0.25	0.00	0.44	0.77	0.00	0.29
1/29/307	0.33	0.00	0.89	0.81	0.33	0.47
1/29/498	0.29	0.00	0.44	0.72	0.33	0.36
1/29/535	0.30	0.00	0.60	0.64	0.33	0.37
1/29/581	0.23	0.20	0.51	0.82	0.33	0.42
1/29/589	0.25	0.80	0.63	0.68	0.67	0.61
2/74/009	0.22	0.00	0.78	0.90	0.33	0.45
2/74/014	0.20	0.30	0.64	0.81	0.67	0.52
2/74/015	0.36	0.80	0.37	0.50	0.67	0.54

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
2/74/016	0.26	0.00	0.68	0.82	0.33	0.42
2/74/023	0.33	0.20	0.58	0.60	0.33	0.41
2/74/024	0.20	0.10	0.72	0.93	0.33	0.46
2/74/030	0.25	0.10	0.67	0.82	0.33	0.43
2/74/036	0.14	0.00	0.69	0.46	0.00	0.26
2/74/038	0.24	0.20	0.65	0.72	0.67	0.50
2/74/053	0.27	0.00	0.71	0.59	0.33	0.38
2/74/060	0.23	0.00	0.44	0.63	0.00	0.26
2/74/089	0.24	0.30	0.48	0.83	0.33	0.44
2/74/113	0.15	0.00	0.59	0.82	0.00	0.31
2/74/118	0.21	0.20	0.62	0.52	0.67	0.44
2/74/123	0.29	0.00	0.58	0.50	0.33	0.34
2/74/125	0.26	0.00	0.51	0.72	0.33	0.36
2/74/125	0.26	0.00	0.51	0.72	0.33	0.36
2/74/162	0.19	0.00	0.55	0.43	0.33	0.30
2/74/168	0.21	0.00	0.50	0.67	0.67	0.41
2/74/177	0.22	0.00	0.74	0.80	0.00	0.35
2/74/193	0.21	0.00	0.24	0.00	0.00	0.09
2/75/005	0.21	0.30	0.77	0.66	0.67	0.52
2/75/008	0.25	0.00	0.72	0.81	0.33	0.42
2/75/011	0.22	0.00	0.68	0.86	0.33	0.42
2/75/048	0.22	0.10	0.65	0.78	0.67	0.48
2/75/064	0.26	0.70	0.51	0.73	0.33	0.51
2/75/067	0.25	0.00	0.39	0.73	0.33	0.34
2/75/081	0.15	0.50	0.44	0.64	0.00	0.35
2/75/083	0.15	0.20	0.53	0.73	0.00	0.32
2/75/093	0.22	0.00	0.48	0.83	1.00	0.51
2/75/095	0.32	0.10	0.57	0.83	0.33	0.43
2/75/117	0.22	0.00	0.72	0.83	0.00	0.35
2/75/159	0.15	0.13	0.52	0.43	0.33	0.31
2/75/181	0.20	0.20	0.56	0.61	0.33	0.38
2/76/007	0.23	0.30	0.81	0.73	0.67	0.55
2/76/071	0.26	0.70	0.48	0.84	0.00	0.46
2/76/080	0.25	0.38	0.68	0.87	0.33	0.50
2/76/088	0.25	0.00	0.65	0.28	0.33	0.30
2/76/090	0.20	0.00	0.61	0.78	0.33	0.38
2/76/093	0.25	0.30	0.55	0.59	0.33	0.40
2/76/113	0.29	0.10	0.63	0.84	0.33	0.44
2/76/114	0.32	0.00	0.67	0.97	0.33	0.46
2/76/130	0.30	0.30	0.43	0.77	0.67	0.49
2/76/139	0.35	0.00	0.66	0.78	0.67	0.49
2/76/140	0.18	0.20	0.41	0.89	0.00	0.34
2/76/146	0.19	0.00	0.48	0.64	0.33	0.33
2/76/162	0.23	0.00	0.45	0.43	0.67	0.36
2/76/169	0.09	0.00	0.45	0.87	0.67	0.42
2/76/170	1.00	0.00	0.45	0.80	0.33	0.52
2/76/187	0.09	0.00	0.69	0.93	0.33	0.41
2/76/193	0.21	0.30	0.39	0.00	0.00	0.18
2/76/194	0.20	0.00	0.72	0.67	0.33	0.38
2/76/201	0.20	0.30	0.58	0.66	0.33	0.41

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
2/76/204	0.20	0.20	0.30	0.53	0.67	0.38
2/76/211	0.23	0.80	0.61	0.62	0.33	0.52
2/76/212	0.24	0.20	0.59	0.84	0.33	0.44
2/76/213	0.21	0.25	0.51	0.83	0.33	0.43
2/76/216	0.12	0.20	0.74	0.89	0.00	0.39
2/76/225	0.24	0.20	0.47	0.88	0.67	0.49
2/76/235	0.29	0.70	0.49	0.49	0.67	0.53
2/77/003	0.25	0.30	0.50	0.64	0.33	0.40
2/77/004	0.26	0.30	0.45	0.00	0.33	0.27
2/77/006	0.18	0.00	0.69	0.86	0.33	0.41
2/77/027	0.25	0.70	0.65	0.72	1.00	0.66
2/77/028	0.26	0.30	0.74	0.80	0.67	0.55
2/77/031	0.17	0.00	0.71	0.88	0.33	0.42
2/77/035	0.25	0.00	0.46	0.77	0.33	0.36
2/77/037	0.30	0.00	0.54	0.60	0.33	0.35
2/77/043	0.23	0.00	0.63	0.83	0.00	0.34
2/77/051	0.25	0.90	0.74	0.68	0.67	0.65
2/77/067	0.20	0.00	0.38	0.00	0.00	0.12
2/77/089	0.16	0.00	0.73	0.81	0.00	0.34
2/77/097	0.25	0.00	0.65	0.89	0.33	0.42
2/77/099	0.26	0.30	0.65	0.72	0.33	0.45
2/77/116	0.25	0.20	0.60	0.60	0.67	0.46
2/77/148	0.22	0.30	0.66	0.78	0.67	0.53
2/77/149	0.23	0.00	0.47	0.64	0.33	0.33
2/78/006	0.41	0.00	0.66	0.88	0.00	0.39
2/78/007	0.27	0.20	0.49	0.70	0.33	0.40
2/78/014	0.23	0.00	0.42	0.58	0.33	0.31
2/78/017	0.27	0.70	0.70	0.72	0.33	0.54
2/78/024	0.25	0.00	0.93	0.92	0.33	0.49
2/78/040	0.29	0.00	0.46	0.63	0.33	0.34
2/78/045	0.22	0.30	0.80	0.66	0.33	0.46
2/78/052	0.13	0.00	0.26	0.37	0.00	0.15
2/78/059	0.22	0.30	0.68	0.69	0.33	0.44
2/78/060	0.25	0.80	0.49	0.64	0.33	0.50
2/78/073	0.29	0.34	0.49	0.67	0.33	0.42
2/78/074	0.31	0.00	0.86	0.90	0.33	0.48
2/78/084	0.22	0.00	0.64	0.72	0.33	0.38
2/78/101	0.20	0.13	0.39	0.71	0.33	0.35
2/78/102	0.26	0.25	0.48	0.64	0.33	0.39
2/78/103	0.29	0.70	0.64	0.96	0.33	0.58
2/78/109	0.40	0.00	0.57	0.79	0.33	0.42
2/78/127	0.18	0.00	0.71	0.79	0.33	0.40
2/78/131	0.27	0.00	0.46	0.59	0.33	0.33
2/78/145	0.18	0.00	0.41	0.59	0.33	0.30
2/78/151	0.22	0.30	0.54	0.87	0.33	0.45
2/78/154	0.18	0.30	0.47	0.71	0.33	0.40
2/78/155	0.25	0.40	0.50	0.81	0.67	0.53
2/78/170	0.24	0.10	0.37	0.76	0.67	0.43
2/78/176	0.17	0.50	0.52	0.72	0.67	0.52
2/78/190	0.20	0.00	0.66	0.81	0.33	0.40

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
2/78/201	0.36	0.00	0.47	0.69	0.00	0.30
2/78/206	0.25	0.20	0.44	0.80	0.33	0.40
2/78/210	0.32	0.10	0.40	0.57	0.67	0.41
2/78/223	0.28	0.10	0.63	0.67	0.33	0.40
2/78/234	0.24	0.00	0.61	0.74	0.00	0.32
2/78/236	0.30	0.17	0.61	0.79	0.67	0.51
2/78/247	0.24	0.70	0.63	0.87	0.67	0.62
2/79/002	0.18	0.00	0.61	0.82	0.00	0.32
2/79/004	0.16	0.00	0.61	0.89	0.00	0.33
2/79/006	0.19	0.00	0.68	0.53	0.00	0.28
2/79/007	0.22	0.00	0.49	0.78	0.33	0.36
2/79/015	0.15	0.00	0.73	0.70	0.33	0.38
2/79/019	0.20	0.00	0.83	0.82	0.33	0.44
2/79/022	0.30	0.30	0.58	0.71	0.67	0.51
2/79/035	0.25	0.00	0.60	0.72	0.33	0.38
2/79/043	0.18	0.00	0.37	0.33	0.00	0.18
2/79/049	0.25	0.00	0.74	0.64	0.33	0.39
2/79/050	0.21	0.00	0.55	0.64	0.00	0.28
2/79/057	0.36	0.00	0.58	0.80	0.00	0.35
2/79/061	0.25	0.10	0.79	0.80	0.33	0.45
2/79/065	0.19	0.00	0.33	0.44	0.00	0.19
2/79/069	0.38	0.20	0.48	0.60	0.67	0.47
2/79/071	0.24	0.25	0.68	0.86	0.33	0.47
2/79/072	0.23	0.00	0.84	0.83	0.33	0.45
2/79/073	0.31	0.00	0.50	0.60	0.33	0.35
2/79/095	0.17	0.50	0.51	0.82	0.33	0.47
2/79/096	0.17	0.10	0.80	1.00	0.33	0.48
2/79/098	0.28	0.13	0.62	0.90	0.00	0.39
2/79/110	0.38	0.20	0.47	0.89	0.33	0.45
2/79/134	0.33	0.00	0.48	0.74	0.33	0.38
2/79/143	0.26	0.00	0.43	0.77	0.33	0.36
2/79/145	0.46	0.00	0.68	0.67	0.00	0.36
2/79/171	0.18	0.10	0.67	0.72	0.33	0.40
2/79/181	0.29	0.00	0.48	0.84	0.00	0.32
2/79/210	0.22	0.50	0.36	0.00	0.67	0.35
2/79/217	0.23	0.80	0.88	0.90	0.33	0.63
2/79/221	0.23	0.00	0.92	0.83	0.00	0.40
2/79/223	0.23	0.38	0.58	0.82	0.33	0.47
2/79/225	0.22	0.25	0.58	1.00	0.33	0.48
2/79/228	0.19	0.70	0.72	0.90	0.67	0.64
2/79/230	0.19	0.00	0.46	0.73	0.00	0.28
2/79/235	0.23	0.10	0.72	0.93	0.00	0.40
2/79/243	0.21	0.20	0.76	0.51	0.00	0.34
2/79/260	0.16	0.00	0.75	0.50	0.00	0.28
2/79/272	0.23	0.00	0.64	0.67	0.33	0.37
2/79/279	0.27	0.20	0.74	0.51	0.33	0.41
2/80/006	0.26	0.00	0.66	0.89	0.33	0.43
2/80/009	0.14	0.25	0.57	0.86	0.33	0.43
2/80/049	0.22	0.00	0.74	0.68	0.00	0.33
2/80/055	0.22	0.50	0.59	0.84	0.33	0.50

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
2/80/058	0.20	0.00	0.49	0.90	0.33	0.38
2/80/065	0.21	0.00	0.32	0.69	0.33	0.31
2/80/080	0.26	0.00	0.42	0.00	0.00	0.14
2/80/103	0.29	0.20	0.68	0.86	0.33	0.47
2/80/135	0.17	0.00	0.38	0.78	0.33	0.33
2/80/136	0.20	0.10	0.75	0.92	0.33	0.46
2/80/138	0.24	0.00	0.42	0.76	0.33	0.35
2/80/139	0.27	0.00	0.38	0.56	0.33	0.31
2/80/142	0.16	0.00	0.56	0.63	0.33	0.34
2/80/143	0.24	0.00	0.60	0.74	0.00	0.32
2/80/146	0.25	0.00	0.65	0.78	0.33	0.40
2/80/153	0.26	0.20	0.49	0.54	0.33	0.36
2/80/167	0.23	0.00	0.30	0.56	0.33	0.28
2/80/168	0.26	0.00	0.62	0.78	0.33	0.40
2/80/174	0.16	0.00	0.81	0.68	0.00	0.33
2/80/179	0.22	0.25	0.58	0.86	0.33	0.45
2/80/189	0.29	0.00	0.54	0.84	0.33	0.40
2/80/190	0.20	0.50	0.59	0.79	0.67	0.55
2/80/191	0.33	0.00	0.59	0.83	0.33	0.42
2/80/195	0.22	0.25	0.69	0.63	0.00	0.36
2/80/196	0.43	0.20	0.66	0.83	0.33	0.49
2/80/199	0.44	0.10	0.69	0.60	0.00	0.37
2/80/212	0.22	0.00	0.64	0.66	0.00	0.30
2/80/218	0.19	0.00	0.70	0.56	0.00	0.29
2/80/221	0.12	0.10	0.36	0.00	0.00	0.12
2/80/230	0.26	0.00	0.49	0.52	0.00	0.25
2/80/233	0.19	0.00	0.63	0.57	0.00	0.28
2/80/234	0.16	0.00	0.30	0.59	0.00	0.21
2/80/237	0.21	0.30	0.41	0.68	0.33	0.39
2/80/239	0.23	0.30	0.54	0.66	0.00	0.35
2/81/013	0.22	0.00	0.86	0.81	0.67	0.51
2/81/023	0.23	0.00	0.68	0.48	0.33	0.34
2/81/029	0.26	0.00	0.41	0.56	0.33	0.31
2/81/068	0.26	0.70	0.66	0.51	0.67	0.56
2/81/070	0.29	0.00	0.75	0.93	0.00	0.39
2/81/072	0.36	0.38	0.76	0.90	0.33	0.55
2/81/083	0.18	0.20	0.66	0.68	0.67	0.48
2/81/084	0.21	0.30	0.46	0.87	0.33	0.43
2/81/085	0.22	0.30	0.46	0.80	0.33	0.42
2/81/096	0.24	0.00	0.54	0.66	0.33	0.35
2/81/114	0.19	0.00	0.63	0.76	0.00	0.32
2/81/126	0.18	0.20	0.57	0.73	0.33	0.40
2/81/136	0.33	0.20	0.62	0.70	0.33	0.44
2/81/139	0.25	0.00	0.61	0.74	0.00	0.32
2/81/149	0.26	0.00	0.61	0.93	0.33	0.43
2/81/154	0.49	0.00	0.53	0.62	0.33	0.39
2/81/161	0.21	0.13	0.84	0.90	0.00	0.42
2/81/178	0.17	0.25	0.74	0.87	0.33	0.47
2/81/180	0.20	0.00	0.84	0.76	0.00	0.36
2/81/184	0.15	0.00	0.77	0.83	0.33	0.42

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
2/81/196	0.21	0.00	0.48	0.73	0.00	0.28
2/81/197	0.21	0.20	0.46	0.71	0.33	0.38
2/81/198	0.26	0.00	0.51	0.70	0.67	0.43
2/81/200	0.13	0.20	0.90	0.80	0.33	0.47
2/81/210	0.24	0.00	0.63	0.56	0.33	0.35
2/81/214	0.15	0.25	0.71	0.90	0.33	0.47
2/81/216	0.20	0.00	0.72	0.53	0.00	0.29
2/81/228	0.26	0.00	0.49	0.71	0.00	0.29
2/82/012	0.21	0.00	0.88	0.70	0.33	0.42
2/82/022	0.16	0.00	0.59	0.00	0.00	0.15
2/82/052	0.27	0.00	0.56	0.72	0.00	0.31
2/82/054	0.24	0.00	0.61	0.80	0.33	0.40
2/82/058	0.26	0.00	0.45	0.67	0.33	0.34
2/82/085	0.21	0.13	0.61	0.78	0.00	0.35
2/82/087	0.29	0.50	0.67	0.76	0.67	0.58
2/82/088	0.18	0.00	0.49	0.48	0.00	0.23
2/82/098	0.25	0.00	0.65	0.80	0.33	0.41
2/82/107	0.19	0.00	0.47	0.63	0.33	0.32
2/82/121	0.33	0.00	0.69	0.69	0.33	0.41
2/82/123	0.58	0.30	0.42	0.37	0.67	0.47
2/82/141	0.19	0.00	0.64	0.89	0.67	0.48
2/82/148	0.20	0.00	0.75	0.82	0.33	0.42
2/82/159	0.27	0.00	0.69	0.80	0.33	0.42
2/82/171	0.17	0.00	0.50	0.58	0.00	0.25
2/82/175	0.24	0.00	0.45	0.91	0.67	0.45
2/82/196	0.13	0.00	0.61	0.58	0.00	0.26
2/82/223	0.30	0.00	0.37	0.16	0.33	0.23
2/82/225	0.23	0.00	0.39	0.71	0.00	0.27
2/82/237	0.14	0.00	0.76	0.69	0.00	0.32
2/82/241	0.19	0.00	0.49	0.77	0.33	0.36
2/82/245	0.30	0.10	0.48	0.60	0.33	0.36
2/82/246	0.28	0.20	0.71	0.78	0.67	0.53
2/83/007	0.19	0.00	0.76	0.96	0.33	0.45
2/83/008	0.45	0.00	0.48	0.57	0.00	0.30
2/83/009	0.27	0.00	0.46	0.80	0.33	0.37
2/83/015	0.22	0.10	0.69	0.89	0.00	0.38
2/83/042	0.20	0.00	0.52	0.84	0.33	0.38
2/83/044	0.14	0.00	0.51	0.78	0.33	0.35
2/83/052	0.14	0.00	0.55	0.64	0.00	0.27
2/83/054	0.22	0.00	0.53	0.82	0.33	0.38
2/83/056	0.19	0.00	0.63	0.83	0.33	0.40
2/83/069	0.43	0.00	0.56	0.76	0.33	0.42
2/83/073	0.20	0.00	0.63	0.89	0.00	0.34
2/83/077	0.25	0.00	0.58	0.88	0.00	0.34
2/83/096	0.21	0.00	0.69	0.50	0.00	0.28
2/83/107	0.24	0.10	0.26	0.54	0.33	0.29
2/83/128	0.28	0.10	0.48	0.61	0.33	0.36
2/83/130	0.30	0.70	0.55	0.80	0.67	0.60
2/83/137	0.20	0.00	0.58	0.88	0.00	0.33
2/83/138	0.21	0.80	0.68	0.86	0.67	0.64

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
2/83/139	0.22	0.80	0.71	0.89	1.00	0.72
2/83/144	0.25	0.50	0.63	0.71	0.67	0.55
2/83/158	0.22	0.00	0.38	0.43	0.33	0.27
2/83/196	0.53	0.00	0.61	0.68	0.33	0.43
2/83/230	0.21	0.70	0.53	0.69	0.33	0.49
2/83/255	0.20	0.40	0.70	0.30	0.00	0.32
2/83/257	0.19	0.00	0.51	0.58	0.33	0.32
2/83/279	0.21	0.00	0.37	0.68	0.33	0.32
2/83/280	0.39	0.00	0.63	0.98	0.33	0.47
2/83/286	0.21	0.10	0.65	0.69	0.33	0.40
2/83/295	0.18	0.20	0.41	0.76	0.00	0.31
2/83/303	0.17	0.00	0.84	0.88	0.33	0.44
2/83/539	0.22	0.00	0.56	0.64	0.00	0.28
3/74/004	0.21	0.30	0.70	0.54	0.00	0.35
3/74/024	0.18	0.00	0.61	0.77	0.00	0.31
3/74/025	0.38	0.00	0.59	0.79	0.00	0.35
3/74/028	0.08	0.30	0.30	0.13	0.00	0.16
3/74/053	0.27	0.00	0.71	0.59	0.33	0.38
3/74/095	0.17	0.00	0.54	0.88	0.00	0.32
3/74/161	0.51	0.00	0.56	0.67	0.33	0.41
3/74/172	0.15	0.00	0.61	0.72	0.33	0.36
3/74/173	0.28	0.10	0.46	0.58	0.33	0.35
3/74/174	0.24	0.00	0.58	0.74	0.00	0.31
3/74/185	0.29	0.00	0.44	0.66	0.33	0.34
3/74/201	0.49	0.00	0.47	0.44	0.00	0.28
3/74/204	0.11	0.00	0.52	0.81	0.33	0.35
3/74/210	0.18	0.10	0.59	0.78	0.33	0.40
3/74/214	0.20	0.20	0.57	0.74	0.33	0.41
3/74/228	0.10	0.00	0.69	0.69	0.00	0.30
3/74/230	0.39	0.00	0.67	0.90	0.33	0.46
3/74/234	0.40	0.00	0.46	0.62	0.00	0.30
3/74/240	0.16	0.00	0.70	0.80	0.33	0.40
3/74/255	0.15	0.20	0.68	0.78	0.33	0.43
3/74/260	0.26	0.00	0.48	0.67	0.33	0.35
3/74/263	0.10	0.00	0.76	0.90	0.33	0.42
3/74/268	0.36	0.34	0.71	0.94	0.33	0.54
3/74/275	0.29	0.00	0.62	0.59	0.33	0.37
3/75/027	0.23	0.00	0.71	0.56	0.33	0.37
3/75/030	0.22	0.10	0.65	0.84	0.33	0.43
3/75/039	0.37	0.00	0.69	0.78	0.33	0.43
3/75/040	0.26	0.00	0.50	0.64	0.33	0.35
3/75/047	0.33	0.00	0.61	0.68	0.33	0.39
3/75/059	0.24	0.00	0.56	0.68	0.33	0.36
3/75/084	0.15	0.00	0.57	0.78	0.33	0.37
3/75/097	0.31	0.70	0.65	0.74	0.33	0.55
3/75/121	0.17	0.00	0.55	0.54	0.00	0.25
3/75/145	0.22	0.30	0.48	0.24	0.67	0.38
3/75/154	0.56	0.00	0.72	0.30	0.33	0.38
3/75/174	0.28	0.00	0.35	0.84	0.33	0.36
3/75/204	0.32	0.20	0.72	0.86	0.67	0.55

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
3/75/208	0.17	0.00	0.72	1.00	0.00	0.38
3/75/237	0.22	0.00	0.75	0.87	0.67	0.50
3/75/244	0.20	0.20	0.66	0.76	0.33	0.43
3/75/245	0.23	0.00	0.38	0.22	0.00	0.17
3/75/255	0.19	0.00	0.63	0.73	0.33	0.38
3/75/259	0.28	0.00	0.67	0.76	0.00	0.34
3/76/019	0.12	0.00	0.60	0.78	0.00	0.30
3/76/027	0.23	0.00	0.54	0.87	0.00	0.33
3/76/044	0.24	0.17	0.42	0.79	0.00	0.32
3/76/051	0.50	0.00	0.58	1.00	0.33	0.48
3/76/056	0.20	0.00	0.49	0.53	0.33	0.31
3/76/075	0.24	0.00	0.67	0.81	0.33	0.41
3/76/076	0.24	0.00	0.60	0.78	0.00	0.32
3/76/077	0.20	0.00	0.67	0.79	0.33	0.40
3/76/084	0.19	0.00	0.44	0.00	0.00	0.13
3/76/090	0.15	0.00	0.93	0.90	0.00	0.40
3/76/135	0.11	0.00	0.59	0.93	0.33	0.39
3/76/151	0.41	0.00	0.61	0.80	0.00	0.36
3/76/162	0.29	0.00	0.51	0.78	0.33	0.38
3/76/187	0.08	0.00	0.51	0.86	0.00	0.29
3/76/206	0.19	0.00	0.57	0.63	0.33	0.34
3/76/214	0.19	0.20	0.46	0.53	0.33	0.34
3/77/077	0.21	0.00	0.56	0.71	0.33	0.36
3/77/078	0.52	0.00	0.66	0.81	0.67	0.53
3/77/092	0.21	0.00	0.60	0.84	0.33	0.40
3/77/093	0.25	0.00	0.77	0.00	0.00	0.20
3/77/097	0.25	0.00	0.55	0.67	0.00	0.29
3/77/105	0.22	0.00	0.40	0.67	0.00	0.26
3/77/167	0.25	0.00	0.40	0.77	0.67	0.42
3/77/209	0.17	0.00	0.75	0.87	0.33	0.42
3/77/211	0.21	0.20	0.73	0.91	0.67	0.54
3/77/236	0.21	0.00	0.63	0.76	0.67	0.45
3/77/239	0.22	0.00	0.49	0.78	0.67	0.43
3/78/004	0.17	0.70	0.70	0.86	0.67	0.62
3/78/009	0.18	0.30	0.53	0.74	0.33	0.42
3/78/018	0.18	0.00	0.57	0.72	0.67	0.43
3/78/019	0.21	0.00	0.58	0.96	0.00	0.35
3/78/030	0.25	0.00	0.59	0.84	0.00	0.34
3/78/040	0.27	0.70	0.56	0.66	0.33	0.50
3/78/041	0.20	0.00	0.69	0.83	0.00	0.34
3/78/042	0.21	0.00	0.52	0.86	0.33	0.38
3/78/059	0.24	0.00	0.62	0.66	0.00	0.30
3/78/066	0.31	0.00	0.45	0.47	0.33	0.31
3/78/073	0.13	0.00	0.56	0.71	0.00	0.28
3/78/089	0.25	0.20	0.48	0.66	0.67	0.45
3/78/095	0.19	0.00	0.46	0.69	0.00	0.27
3/78/126	0.43	0.00	0.49	0.76	0.33	0.40
3/78/143	0.22	0.00	0.55	0.86	0.33	0.39
3/78/153	0.17	0.00	0.53	0.74	0.00	0.29
3/78/164	0.23	0.00	0.60	0.90	0.33	0.41

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
3/78/191	0.30	0.30	0.74	0.76	0.33	0.49
3/79/006	0.20	0.00	0.56	0.68	0.00	0.29
3/79/011	0.23	0.80	0.71	0.61	0.00	0.47
3/79/043	0.39	0.00	0.65	0.00	0.00	0.21
3/79/054	0.38	0.00	0.63	0.87	0.33	0.44
3/79/055	0.19	0.00	0.69	0.81	0.33	0.40
3/79/058	0.29	0.00	0.58	0.67	0.33	0.37
3/79/068	0.19	0.50	0.40	0.66	0.00	0.35
3/79/071	0.20	0.00	0.49	0.83	0.67	0.44
3/79/085	0.20	0.00	0.37	0.61	0.67	0.37
3/79/126	0.21	0.00	0.74	0.62	0.00	0.31
3/79/127	0.44	0.00	0.51	0.61	0.67	0.45
3/79/133	0.24	0.00	0.69	0.74	0.33	0.40
3/79/163	0.20	0.00	0.68	0.61	0.33	0.36
3/79/164	0.20	0.00	0.68	0.74	0.00	0.32
3/79/203	0.11	0.00	0.50	0.80	0.67	0.42
3/79/206	0.38	0.00	0.67	0.93	0.00	0.40
3/79/213	0.19	0.00	0.63	0.67	0.00	0.30
3/79/237	0.28	0.30	0.51	0.86	0.67	0.52
3/79/274	0.18	0.00	0.92	0.74	0.00	0.37
3/79/279	0.24	0.00	0.57	0.63	0.33	0.35
3/79/298	0.15	0.00	0.53	0.60	0.33	0.32
3/79/302	0.35	0.00	0.61	0.86	0.33	0.43
3/79/305	0.31	0.00	0.78	0.94	0.33	0.47
3/79/307	0.15	0.00	0.30	0.09	0.33	0.17
3/79/311	0.37	0.00	0.30	0.42	0.33	0.28
3/79/314	0.10	0.00	0.43	0.72	0.33	0.32
3/80/012	0.24	0.00	0.61	0.50	0.33	0.34
3/80/021	0.17	0.00	0.58	0.87	0.00	0.32
3/80/025	0.23	0.00	0.70	0.80	0.00	0.35
3/80/050	0.44	0.30	0.58	0.78	0.67	0.55
3/80/054	0.22	0.00	0.53	0.74	0.33	0.36
3/80/063	0.20	0.00	0.54	0.47	0.33	0.31
3/80/078	0.26	0.00	0.63	0.62	0.00	0.30
3/80/081	0.18	0.00	0.49	0.71	0.33	0.34
3/80/090	0.38	0.00	0.54	0.63	0.00	0.31
3/80/106	0.21	0.20	0.68	0.69	0.00	0.36
3/80/117	0.40	0.10	0.75	1.00	0.33	0.52
3/80/165	0.24	0.00	0.61	0.84	0.67	0.47
3/80/223	0.25	0.20	0.30	0.87	0.33	0.39
3/80/233	0.13	0.00	0.71	0.42	0.00	0.25
3/80/234	0.40	0.00	0.58	0.90	0.00	0.38
3/80/259	0.15	0.10	0.45	0.39	0.33	0.28
3/80/267	0.29	0.00	0.55	0.86	0.33	0.41
3/80/272	0.15	0.00	0.73	0.82	0.33	0.41
3/80/276	0.24	0.00	0.49	0.70	0.33	0.35
3/81/003	0.24	0.00	0.58	0.84	0.33	0.40
3/81/008	0.26	0.00	0.44	0.00	0.33	0.21
3/81/030	0.21	0.00	0.53	0.40	0.00	0.23
3/81/061	0.28	0.00	0.69	0.69	0.00	0.33

Impact Indices

Id	Economic Impact	Techno-Scientific Impact	Socio-Cultural Impact	Personal Impact	Other Impact	Composite Impact
3/81/062	0.20	0.00	0.53	0.89	0.33	0.39
3/81/147	0.25	0.00	0.40	0.00	0.00	0.13
3/81/157	0.20	0.00	0.34	0.74	0.33	0.32
3/81/171	0.24	0.00	0.46	0.78	0.00	0.30
3/81/173	0.23	0.00	0.63	0.86	0.33	0.41
3/81/204	0.32	0.00	0.43	0.54	0.00	0.26
3/81/249	0.21	0.00	0.50	0.80	0.33	0.37
3/81/256	0.23	0.00	0.75	0.58	0.33	0.38
3/81/258	0.24	0.00	0.46	0.69	0.00	0.28
3/81/271	0.23	0.00	0.62	1.00	0.33	0.44
3/81/277	0.23	0.00	0.38	0.50	0.33	0.29
3/81/281	0.38	0.00	0.61	0.78	0.33	0.42
3/81/289	0.16	0.00	0.61	0.69	0.33	0.36
3/82/016	0.24	0.00	0.69	0.96	0.00	0.38
3/82/017	0.32	0.00	0.45	0.86	0.00	0.33
3/82/019	0.45	0.00	0.63	0.80	0.00	0.38
3/82/024	0.16	0.00	0.69	0.78	0.00	0.33
3/82/043	0.34	0.00	0.65	0.87	0.67	0.51
3/82/068	0.24	0.00	0.86	0.78	0.00	0.38
3/82/071	0.21	0.00	0.62	0.56	0.33	0.34
3/82/075	0.24	0.00	0.66	0.89	0.00	0.36
3/82/086	0.10	0.00	0.58	0.69	0.33	0.34
3/82/115	0.18	0.00	0.42	0.53	0.00	0.23
3/82/124	0.18	0.00	0.48	0.21	0.00	0.17
3/82/157	0.24	0.00	0.80	0.97	0.00	0.40
3/82/161	0.24	0.00	0.64	0.82	0.33	0.41
3/82/179	0.18	0.00	0.55	0.61	0.00	0.27
3/82/186	0.19	0.00	0.90	0.83	0.00	0.38
3/82/190	0.25	0.00	0.68	0.96	0.00	0.38
3/82/195	0.31	0.00	0.69	0.91	0.00	0.38
3/82/198	0.18	0.00	0.46	0.61	0.33	0.32
3/82/201	0.19	0.00	0.72	0.67	0.33	0.38
3/82/212	0.33	0.00	0.66	0.73	0.33	0.41
3/82/229	0.18	0.00	0.72	0.63	0.00	0.31
3/82/233	0.33	0.00	0.64	0.94	0.33	0.45
3/82/235	0.18	0.00	0.57	0.78	0.00	0.31
3/82/245	0.29	0.00	0.72	0.57	0.33	0.38
3/82/255	0.28	0.00	0.61	0.61	0.33	0.37
3/83/054	0.24	0.00	0.58	0.03	0.00	0.17
3/83/058	0.20	0.00	0.88	1.00	0.33	0.48
3/83/089	0.22	0.00	0.41	0.93	0.00	0.31
3/83/097	0.22	0.00	0.67	0.79	0.00	0.34
3/83/131	0.22	0.00	0.38	0.47	0.00	0.21
3/83/133	0.24	0.00	0.40	0.69	0.33	0.33
3/83/159	0.21	0.00	0.57	0.83	0.00	0.32
3/83/178	0.25	0.70	0.47	0.83	0.67	0.58
3/83/194	0.27	0.00	0.54	0.39	0.33	0.31
3/83/211	0.15	0.00	0.49	0.52	0.33	0.30

Impact Indices

Chapter 5

Impact Analysis

5.1 Aspect of Computing Correlation and Regression Models

The following points are important for meaningful inferences to be drawn from correlation values and regression coefficients computed using a least squares approach.

5.1.1 Correlation

1. Since all variables here are positive, computation of correlation must be done after subtracting the means from each data set. Otherwise the deduced nature of relationships between the dependent and indepentent variables may be wrong since, in all cases, the correlation would turn out to be positive.

2. In cases where the whole population consists of a number of clusters that are well separated and represent distinct groups, computation of correlation should be done for each cluster separately subtracting the means of the clusters. For example, while analysing economic data it was observed that the income of distinct professional groups such as managers, teachers, enterpreneurs exist in different ranges. In such a case one should not try correlating the income data for the whole group with independent factors such as Degree, Rel-IIT etc. which take their values over the same range for all the groups.

3. While computing cross correlation, normalization by the corresponding autocorrelation values of the variables should be done. The following formulae have been used in the work.

$C_{xy} = \frac{r_{xy}}{\sqrt{r_{xx}}\sqrt{r_{yy}}}$; $r_{xy} = \frac{1}{N}\sum \tilde{x}_i.\tilde{y}_i$; $r_{xx} = \frac{1}{N}\sum \tilde{x}_i.\tilde{x}_i$; $r_{yy} = \frac{1}{N}\sum \tilde{y}_i.\tilde{y}_i$;
$\tilde{x}_i = x_i - \overline{x}$; $\tilde{y}_i = y_i - \overline{y}$; $\overline{x} = \frac{1}{N}\sum x_i$; $\overline{y} = \frac{1}{N}\sum y_i$

4. Finally, it is mentioned that correlation between two variables should only be attempted when one expects a cause-effect relationship between the variables. However, the more existence of a nonzero correlation between two arbitrary data sets does not necessarily mean that any cause-effect relationship exists between them.

5.1.2 Regression Model

1. One of the important things that must be seen simultaneously with any regression model obtained through numerical procedures is the quality of the model. This may be deduced from various figures of merit e.g. total sum of squares of errors, standard deviation of the obtained parameters, various statistics such as students-t etc. Therfore, conclusions may be drawn only based on models having good quality.

2. The number of independent variables in the model should be carefully determined. In some cases the addition of new independent variables does not add to any significant reduction in the sum of squares of errors. Incorporation of such variables into the model, therefore, only adds to the model complexity, without commensurate advantage in explaining the data more accuarately. One should choose a model with the least number of parameter that is able to explain the data adequately.

3. The main advantage of a good model stems from the fact that it can explain or predict behaviour of new data sets other than the one based on which it is obtained. To establish the effectiveness of the obtained models, it is therfore necessary to keep aside a part of the sample set which would not be used in model building. The model built using the rest of the data should be used to predict the dependent vaiables of this data set using the independent ones. This procedure is called model validation. A model should be validated before using it for prediction.

4. For ordering the independent variables in terms of their significance in describing the dependent variables, one should not merely look at the regression coefficients. In other words, the variable with the largest regression coefficient may not be the one explaining the largest part of the dependent variable. To assess this, one should consider the mean values of each independent variables. This multiplied by the regression coefficient indicates the part of the output explained by this variable on

an average. Note further that a significant part of the dependent variable value may actually explained by the constant coefficient in the model.

5.2 The Variables : Explanatory and Dependent

The model for impact assessment, as conceived within the theoretical framework, inferred a set of dependent variables which are the four impact measures, namely, economic, techno-scientific, socio-cultural and personal. Such measures are to be derived from the attribute values pertaining to each of the four groups. The attribute values are obtained from the questionnaire - either in the original form or after carrying out simple transformation. In a large number of cases data obtained from the questionnaire had to be normalised to the details of the group specific attributes have been provided in the previous section. However in the practical analysis all the attribute values could not be included mainly because of the following reasons.

1. Lack of total information - For example, while computing the economic index the investment attribute could not be considered because majority of the alumni did not answer the relevant question. Even if they did provide the total investment figure, they did not answer the questions like year of investment, annual return etc. Partial data led to incompletenes of the information.

2. Inconsistency of information - For example while answering to the question on overall employment pattern and average salary of each class in the alumnus' current place of work, some provided the required average salary but the others gave the basic pay scale for that class.

5.2.1 The Economic Impact Measure (ECONO)

The economic impact measure has been determined based only on the income of the alumni. The other factor values such as employment generation, investment, foreign remittances etc. could not be included or were intentionally excluded because of the above mentioned reasons. Since the data set on income spans a period of ten years the income data had to be discounted by the number of years to eliminate the effect of seniority in service on income.

The income figures have been normalised using the following formula

$$Normalised\ Income = \frac{127}{127 - \frac{20}{5.5}(Year\ of\ graduation - 74)} \times Income$$

The coefficients in the above formula have been obtained based on a linear approximation of the income generation relationship obtained by plotting the data graphically.

A further normalisation scheme is undertaken on the modified income figure to improve the numerical conditioning for subsequent computations. This is the simplest form of discounting where the figures are divided by the highest value to scale it done between 0-1. That is Normalised Economic Index $N - Inc = \frac{NormalisedIncome}{MaxNormaliseIncome}$

5.2.2 The Socio-Cultural Impact Measure (SC)

For the socio-cultural impact measure the attitude and value aspects have been included. Factors like social mobility, national/regional integration etc. could not be considered as it was increasing the complexity of the analysis without adding significantly to the inferences. The value and attitude scores, as obtained from the questionnaire, were combined to generate a composite index to indicate the level of openness towards societal norms and the system.

5.2.3 The Techno-Scientific Impact Measure (TS)

The techno scientific impact measure was obtained from research output of the alumnus in terms of publications, patents, software or design developments, appropriate technology innovations etc. In this case the score for each factor was considered to be binary in the form of Yes-No and 1-0 was assigned to them respectively. While this could be refined by providing weightages corresponding to, say different categories of publications like international journal, national journal, conference/workshop it was found difficult to do so for the other indicators such as patents or software developments. As in the case of the socio-cultural impact measure, all the TS factor values have been combined to a representative score which after suitable normalisation provided the impact measure.

5.2.4 The Personal Impact Measure (P)

The personal impact measure was derived from the factor discussed in the previous chapter. The influence of the IIT environment, both academic and sociocultural, on the personal

qualities or attitudes of the alumnus have been captured through a set of factors. The factors are assigned scores between 0-1 which have again been combined and normalised in the usual way. As a matter of fact all the variables that entered the analysis had been scaled to 0-1 to achieve uniformity in the diverse data types.

5.2.5 The Concerned Independent Variable

The independent variable set comprises those aspects which characterise the stay and education in IIT. Such factors have already been listed in section. The values for these factors are either obtained directly from the questionnaire or by simple mathematical derivation on the raw data as discussed below.

1. Degree - B.Tech, M.Tech or Ph.D has been assigned scores 0.5, 0.75, 1 respectively. The cardinal value of the numbers merely signify the ordinality or the levels of educational achievement. In the analysis, often the highest degree, whether from IIT or not, has been taken as the explanatory variable to establish the relationship between the impact measures and the level of education.

2. Rel IIT and Rel Others indicate the perceived relevance of IIT and non-IIT education to the alumnus' current professional activities. For Rel-IIT, Rel Other scores have been obtained directly from the questionnaire. They attain the values between 0-1.

3. Stay IIT and Stay Others scores represent in terms of years, stay at IIT and at different other institutes after school. These are integers which are normalised with respect to the highest value to scale it down between 0-1.

4. Another set of independent variables namely Y-vill-town and Y-city-mcity are derived from the numbers representing years of stay in village/town or city/metropolitan city respectively. However a discounting/saturation scheme had been undertaken on the numbers indicating years, once again to eliminate the effect of seniority. The saturation scheme is as follows.

5.3 Choice of dependent-variable-specific explanatory variables

Having decided on the sets of dependent and independent variables, the next step is to determine the subsets of explanatory variables that correspond to each dependent variable.

As mentioned already, the choice would depend on two factors. Firstly the researcher's insight into the problems or the hypotheses that the researcher builds before carrying out the analysis. Secondly, the correlation between dependent and the independent variables of the corresponding subset. This would aid in validating the notions of the researcher and would give indications to the nature of relationship. The combination of the two analyses would provide the actual set of explanatory variables for a given dependent variable.

We would thus proceed by considering each impact measure at a time and establish the relational features.

5.3.1 Economic Impact (ECONO)

The economic impact measured in terms of the income of the alumni is considered to be dependent on three explanatory variables Degree, Rel IIT and Rel Others.

Because the income of alumni vary significantly among professional categories it was felt necessary to carryout the analysis separately for each category. It is natural that the explanatory variables would have differential impacts on the economic index figures of different categories due to the differences in the nature of proficiencies required in the various categories.

Table 6.1 - provides the correlation estimates. Degree relates to the heighest degree. As evident, level of education (indicated by the degree) has a high relevance with the economic index. This is particularly true in the case of Research Scientists and Teachers, as higher degree is a facilitate for their promotion and higher pay scale implying higher economic impact. The association is least in the case of 'Entrepreneurs' since for them time devoted in obtaining higher degrees means less of input in terms of time in the enterpreneural pursuit.

	Degree	Rel_IIT	Rel_Others
Practising Engg.	0.875	0.883	0.596
Research scientist	0.946	0.905	0.716
Manager	0.796	0.723	0.532
Entrepreneur	0.759	0.810	0.509
Teacher	0.922	0.908	0.788
Consultant	0.796	0.723	0.532
Others	0.888	0.786	0.653

Table 5.1: Correlation Estimate Related To Economic Impact (ECONO)

The measures of association betwen Rel IIT, Rel Others and ECONO are signigicant though in all cases relevance of IIT indicated by Rel IIT has a higher positive effect on ECONO. But the nature of the intercategory differentials is the same for both Rel IIT and Rel Others.

5.3.2 Techno_Scientific Impact (TS)

The techno-scientific impact measured in terms of the research output is again considered to be affected by the three explanatory variables viz. Degree, Rel IIT, Rel Others. The nature of jobs being diverse in the different professional categories, the quantum of research and devolopment output would also vary accordingly. The correlation coefficients presented in Table 6.2 bring out these differences in impacts.

	Degree	Rel_IIT	Rel_Others
Practising Engg.	0.475	0.450	0.409
Research scientist	0.738	0.703	0.616
Manager	0.389	0.323	0.179
Entrepreneur	0.446	0.348	0.698
Teacher	0.570	0.479	0.393
Consultant			
Others	0.528	0.426	0.419

Table 5.2: Correlation Estimate Related To Technoscientific Impact (TS)

Degree has the maximum impact in the categories - 'Research Scientists' and 'Teachers' since in these two professional classes people usually go for higher degrees such as Ph.D. Often the research leading to these degrees brings forth publications, monographs etc. which in turn produce a high technoscientific impact index. For classes such as Executives/Managers, Entrepreneurs, Practising Engineers the correlation is comparable.

Considering the correlations between the Rel-IIT, Rel-Others and TS it is observed that IIT education is perceived by the respondents to have significant impact on techno-scientific achievements. Other educational qualifications are also perceived to have good contribution but in all cases, excepting that of 'Entrepreneurs', it is found to be lower than that of IIT education. The maximum association between Rel-IIT, Rel Others and TS is found in the category of 'Research Scientists' This is because Research Scientists go for higher degrees in very specialised fields which would obviously have significant impact on their nature of job and specialisation. The results for the class 'Consultants' are erratic

and statistically inconclusive due to the small sample size for this class.

5.3.3 Socio_Cultural Impact (SC)

The Socio-cultural impact SC is considered to be dependent on five explanatory variables. The nature of dependence is not direct in some cases but is derived from an indirect effect on the dependent variable. For example, degree may not have direct effect on the socio-cultural impact measure but definitely has a derived effect for which the correlation values may turn out to be significantly high. The identified explanatory variables are Degree, Stay IIT, Stay Others, Y-vill-town, Y-city-mcity.

The correlation coefficients have been calculated for the dependent variable and each independent variable pair - professional categorywise. The correlation figures have been presented in Table 6.3.

	Degree	Stay_IIT	Stay_Others	Y_Vill_Town	Y_City_Mcity
Practising Engg.	0.973	0.879	0.618	0.625	0.788
Research scientist	0.953	0.776	0.787	0.667	0.817
Manager	0.901	0.771	0.527	0.447	0.756
Entrepreneur	0.969	0.953	0.493	516	0.899
Teacher	0.921	0.815	0.833	0.684	0.737
Consultant	0.989	0.988	0.729	657	0.876
Others	0.934	0.808	0.613	0.714	0.801

Table 5.3: Correlation Estimate Related To Sociocultural Impact

As observed, Degree is highly correlated with SC. This may be due to several causes. Note that a high degree for an otherwise socioculturally backward individual implies long stay in an urban cosmopolitan environment. Secondly an inverse effect is also possible since generally socioculturally advanced people value education more and are more likely to go for higher education than those who are not. In view of these, correlation of socio-cultural impact index with degree is seen to be high.

Stay-IIT is similarly highly correlated. But in this case dependence is quite straightforward as greater the number of years of stay in IIT i.e. in a cosmopolitan environment greater is the acceptability of issues like inter-caste, inter-state, inter-religion marriage etc. to him and these add to the alumnus' SC score.

Stay Others also depict high correlation with SC. The greater the number of years of stay in other institutes the greater is the impact on the socio- cultural measure. The same

logic holds in this case. Away from home in a not-so-familiar surrounding definitely works towards openness in attitude and value. But in almost all cases correlation coefficient values for Stay IIT is higher than Stay Others.

Years of stay in village and town and years of stay in city-metropolitan city indicated by Y-vill-town and Y-city-mcity respectively have significant impact on the socio-cultural environment. As observed, the correlation co-efficients for Y-city-mcity are higher than that for Y-vill-town. This is because greater the number of years of stay in the urban setting the greater is the exposure and attitudinal changes.

5.3.4 Personal Impact (P)

The personal impact measure (P) is considered to be dependent on primarily four factors Stay-IIT, Stay-Others, Y-vill-town and Y-city-mcity. It is assumed that all these explanatory variables have significant effect on the characteristic qualities of the alumnus.

The correlation coefficients have been presented in Table 6.4.

	Stay_IIT	Stay_Others	Y_Vill_Town	Y_City_Mcity
Practising Engg.	0.904	0.617	0.533	0.854
Research scientist	0.769	0.741	0.606	0.803
Manager	0.750	0.515	0.396	0.751
Entrepreneur	0.919	0.498	0.502	873
Teacher	0.785	0.844	0.615	0.785
Consultant	0.988	0.660	0.666	928
Others	0.659	0.659	0.625	0.788

Table 5.4: Correlation Estimate Related To Personal Impact

Stay IIT and Stay Others - both are highly correlated with personal impact, though the correlation co-efficients for Stay IIT is greater than that for Stay Others. This could be justified by the logic that more the number of years of stay in IIT and the greater is his feeling of achievement and capability as the technical or engineering stamp on qualification helps him/her to be more successful professionally and socio-economically.

The point to be noted here is that the absolute value to the correlation index does not mean much as it is often dependent on the nature of the data set and it can be statistically biased. But this definitely gives the characteristic of the inter factor relationships - relative as well as in absolute terms.

5.4 The Regression model for impact assessment

Analysis of Results

Before going into actual analysis of results of the regression model it would be useful to list out the dependent variables and their corresponding independent variables.

Sl. No.	Dependent Variable	Corresponding independent variable
1.	Economic Impact	Degree
		Rel-IIT
		Rel-Others
2.	Socio-cultural Impact	Degree
		Stay-IIT
		Stay-Others
		Y-vill-town
		Y-city-mcity
3.	Techno-scientific Impact	Degree
		Rel-IIT
		Rel-Others
4.	Personal Impact	Stay-IIT
		Stay-Others
		Y-vill-town
		Y-city-mcity

At each stage a particular dependent variable and its corresponding independent variable set is considered and the regression model is run. In this case also the data set has been disaggregrated into professional categories and the analysis to carried out for each class.

For each set the regression analysis has been carried out in a phased manner. Starting from a bivariate case i.e. considering just one explanatory variable at the beginning, the regression cooefficient and the constant along with STD error, t, STD error of estimation, r^2 and r has been obtained. Gradually the other explanatory variables have been included one at a time along with the previous ones. The quality of fit is examined in terms of

the increase or decrease in the values of r^2 and the STD error of estimate. The change in values would indicate the efficiency of the explanatory variables in explaining the dependent variable. If inclusion of an explanatory variable does not improve the quality of fit then that variable need not be included in the final model.

The following sections deal with the inferences drawn from the results of the regression analysis considering each impact index and working it out for the different professional categories.

5.4.1 Economic Impact (ECONO)

The economic impact (measured in terms of N-Inc) is considered to be dependent on the three variables Degree, Rel-IIT, Rel Others. Since income varies widely among professional categories it was incorrect to carry out the analysis for the entire data set. Therefore regression speciality for each professional group provided specialised inferences conclusive for the different professional groups as described below.

Practising Engineers

1. Rel-IIT is the most important factor. It is also statistically the most significant and roughly speaking it can be said with about 60that the regression coefficient of Rel-IIT stays within 0.1-0.2. Such ranges for the other two variables are much more uncertain since their standard error is larger. This could well be justified in that IIT B.Tech alumni in this profession categery have mostly joined jobs where their B.Tech education was relevant. In the case of IIT post gradute practising engineers, majority of them are making use of their specialisation in their job. A possible cause for the high correlation of Rel-IIT with economic index is that for the job skills required for engineers in highly paying industries, IIT education is deemed to be significantly relevant.

2. Rel-Others also has some relevance in their current job but it is definitely lower than Rel IIT, IIT B.Tech practising engineers seldom go to other institutes for higher studies. Even if they do, they find their basic education more relevant. On the other hand Non IIT B.Techs who join IIT for postgraduation find the education of IIT to be more relevant to their jobs.

3. Degree as such does not affect ECONO the economic impact significantly in this category.

Table 5.5 provides the Regression coefficients for Economic Impact(E) for Practising Engineers.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.6065	0.1248	0.0131	0.1300	0.2500	0.1200	
2	1:Degree	0.6065	0.1248	0.0595	0.1200	0.1200	0.1100	
	2:Rel_IIT	0.6500	0.2448	0.1600	0.0633			
3	1:Degree	0.6065	0.1248	0.0552	0.1300			
	2:Rel_IIT	0.6500	0.2448	0.1600	0.0661	0.1200	0.1100	
	3:Rel_Other	0.2944	0.3305	0.0069	0.0494			

Dependent Variable	E	Mean(E)	0.2619
No. of Samples	54	S.D.(E)	0.1162

Table 5.5: Regression Coefficients for Economic Impact (E) for Professional Category A (Practising Engineers)

Research Scientists

For the research scientists however, the highest degree turns out to be the most influential variable as indicated by the factor (Mean x Regression coefficient).

However the magnitude of the coefficients are very low as are their statistical sifnificance values. The dependent variable is mostly explained by the value of the constant. For this class, since the normalised economic indices are almost constant, as shown by low standard deviation and the dependent variabel, the explanatory variables have insignificant effect. Ref Table 5.6.

Executives / Managers

1. This category consists of two classes of managers - the technical managers and the administrative managers. For technical managers higher degree may have a positive effect on income but for administrative managers higher IIT degrees do not add to their credentials for earning more. Rather, a B.Tech with an MBA degree would be higher paid as compared to others. Even technical managers would prefer to take up on job trainings or courses rather than the highly specialised and theoretically

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	1.6180	0.6991	0.0052	0.0061	0.1900	0.0400	
2	1:Degree	1.6180	0.6991	0.0052	0.0060	0.1900	0.0400	
	2:Rel_IIT	0.7247	0.2361	0.0008	0.0018			
3	1:Degree	1.6180	0.6991	0.0055	0.0065			
	2:Rel_IIT	0.7242	0.2361	0.0005	0.0018	0.1900	0.0400	
	3:Rel_Other	0.4978	0.3726	0.0014	0.0012			

Dependent Variable	E	Mean(E)	0.1994
No. of Samples	89	S.D.(E)	0.0392

Table 5.6: Regression Coefficients for Economic Impact (E) for Professional Category B (Research Scientists)

inclined courses in IITs since the nature of their jobs do not demand much theoretical knowledge.

2. Rel-IIT and Rel-Others do not have significant effect on the economic impact. However Rel Others has an edge over the former mainly because the degrees from management institutes and degrees from line organisations and institutes help the alumni to earn more. The results in ths case are not very conclusive since they are statistically not very significant. Ref Table 5.7.

Entrepreneurs

1. For this class of alumni, IIT degree has a negative effect on ECONO. This is explanable since post graduate specialisation does not help the business to flourish. Rather an early start and full time involvement leads to an more economic prosperity.

2. Though the sample size is small to generalise features, most of the entrepreneurs are IIT B.Techs. Hence IIT Education seems to be more effective in their present prospect as compared to others. Ref Table 5.8.

Teachers

1. This class includes teachers from different educational institutes, which range from

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.6487	0.1382	-0.1100	0.0467	0.3300	0.0900	
2	1:Degree	0.6487	0.1382	-0.1100	0.0470	0.3300	0.0900	
	2:Rel_IIT	0.6042	0.2513	0.0083	0.0259			
3	1:Degree	0.6487	0.1382	-0.1200	0.0474			
	2:Rel_IIT	0.6042	0.2513	0.0059	0.0261	0.3300	0.0900	
	3:Rel_Other	0.4111	0.3369	0.0122	0.0196			

Dependent Variable	E	Mean(E)	0.2615
No. of Samples	190	S.D.(E)	0.0898

Table 5.7: Regression Coefficients for Economic Impact (E) for Professional Category C (Executives)

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.5588	0.1093	-0.4800	0.6100	0.6200	0.2700	
2	1:Degree	0.5588	0.1093	-0.4900	0.6100	0.3700	0.2700	
	2:Rel_IIT	0.6941	0.1952	0.3600	0.3400			
3	1:Degree	0.5588	0.1093	-0.6700	0.6500			
	2:Rel_IIT	0.6941	0.1952	0.3200	0.3500	0.4600	0.2700	
	3:Rel_Other	0.2235	0.3615	0.1700	0.2000			

Dependent Variable	E	Mean(E)	0.3523
No. of Samples	17	S.D.(E)	0.2652

Table 5.8: Regression Coefficients for Economic Impact (E) for Professional Category D (Enterpreneurs)

ordinary undergraduate colleges, regional engineering colleges to national institutes like IIT's, Indian Institute of Science etc. In this case IIT degree in particular does not have much influence on the dependent variable i.e. N-Inc. or the income of the alumnus rather a combination of the degrees achieved leads to this present income status. Since the alumni correspond to the period 1973-83, for this section of teachers higher degrees was not a prerequisite for promotion and higher income. It was the years of service that mattered. Further the Sen Committee followed by the Goni Committee in the year 1973 announced fixed payscales for Engineers and Non-Engineers. Thus IIT Degree or in general engineering background in teaching did not mean high payscales until the 4th Pay Commission reports on pay revision in favour of IIT's and the other national institutes was released.

2. Teachers belong mostly to the Science Stream. Especially during our period of study IIT engineering graduates seldom joined the teaching profession. Hence B.Tech degree did not have much relevance. But post graduate IIT education has a direct impact since a majority of them are B.Sc-s or M.Sc-s from Universities and post graduates from IIT Kharagpur. Entry to the post graduate courses, during the study period was, much easier comparee to joining IIT's through the Joint Entrance Examination. Further a large number of IIT postgraduates were sponsored candidates under the technical education schemes like QIP, FIP etc.

3. Rel-IIT and Rel-Others both have nearly comparable impact though not very significant. Just because a combination of degrees actually direct the professional development, the Institue of obtaining the degree does not feature that greatly. Ref Table 5.9.

Consultants

Because of lack of data in this professional category results could not be obtained due to numerical problems. However certain conjectures can be made considering individual cases.

1. Degree may not be that relevant as in the case of consultants.

2. Rel-IIT may turn out to be important considering the fact that the alumni work as consultants in their basic discipline like architecture , civil engg etc. and they have obtained the related degrees from IIT.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	1.2941	0.5375	-0.0030	0.0069	0.1800	0.0400	
2	1:Degree	1.2941	0.5375	-0.0010	0.0737	0.1700	0.0400	
	2:Rel_IIT	0.7814	0.2481	-0.0140	0.0160			
3	1:Degree	1.2941	0.5375	-0.0780	0.0074			
	2:Rel_IIT	0.7914	0.2481	0.0178	0.0168	0.1700	0.0400	
	3:Rel_Other	0.6373	0.3546	-0.0070	0.0112			

Dependent Variable	E	Mean(E)	0.1794
No. of Samples	102	S.D.(E)	0.0373

Table 5.9: Regression Coefficients for Economic Impact (E) for Professional Category E (Teachers)

3. Rel-Others may similarly be important considering the relevance of degree in their profession.

Others

This class consists of all alumni who belong to diverse and off-beat professional categories like Journalist, Religious leader, Social Worker in voluntary organisation, Surveyor etc. Hence none of the explanatory variables show any definitive trend in influence. Degree seems to be important but poses an inverse relationship. It could mean that IIT B.Tech-s are often economically better established than the IIT post graduates in such professions. Ref Table 5.10.

Overall Assessment of Impact

In general Rel-IIT turns out to the most important factor. This indicates the fact that IIT education is a key factor in an alumnus' economic prosperity, especially for practising engineers. To put it in other words, high paying companies or organisations most often prefer an IIT stamp. Degree has a significant impact though always not positive. This is because with time the alumni have often shifted to jobs not always of a technical nature, such as managerial, enterpreneurial etc. Highest degree is the most significant factor for research scientists. Rel-Others has some influence in all the cases but it stands out for professionals who are in the 'Others' categery. In a, nutshell, IIT education and degree

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.6917	0.1697	-0.0870	0.0783	0.2600	0.0700	
2	1:Degree	0.6917	0.1697	-0.0780	0.0805	0.2400	0.0700	
	2:Rel_IIT	0.5133	0.3598	0.0239	0.0380			
3	1:Degree	0.6917	0.1697	-0.1100	0.0885			
	2:Rel_IIT	0.5133	0.3598	-0.0040	0.0482	0.2600	0.0700	
	3:Rel_Other	0.3400	0.3766	0.0443	0.0466			

Dependent Variable	E	Mean(E)	0.1995
No. of Samples	30	S.D.(E)	0.0718

Table 5.10: Regression Coefficients for Economic Impact (E) for Professional Category G (Others)

definitely has a positive influence on an alumnus' economic well being.

5.4.2 Techno_Scientific (TS)

The technoscientific impact is considered to depend on the same set of explanatory factors, namely, Degree, Rel-IIT and Rel-Others. Once again the analysis is carried out for different professional classes and the characterising features have been brought out.

Practising Engineers

1. Degree has a positive effect and turns out to be the most important factor among the three. This is because in the Practising Engineers category, specialisation or specialised degrees enables one to produce some research output either in the form of publications or research notes. It is likely that a B.Tech would have lesser research output compared to an M.Tech or a Ph.D.

2. Rel-IIT and Rel-Others have positive contributions. Rel-IIT and Rel-others both indirectly reflect the influence of degree.

3. However the standard error of the regression coefficients are also not very low. Therefore while one can be reasonably sure about the sign of the regression coefficients it is not possible to be so about the value. Ref Table 5.11.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.6065	0.1248	0.1100	0.1100	0.0136	0.1000	
2	1:Degree	0.6065	0.1248	0.1300	0.1100	-0.0630	0.1000	
	2:Rel_IIT	0.6500	0.2448	0.0598	0.0545			
3	1:Degree	0.6065	0.1248	0.1000	0.1100			
	2:Rel_IIT	0.6500	0.2448	0.0457	0.0564	-0.0500	0.1000	
	3:Rel_Other	0.2944	0.3305	0.0411	0.0422			

Dependent Variable	TS	Mean(TS)	0.0526
No. of Samples	54	S.D.(TS)	0.0964

Table 5.11: Regression Coefficients for Techno-scientific Impact (TS) for Professional Category A (Practising Engineers)

Research Scientists

1. Degree in this case also features as the most dominant factor. As compared to the previous category it has a somewhat higher impact on TS output. This is because the nature of job of this class of professionals infers a direct relationship with research and development output. As a matter of fact TS output is an indicator of technical achievement which is facilitated by higher degrees and specialisations.

2. Rel-IIT and Rel-Others have some impact but here again it is not at all remarkable.

3. The statistical significance of Degree and Rel-IIT are however quite poor. That of Rel-Others is better. This however, indicates that the effect of Rel-Others on TS is small with some certainity. Ref Table 5.12.

Executives / Managers

1. The nature and extent of impact of the explanatory variables on TS output in this class is more or less the same, but Degree has a much higher influence than the former cases. As already mentioned, managers can be classified as technical managers and administrative managers. Good TS output in the form of designs, algorithms, software, publications is more probable for technical managers for which the higher technical degrees is an advantage.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.7893	0.1405	0.1500	0.2000	0.2400	0.2700	
2	1:Degree	0.7893	0.1405	0.1500	0.2000	0.2000	0.2700	
	2:Rel_IIT	0.7247	0.2361	0.0533	0.1200			
3	1:Degree	0.7893	0.1505	0.1300	0.2000			
	2:Rel_IIT	0.7247	0.2361	0.0326	0.1200	0.1800	0.2700	
	3:Rel_Other	0.4978	0.3726	0.0973	0.0771			

Dependent Variable	TS	Mean(TS)	0.3588
No. of Samples	89	S.D.(TS)	0.2652

Table 5.12: Regression Coefficients for Techno-scientific Impact (TS) for Professional Category B (Research Scientists)

2. Rel-IIT and Rel-Others together explain a small portion of the TS output. Rel-IIT has a positive effect while the impact of Rel-Others, interestingly turn out to be negative.

3. The regression coefficient for Degree is very significant. That of Rel-IIT is also quite significant. However the significance of the regression coefficient for Rel Other is low. A probable explanation for Rel-Others having a negative effect is as follows. For administrative managers, most often having a management degree from other institutes do not generate professional output of exactly techno-scientific nature. They might have publications but other forms of TS output is not relevant in their case. Ref Table 5.13.

Entrepreneurs

1. Degree features as the key factor. TS output, however small, has a direct relationship with higher degrees in this category also. The value of the regressin co-efficient implies substantial influence of Degree on TS output. This can be justified by the logic that usually entrepreneurs do not go for higher degrees. If at all they go for specialised learning it is because they can put it to effective and practical use and developments leading to innovative output in the form of patents, design, algorithm, software etc.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.6487	0.1382	0.3400	0.0634	-0.1600	0.1200	
2	1:Degree	0.6487	0.1382	0.3300	0.0633	-0.1900	0.1200	
	2:Rel_IIT	0.6042	0.2513	0.0621	0.0348			
3	1:Degree	0.6487	0.1382	-0.3400	0.0637			
	2:Rel_IIT	0.6042	0.2513	0.0664	0.0352	-0.1900	0.1200	
	3:Rel_Other	0.4111	0.1292	-0.0219	0.0264			

Dependent Variable	TS	Mean(TS)	0.0639
No. of Samples	190	S.D.(TS)	0.1292

Table 5.13: Regression Coefficients for Techno-scientific Impact (TS) for Professional Category C (Executives)

2. Rel-IIT has some contribution but not that significant. However Rel Others exercises a greater influence on TS output in this particular category. This is because the alumni undertake trainings and courses from other institutes or organisations which are directly related to their profession.

3. Satistically speaking, the model obtained in this class has achieved good fit of the data. The significance of Degree and Rel-Others is quite high. Ref Table 5.14.

Teachers

1. Degree is the predominant factor again. The same logic holds true as in the case of research scientists. In both the professional categories obtaining higher degrees is a prerequisite for professional advancement and higher degrees imply greater TS output. Particularly the nature of their job being teaching and research, the professional capability and efficiency are dictated by research output which is facilitated by higher learning.

2. The impact of Rel IIT and Rel Other is not only small but insignificant too. Based on this a parssimonious model should only involve one explanatory variable, namely Degree. Ref Table 5.15.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.5588	0.1093	1.0000	0.3000	-0.5000	0.1300	
2	1:Degree	0.5588	0.1093	1.0000	0.3000	-0.5600	0.1300	
	2:Rel_IIT	0.6941	0.1952	0.0820	0.1700			
3	1:Degree	0.5588	0.1093	-0.7600	0.2600			
	2:Rel_IIT	0.6941	0.1952	0.0320	0.1400	-0.4400	0.1100	
	3:Rel_Other	0.2235	0.3615	0.2200	0.0799			

Dependent Variable	TS	Mean(TS)	0.0588
No. of Samples	17	S.D.(TS)	0.1661

Table 5.14: Regression Coefficients for Techno-scientific Impact (TS) for Professional Category D (Enterpreneurs)

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.8505	0.1622	0.7500	0.1200	-0.4700	0.2000	
2	1:Degree	0.8505	0.1662	0.7400	0.1200	-0.5000	0.2000	
	2:Rel_IIT	0.7814	0.2481	0.0452	0.0813			
3	1:Degree	0.8505	0.1622	0.7400	0.1300			
	2:Rel_IIT	0.7914	0.2481	0.0477	0.0867	-0.5000	0.2000	
	3:Rel_Other	0.6373	0.3546	-0.0052	0.0602			

Dependent Variable	TS	Mean(TS)	0.1594
No. of Samples	102	S.D.(TS)	0.2332

Table 5.15: Regression Coefficients for Techno-scientific Impact (TS) for Professional Category E (Teachers)

Consultants

As in the case of economic impact, the TS output could not be explained by the independent variables for this class of professionals.

Others

Since this group is a heterogeneous mix of professionals, none of the variables turned out to be important in explaining the TS impact. Data fit is poor and the regression coefficients have very low significance.

In the case of TS impact in general, Degree turns out to be the most significant influencing factor followed by Rel IIT. Higher the specialisation through higher degrees, greater is the potential and prospects of a person to achieve more technoscientifically. Ref Table 5.16.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.6917	0.1697	0.0849	0.1700	0.0389	0.1500	
2	1:Degree	0.6917	0.1697	0.0107	0.0821	0.0306	0.1600	
	2:Rel_IIT	0.5133	0.3598	0.0107	0.0821			
3	1:Degree	0.6917	0.1697	0.0450	0.1900			
	2:Rel_IIT	0.5133	0.3598	0.0257	0.1100	0.0602	0.1600	
	3:Rel_Other	0.3400	0.3766	0.0564	0.1000			

Dependent Variable	TS	Mean(TS)	0.0977
No. of Samples	30	S.D.(TS)	0.1515

Table 5.16: Regression Coefficients for Techno-scientific Impact (TS) for Professional Category G (Others)

5.4.3 Personal impact (P)

Personal impact which is computed based on certain qualitative features of the alumnus is considered to be dependent on the variables, Stay IIT, Stay Others, Y-vill-town and Y-city-mcity. The latter two are expressed as years of stay in vill-town and city-mcity. The regression model has been obtained for different professional categories to analyse for the different classes.

Practising Engineers

1. Degree does not feature as important as it does in the case of ECONO and TS. Though the degree in some cases may have an indirect effect in the sense that the years of stay in the IIT environment for obtaining a degree combined with the age at stay could have some effect on the mental get up and characteristic features of the alumnus.

2. Stay IIT has a positive effect while Stay-Others has a negative effect, none of them being significant. The competitive education system, cosmopolitan environment which characterise the IIT's may have some impact on the personal qualities like confidence, determination, zeal but again it varies from individual to individual. As compared to IIT, Stay Others may exercise a lesser effect but the inverse relationship in absolute terms cannot be explained.

3. Y-village-town seems to have a negative effect while Y-city-mcity has a positive influence. A person spending most of the time in the village and town lacks in confidence and smartness when exposed to the greater urban world. But a person from a city background already has certain in-built characteristics of mind which help them further to enrich these qualities through their stay in IIT. Ref Table 5.17.

Research Scientists

1. Degree has a positive but minor effect. The same logic holds true as in the previous case. The indirect influence of the degree may exercise certain positive effects.

2. Stay IIT has a positive influence. The greater the number of years of stay in IIT the higher is its effect on the personal qualities of the alumnus. Stay Others however exercises a negative impact which again remains unexplained.

3. Y-vill-town has a positive effect while Y-city-mcity has a negative influence. This is because more the number of years a person spends in a village or town, the greater is the degree of transformation towards the urban way of life and this process of change makes them more determined and instills in them the feeling of achievement and ability to serve the nation. In general people with a rural background realise the need for service to the deprived (as they are more exposed to the realities of the life) and value their capabilities more while the urbanites are are less concerned but

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Stay-IIT	4.2830	1.8332	0.0178	0.0105	0.6300	0.1400	
2	1:Stay-IIT	4.2830	1.8332	0.0124	0.0132	0.6700	0.1400	
	2:Stay-Others	2.3019	2.3170	-0.0072	0.0105			
3	1:Stay-IIT	4.2830	1.8332	0.0119	0.0134			
	2:Stay-Others	2.3019	2.3170	0.0071	0.0105	0.6800	0.1400	
	3:Vill+Town	3.9623	6.6765	0.0014	0.0029			
4	1:Stay-IIT	4.2830	1.8332	0.0119	0.0135			
	2:Stay-Others	2.3019	2.3170	-0.0070	0.0106	0.6700	0.1400	
	3:Vill+Town	3.9623	6.6765	-0.0011	0.0037			
	4:City+Mcity	11.6038	6.3377	0.0005	0.0038			

Dependent Variable	P	Mean(P)	0.7081
No. of Samples	54	S.D.(P)	0.1414

Table 5.17: Regression Coefficients for Personal Impact (P) for Professional Category A (Practising Engineers)

more confident and hence the value loaded attributes are less prominent in them. Ref Table 5.18.

Executives/Managers

The pattern of influence is more or less the same as in the previous case. Stay IIT exerts a positive influence while Stay Others depicts an inverse relationship. Years of stay in village and town shows a positive impact while Y-city-mcity exercises a negative effect. Ref Table 5.19.

Enterpreneurs

For this class of alumni the nature of dependence is reverse as compared to the previous categories. Stay-IIT exercises an inverse impact. Since degree does not have a direct relationship, Stay-IIT which is to some extent related to degree (considering the case when all degrees are obtained from the same institute) exerts a negaitve effect. Stay Others however has a direct relationship with personal impact. The more the number of years spent in other organisations which provide education related to the trade the more is his

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Stay-IIT	4.2386	2.6695	0.0063	0.0080	0.7200	0.2000	
2	1:Stay-IIT	4.2386	2.6695	0.0029	0.0091	0.7200	0.2000	
	2:Stay-Others	4.3523	2.5373	-0.0074	0.0096			
3	1:Stay-IIT	4.2386	2.6695	0.0029	0.0092			
	2:Stay-Others	4.3523	2.5373	-0.0079	0.0098	0.7200	0.2000	
	3:Vill+Town	5.2841	7.2062	0.0009	0.0030			
4	1:Stay-IIT	4.2386	2.6695	0.0029	0.0092			
	2:Stay-Others	4.3523	2.5373	-0.0077	0.0099	0.7200	0.2000	
	3:Vill+Town	5.2841	7.2062	0.0007	0.0032			
	4:City+Mcity	12.6136	5.5179	-0.0010	0.0041			

Dependent Variable	P	Mean(P)	0.7024
No. of Samples	89	S.D.(P)	0.2005

Table 5.18: Regression Coefficients for Personal Impact (P) for Professional Category B (Research Scientists)

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Stay-IIT	3.9630	1.8889	0.0058	0.0066	0.7200	0.1700	
2	1:Stay-IIT	3.9630	1.8889	0.0026	0.0090	0.7200	0.1700	
	2:Stay-Others	2.9048	2.5289	-0.0035	0.0067			
3	1:Stay-IIT	3.9630	1.8889	0.0026	0.0090			
	2:Stay-Others	2.9048	2.5289	-0.0036	0.0068	0.7200	0.1700	
	3:Vill+Town	3.9683	6.6340	0.0003	0.0020			
4	1:Stay-IIT	3.9630	1.8889	0.0023	0.0090			
	2:Stay-Others	2.9048	2.5289	-0.0034	0.0068	0.7200	0.1700	
	3:Vill+Town	3.9683	6.6340	-0.0005	0.0020			
	4:City+Mcity	12.3810	5.7095	-0.0024	0.0023			

Dependent Variable	P	Mean(P)	0.7250
No. of Samples	190	S.D.(P)	0.1718

Table 5.19: Regression Coefficients for Personal Impact (P) for Professional Category C (Executives)

technical ability leading to the personal attributes like confidence, sense of achievement etc.

Both Y-vill-town as well as Y-city-mcity have positive influences on the personal qualities. Ref Table 5.20.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Stay-IIT	4.4375	1.2093	-0.0249	0.0479	0.8400	0.2200	
2	1:Stay-IIT	4.4375	1.2093	0.0025	0.1532	0.7000	0.2300	
	2:Stay-Others	1.1875	2.0073	0.0175	0.0893			
3	1:Stay-IIT	4.4375	1.2093	-0.0257	0.1600			
	2:Stay-Others	1.1875	2.0073	0.0037	0.0955	0.8200	0.2400	
	3:Vill+Town	2.8125	6.0467	0.0058	0.0109			
4	1:Stay-IIT	4.4375	1.2093	-0.0130	0.1800			
	2:Stay-Others	1.1875	2.0073	0.0155	0.1100	0.7000	0.2500	
	3:Vill+Town	2.8125	6.0467	0.0066	0.0119			
	4:City+Mcity	13.1250	5.1235	0.0037	0.0162			

Dependent Variable	P	Mean(P)	0.7294
No. of Samples	17	S.D.(P)	0.2188

Table 5.20: Regression Coefficients for Personal Impact (P) for Professional Category D (Enterpreneurs)

Teachers

For teachers again, Stay-IIT exercises a negative impact while Stay-Others show a direct relationship.

Y-vill-town and Y-city-mcity expressed as years of stay have positive influences. The logic behind such dependancies is the same as that has been explained in the previous sections. Ref Table 5.21.

Consultants

As the number of alumnus comprising this group is very small the results often do not reflect the true picture. However as revealed from the co-efficients, Stay-IIT has a positive effect while Stay-Others has negative impact.

Y-vill-town and Y-city-mcity both have positive influences on the personal impact.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Stay-IIT	4.1386	2.0593	-0.0063	0.0095	0.6300	0.2000	
2	1:Stay-IIT	4.1386	2.0593	-0.0018	0.0101	0.6300	0.2000	
	2:Stay-Others	5.4554	2.3855	0.0111	0.0087			
3	1:Stay-IIT	4.1386	2.0593	-0.0013	0.0102			
	2:Stay-Others	5.4554	2.3855	0.0110	0.0088	0.6200	0.2000	
	3:Vill+Town	6.6832	7.4926	0.0013	0.0026			
4	1:Stay-IIT	4.1386	2.0593	-0.0019	0.0103			
	2:Stay-Others	5.4554	2.3855	0.0097	0.0089	0.5900	0.2000	
	3:Vill+Town	6.6832	7.4926	0.0019	0.0028			
	4:City+Mcity	12.1782	5.8913	0.0027	0.0036			

Dependent Variable	P	Mean(P)	0.6828
No. of Samples	102	S.D.(P)	0.1953

Table 5.21: Regression Coefficients for Personal Impact (P) for Professional Category E (Teachers)

Others

1. For this class of alumni which consists of persons from off-beat professions Stay-IIT exerts a negative influence while stay others has a positive impact. The reason behind this is the same as in the case of entrepreneurs. The lesser the number of years spent in IIT the greater is their professional flourish as it is not related to engineering education and hence greater confidence and capability. The reverse is true for stay in other institutes which provide education related to their current job.

2. Y-vill-town has a negative influence but Y-city-mcity exercises a positive effect. Ref Table 5.22.

Concluding notes

The results pertaining to personal impact analysis do not provide much meaningful inferences. The personal qualities of an alumnus are hardly affected by exogenous factors - The external environment helps the alumnus to enrich or strengthen the qualities which are, infact, inherent. Thus the explanatory variables chosen do not have direct effect as

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Stay-IIT	4.1379	3.1021	-0.0079	0.0189	0.6300	0.3100	
2	1:Stay-IIT	4.1379	3.1021	-0.0109	0.0222	0.6700	0.3200	
	2:Stay-Others	4.0000	3.3912	-0.0054	0.0203			
3	1:Stay-IIT	4.1379	3.1021	-0.0105	0.0228			
	2:Stay-Others	4.0000	3.3912	-0.0051	0.0208	0.6700	0.3200	
	3:Vill+Town	6.2069	7.5185	-0.0015	0.0082			
4	1:Stay-IIT	4.1379	3.1021	-0.0182	0.0214			
	2:Stay-Others	4.0000	3.3912	-0.0129	0.0196	0.5400	0.3000	
	3:Vill+Town	6.2069	7.5185	-0.0004	0.0076			
	4:City+Mcity	10.3448	7.0624	0.0183	0.0082			

Dependent Variable	P	Mean(P)	0.6003
No. of Samples	30	S.D.(P)	0.3067

Table 5.22: Regression Coefficients for Personal Impact (P) for Professional Category G (Others)

indicated by the regression coefficients which are, in most cases, not at all significant. They help in creating an environment which provides an induced effect.

5.4.4 Socio-cultural Impact (SC)

Socio-cultural impact is deduced primarily on certain ideas and belief of the alumni which reflect their socio-cultural progressiveness. Critical social issues are chosen to acertain the bent of mind of the alumni. The explanatory variables which are expected to have an effect (direct or indirect) on the SC impact are Degree, Stay-IIT, Stay-Others, Y-vill-town and Y-city-mcity. Each of these variables may not have any direct influences but might create or promote factors which would have a direct influence on this impact factor. Ref Table 5.23. For example, Degree may not have a direct impact but Degree may often indicate the background of the alumnus which may have a direct effect. In this particular case all alumni have been considered together, as professional categoriesation does not have a bearing on the socio-cultural aspects. The inferences that have been brought out from the results of the analysis are as follows.

1. Degree has a direct relationship but its extent is not that significant.

No. of I.V.	Independent Variable			Regression Coefficients		Constant	Standard Error of Estimate	Remarks
	No.:Name	Mean	S.D.	Coefficient Value	Standard Error			
1	1:Degree	0.7095	0.1719	0.0070	0.0342	0.5800	0.1300	
2	1:Degree	0.7095	0.1719	0.0180	0.0346	0.5500	0.1300	
	2:Stay-IIT	4.1434	2.1322	0.0052	0.0028			
3	1:Degree	0.7095	0.1719	0.0409	0.0466			
	2:Stay-IIT	4.1434	2.1322	0.0036	0.0032	0.5600	0.1300	
	3:Stay-Others	3.5820	2.7870	-0.0031	0.0028			
4	1:Degree	0.7095	0.1719	0.0338	0.0394			
	2:Stay-IIT	4.1434	2.1322	0.0033	0.0031	0.5500	0.1300	
	3:Stay-Others	3.5820	2.7870	-0.0050	0.0028			
	4:Vill+Town	4.7951	7.0024	0.0046	0.0008			
5	1:Degree	0.7095	0.1719	0.0339	0.0394			
	2:Stay-IIT	4.1434	2.1322	0.0034	0.0031			
	3:Stay-Others	3.5820	2.7870	-0.0049	0.0028	0.5500	0.1300	
	4:Vill+Town	4.7951	7.0024	0.0045	0.0009			
	5:City+Mcity	0.5889	5.8483	-0.0003	0.0010			

Dependent Variable	SC	Mean(SC)	0.5889
No. of Samples	488	S.D.(SC)	0.1296

Table 5.23: Regression Coefficients for Socio Cultural Impact (SC) for ALL Professional Category

2. Stay-IIT has a positive impact while Stay-Others shows an inverse relationship. This is again because the cosmopolitan nature and the diversity in caste, creed and status of the students of IIT which make a person open and devoid of inhibitions, while in other institutes mainly in regional colleges such an environment may not be guranteed. Infact IITans are indifferent to such inhibitan factors.

Y-vill-town again has a positive effect while Y-city-mcity shows a negative impact. The greater the number of years a person has stayed in a village or town the greater is the degree of transformation since all IITans exhibit a significant change towards modernity and exposure after settling in professional life. That is, greater a person is tradition bound the higher is the level of impact of IIT environment on his socio-cultural attainments.

Y-vill-town thus has a direct influence through an indirect relation. Y-city-mcity however exerts a negative impact. A person from an urban background already has some set values which he has built from experiences. This means, he is more exposed to the positive and negative sides of a cosmopolitan urban environment. The adverse experiences of adverse sides often makes him sceptic or inhibited towards similar happenings and issues for which he cannot be open minded in accepting the so-called progressive ideas. However, this cannot be generalised and the negative relationship cannot be strongly justified.

As in the case of PERSONAL IMPACT, none of the explanatory variables exercise significant effect on the SOCIO CULTURAL IMPACT. The values and ideas are inherent and the environment which is defined by the combination of a number of factors exerts an influence on the socio cultural characteristics.

5.4.5 Conclusion

The total analysis on impact assesment reveals certain interesting facts.

5.4.6 Summary of Main Findings

From the analysis of the data and the observation described previously, the following major points that are probabilistically reliable emerge.

Economic Achievements

1. In category of research scientists and teachers the economic achievements are fixed linear functions of time and reflect the seniority related promotion policy adopted in most organization employing them. Therefore effect of IIT education/culture/training can not be established on these classes.

2. Among enterpreneurs, managers and miscellaneous categories IIT graduate often with a postgraduate degree/diplomas in business management or similar other professional courses are economically better placed than IIT post graduates in engineering. This is a reflection of the fact that business managers are better paid than technical managers.

3. Practising engineers working in industries whose emoluments are high, find the IIT education and training quite relevant to the skills related to their current roles. This is due to the fact that in this catagory IIT graduates are economicly better placed than IIT post graduates.

Technoscientific Achievements

1. For all professional catagories, higher degree implies higher techno scientific achievements.

2. In the classes practising engineers, managers and teachers for techno scientific achievements skill developed through IIT training are detected to be relevant as seen to have more impact than other trainings.

   In the classes research scientists, entrepreneurs and miscellenous, other trainings seem to have more impact than IIT training.

Personal Achievements

Results are mostly inconclusive and statistifically significant on these aspects.

Sociocultural Achievements

1. Duration of stay at IIT has a positive effect on the sociocultural index while stay at other places has a negative one for the whole sample set with all professional categories taken together.

2. Degree also has a high positive effect.

Chapter 6

IIT Kharagpur Alumni within the Economic & Societal System of Prevalence and Change

Development is not a unidimensional concept. It associates with it the notions of economic growth and societal progress and improvement. The IIT education is vowed to generate the manpower which will contribute actively in the process of development meaning specifically increasing the sustainable national output through scientific & technological improvements and creating a congenial societal system for each and every citizen of our country.

The present study aims at examining the extent and nature of impact of the able IIT alumni on the economy and society. It is some sort of an accountability study in the sense that in a country where 70% of the populace reside below the poverty line, crores of rupees are being spent on generating the technological human resource base which is expected to bring about structural changes for the betterment of our nation. The study could however concentrate on few specific issues and thus cannot claim to be a very comprehensive research - but definitely provides an impression about the nature & directions of impact.

The previous chapters dealt with the impact of IIT KGP education and environment on the overall well being of the alumni, which includes professional flourish, economic achievement and positive social attitudes. Considering the hypothesis that professional achievement and economic flourish is directly related to his/her contribution, it could be established that higher up in the hierarchy and greater remuneration means a greater contribution to the organisation. This specifically holds true for the production sectors, where impact is measured in terms of differential incremental output. For the service sectors especially teaching, research and consultancy the same principle holds good though

the relationship is not vivid and direct as impact cannot be expressed in terms of any tangible output. But this could be assessed through certain indirect benefits pertaining to the particular organisation where he/she serves.

However, as mentioned, the theme of the present study is to have a pinpointed assessment of the impact of the IIT alumni on the economy and society as a whole and not just on the organisation where he/she is attached. A logical cumulation over the organisations could however give a measure of an impact on the sectors which constitute the economy.

The findings of this section are discussed under two broad aspects - Impact on the economy and Impact on the society.

Impact on the Economy

The economy is considered to consist of a number of sectors - some productive while other are service sectors, leaving aside the agricultural sector (occupation and practice) where the IIT alumni do not feature at all. The production sectors are classified according to the National Industrial Code of classification and the broad sectoral groups are considered for convenience. They are the following :

10-11 Mining
20-21 Food processing
30 Petroleum refineries & products
31 Fertiliser, Pesticide, paints, varnish etc.
32 Structural clay, glass etc.
33 Iron & Steel and other metals
34 Manufacture of fabricated metal, structural metal pots
35 Manufacture of machinery & equipment
36 Electrical & Electronics
37 Vehicles & Transport equipment
40 Power, gas, Water Supply

The service sectors include Education, Research, Consultancy, Government Administration etc.

Though IIT passout mostly join the production sectors however their enrollment in the service sectors is never the less minor. Hence the analysis in this section is carried out based on the nature of the organisation rather than the professional status of the alumni which has been the basis of previous analysis. The breakup of the alumni following this scheme of categorisation is shown in Table 1.

Table 6.1 indicates that the predominant percentage of the alumni are in the industry either as practising engineers or as managers. This class is followed by alumni in the teaching Institutes. Alumni self employed and alumni in administration are comparable but small in number. Consultant feature in insignificant proportions. Fig 6.1 gives the visual representation.

Sectors	Percentage
Industry	45%
Teaching	21%
Research	13%
Self Employed	9%
Administration	8%
Consultants	2%
Others	2%

Table 6.1: Breakup of alumni based on the Nature of Organisation

	Year										
Sector	74	75	76	77	78	79	80	81	82	83	Total
20-21	0	0	0	0	2	0	1	1	1	1	6
30	0	0	1	0	0	4	2	2	2	1	12
31	0	3	2	0	1	2	3	4	1	0	16
32	1	1	1	1	0	0	1	0	0	0	5
33	5	1	3	0	3	2	2	1	6	2	25
34-35	3	2	0	0	5	4	3	0	2	0	19
36	2	4	1	2	2	8	6	4	6	3	38
37	7	4	1	1	3	1	4	6	5	1	33
40	0	0	1	2	1	0	3	1	0	1	9

Table 6.2: Industrial Count

The impact on the economy is thus assessed according to the type of organisation and the nature of job. Table 6.2 depicts the yearwise distribution of alumni over the industrial sectors. Fig 6.2 depicts this feature. Though a representative set it ascertains the dominance of alumni in the basic and 'sunrise' sectors like 'Iron & Steel', 'Electrical & Electronics' 'Heavy vehicles & Transportation', 'Manufacture of machinery and equipment' etc followed by 'Petroleum Refineries and Products' and 'Fertiliser & Pesticides. IIT Engineers

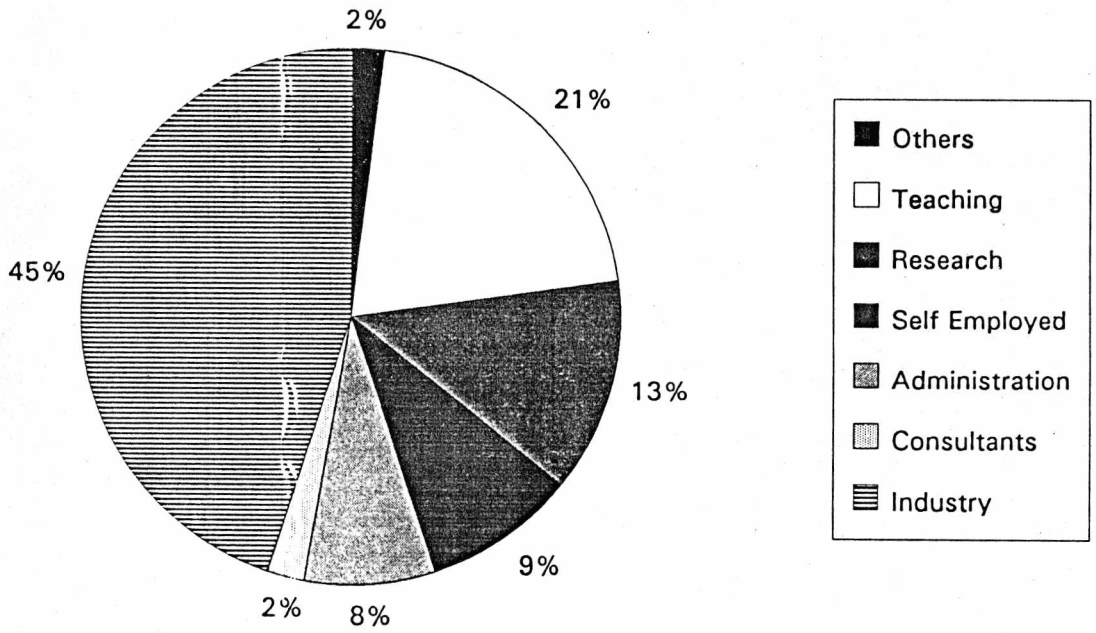

Figure 6.1: Breakup of alumni based on the Nature of Organisation

& Science graduates do not feature much in the sectors like 'Structural clay, glass, unit' 'Manufacture of fabricated metal and metal products', 'Food Processing and Beverages', 'Power, Gas & Water supply'. That is IIT engineers in general are preferred by the leading industrial sectors. The major reason behind the low absorption rate of IIT alumni in the sectors like Food Processing, Glass, Ceramics etc was that such departments offering specialisation in these fields were non-existent. Concentrating on the sector 'Electrical & Electronics' which absorbs maximum number of alumni joining the industry, it is observed that around 1979-80 this sector stood out in terms of placement of alumni. This is because from the early seventies 'Electronics' industries started showing a promising future prospect mainly because of India's drive towards information technology and the resulting polices framed thereby. The trend has been continuing though the figure pertaining to 1983 does not substantiate this feature. However the low order of the data is because of the low order of the sample size specific to the year 1983 in this particular group. A quick scanning of the column 1983 indicates the fact that relative domination is in sector 36 which is 'Electronics & Electrical'. In the sector 'Heavy Vehicles and Transport Equipment' no notable trend of absorption can be cited. Rather it follows a sinusoidal pattern which cannot be explained by the economy's directions of development. But the fact remains that this sector has been a support for the IIT alumni. A major chunk of the alumni are absorbed in the 'Iron & Steel' sector which works as a plinth for any development in heavy engineering. The prominent industries like TISCO, SAIL etc are characterised by a significant enrolement of IIT alumni, though not only Kharagpur IIT.

The broad analysis of the information thus brings out the feature that IIT alumni occupy positions in important industries which play a strategic role in the structural developments of the nation.

Subsequent to the inference that the IIT alumni are to a large extent absorbed by frontlining industrial sectors, the issue that automatically follows is that how important is the alumnus' role in the serving industry and what is his/her contribution to the industry. The importance of the alumnus would be judged by the role of the alumnus in Policy-Decision Making in the industry. This aspect has been trapped through a procedure of subjective enumeration where the alumnus rates his/her contribution in determining important policy directions.

The alumni have been grouped into two classes based on year of passing out. The alumni pertainig to the years '74-'78 could be referred to as 'Senior alumni'. While those of the years '79-'83 could be termed as 'Junior. Alumni : The self assesments have been scaled between 0-1.

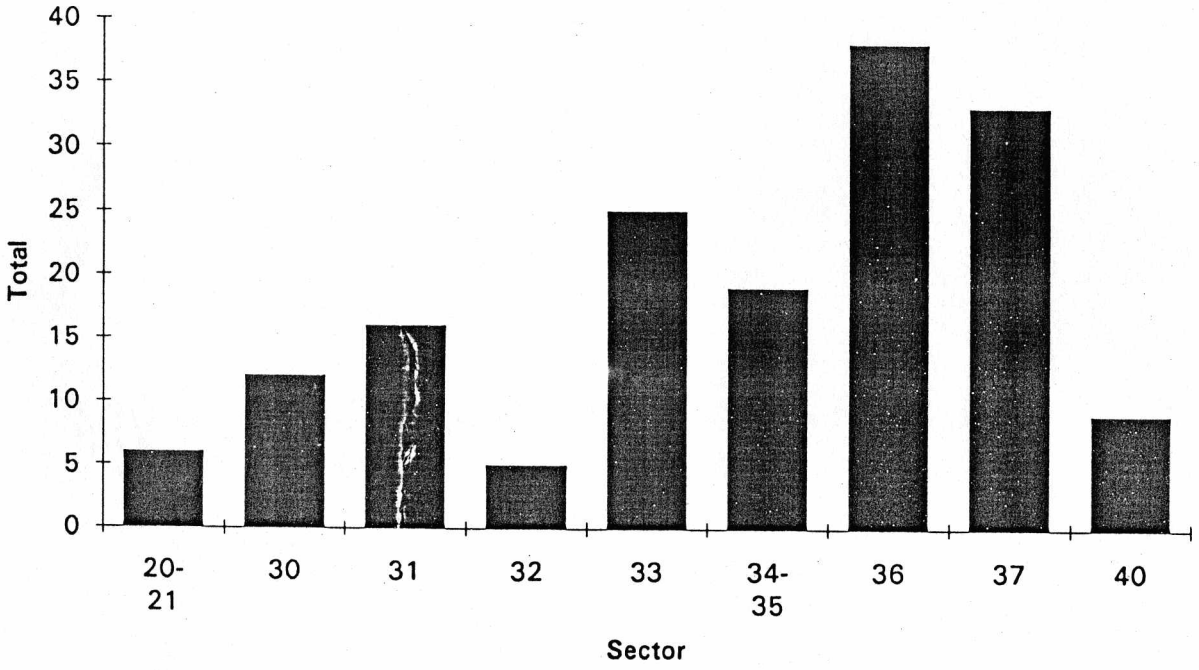

Figure 6.2: Industrial Count

As evident from Table 6.3 the maximum number of Senior and Junior alumni are in the category 0.4 - 0.7 which means that majority of them occupy places in the middle management. But the Senior alumni feature more in this class considering the percentage estimates. Among the 0 - 0.3 and 0.8 - 0.10 classes the Juniors feature more in the former class while the Seniors feature in a higher percentage in the top management cadre.

Year	0-3	4-7	8-10
74-78	18	39	20
79-83	42	52	23

Table 6.3: Industry Policy - Decision

This is obvious and it indicates the professional attainment of the alumni in the sense that with experience they are capable of securing important and strategic positions in the industry.

Table 6.4 establishes this feature further. The 'Senior alumni' have been narrowed down to years '74 & '75 and the Junior alumni include those pertaining to years '82 & '83.The percentage distribution of alumni among the three classes indicates that a higher percentage is in the top management comparing the Seniors as against the Juniors, but the alumni of these years still remain to dominate the middle management. Another feature that emerges is that the difference between the Senior and Junior alumni is not that significant because during the early eighties there was a general drive for management education among IIT engineers.

Year	0-3	4-7	8-10
74-75	7	17	11
82-83	15	19	7

Table 6.4: Industry Policy - Decision

Thus IIT alumni feature mostly in the priority industrial sectors and industries and in course of time with experience and seniority they occupy important positions in the management such that their decisions are highly rated in the industry's policy formulations.

The aspect of policy decision making is particularly relevant for alumni who are in the mangement. But the alumni do have a contribution in the production process. Table 6.5 & 6.6 depicts this aspect. The contribution is rated in the 0-1 scale through subjective

assesments. As evident, the Juniors are more involved in the production process and the Seniors gradually shift from technical jobs to the management cadre. Thus the extent of input in production gradually diminishes with seniority when they are involved in decision making related to production rather than being engaged in the plant as technical hands.

Year	0-3	4-7	8-10
74-78	35	27	15
79-83	56	34	27

Table 6.5: Industry Individual - Contribution

Year	0-3	4-7	8-10
74-75	13	14	8
82-83	15	13	13

Table 6.6: Industry Individual - Contribution

Thus IIT engineers play the dual role of a technical practitioner as well as a decision maker in the leading industrial sectors of the economy. They DECIDE and THEY GENERATE.

IIT alumni also have a significant contribution in the areas of research and academics though proportionately in lesser numbers than in the industry.It is true that IIT's are designed to generate the technical manpower who would bring about structural improvements in the system of production through actual hands-on efforts but IIT KGP alumni are also found to feature in the leading research institutes and academic institutions.

Year	0-3	4-7	8-10
74-78	8	21	18
79-83	5	10	20

Table 6.7: Research Individual - Contribution

The research institutes include Tata Institute of Fundamental Research, CSIR Laboratories, Bhaba Atomic Research Centre, National Physical Laboratories and similar top grade National Level Research Insitutes. The individual contribution of the alumnus has

Year	0-3	4-7	8-10
74-75	3	8	3
82-83	2	4	10

Table 6.8: Research Individual - Contribution

been assessed through subjective weightages provided by the alumni themselves. It is observed that a higher percentage of the Juniors claim to higher individual contributions than the Seniors. Table 6.7 & 6.8 proves this. This could be due to two reasons. The Juniors often have an inflated sense of assesment and it is true that over the recent years such institutes have been provided with improved facilities for independent research. However most of them feel that their independent contribution is of the middle order. When probing into the issue of policydecision making it was found that the Seniors have a more important role to play in decision making than Juniors and it seems to be quite logical and obvious. But most of the alumni rate their role in policy decision making to be in the mid-range and it again seems to be practical considering the seniority level of alumni. Even the seniormost i.e. the passouts of 1974 are not senior enough to occupy the highest rungs of management. But some of them definitely achieved it with their shere capability and skill. Table 6.9 & 6.10 depict this feature.

Year	0-3	4-7	8-10
74-78	12	21	14
79-83	12	18	5

Table 6.9: Research Policy - Decision

Year	0-3	4-7	8-10
74-75	2	6	6
82-83	7	7	2

Table 6.10: Research Policy - Decision

Thus IIT Kgp alumni have a notable impact in areas of fundamental as well as experimental research. The impact may not have a horizontal spread but it is directed and touches upon strategic fields.

The IIT alumni can be subclassed into Science graduates and Engineering Graduates. While majority of the Science graduates have gone for academic jobs, Engineering graduates have seldom opted for the teaching profession since for them the alternative job prospects were much more lucrative and the nature of job was more challenging. Engineering alumni who had joined teaching, had a real inclination or liking for such a profession for which they could forego the salary difference. IIT alumni in general, have been absorbed by Universities and National Institutes like (IIT, ISI, ISM etc.) to a large extent. More than 70% of such alumni are placed in Institutes which offer Graduate as well as Post Graduate courses in specialised technical and science subjects. Around 8% of them work in foreign universities, 20% work in colleges which is constitued mostly of science alumni and the remaining which accounts for 1 to 2% of the alumni in this category, work in schools. That is, IIT alumni also have an impact in building up the human resource base and generating the future technical manpower for contributing in specialised areas and sectors of the economy.

Though a negligible proportion, IIT alumni have ventured into entreprenurial pursuits. The sizes of enterprises are usually small employing three to ten persons. But the alumni are shouldering a major economic and social responsibility of providing employment to a infinitesimally small fraction of the total unemployment pool which is a stigma for our economy. Creating provisions for livelihood for a couple of persons is undoutedly a positive impact on the economy.

Surprising enough, the IIT alumni have also proved their efficiency in administrative jobs. Though an insignificant proportion of the total alumni they occupy strategic positions and take active part in decision making & plan formulation at different regional levels.

Thus on the whole the alumni have either worked for the development and effective functioning of the system of production economy or have helped in building up the resource capital which works towards the overall growth of the nation.

Impact on Society

As indicated, development has a social dimension attached to it. While it has been provided or established to some extent that IIT alumni have a significant economic contribution, it is important to find out the extent of impact in the society. Positive economic impact with associated social evils will never deem a system to be viable and worth encouraging since an alumnus is primarily a social entity. Social impact studies in itself is a topic of extensive research. In the present study however the opinion and views of the alumni have been ascertained which are expected to have a direct or an indirect effect on the societal

system of prevalence and change. The change which curbs injustice and inequality, works against gender bias and works towards upliftment of the underpriviliged, is considered to be a positive change and infact, the resultant of a positive impact.

The views of the alumni in support of certain issues like Women Working, Inter religion/Caste Marraige, Dowry System etc have been assessed through subjective scores. It has been found that more than 80% of the alumni strongly support the concept of Professional Women, Intersect Marriages etc. This is a positive impact as it breaks the gender barrier and brings in equality within different regions and sections. It is an indication of an advanced open society. On the other hand, 99.9% of the alumni strongly oppose the Dowry System which is a curse for a developing society. However regarding their opinion on wife working, alumni have mixed ideas. While a large chunk feel that their wives should work, a similar proportion oppose the idea.

As regards general social, political, cultural and literary consciouness, the awareness level of alumni were judged through subjective weightages. While for social, cultural and literary issues the alumni considered themselves to be quite conscious and aware, majority of the alumni did not or wished not to be considered as politically conscious citizens. This is because mainly they donot have faith in the existing political system of governance. And purposily they have bypassed the issue.

A sizeable section of the alumni are associated with Welfare Organisations and undertake social welfare activities. This however does not give an assesment of the extent of social impact since the nature and extent of association could not be ascertained.

Hence in general IIT alumni are open minded and devoid of inhibitions. This is primarily due to the cosmopolitan environment of IIT which creates a positive impact on the alumni in the formative years. Again the corporate living of the IIT alumni instills in them progressive attitudinal features which in most cases create an apparent progressiveness though they may be quite conservative on certain issues.

The Concluding Remarks

As mentioned at the very beginning of the chapter, the present analysis concentrated on a certain aspects of the total study on impact assesment. This was because it was restricted by the scope and duration of the programme. It brought out a few very significant points but left scope for analysing few more equally relevant issues.

The study infers that the IIT alumni have taken active part in the process of development in the sense that it has contributed to the national output of the economy and at the same time have established themselves as successful social entities but it can also be

inferred that the development has been to some extent lopsided. The lopsided or skewed nature of development is mainly because of structural deficiencies and imbalances in the demand and outturn of specialised manpower. This occurs because the technical institutes or IIT in particular does not tune itself to the changing pattern of the industrial environment. For example it is often the case that certain subjects of a department which do not have relevance in the present day industrial trend are still being taught. The alumni have expressed views on some of those aspects. The result of such an imbalance is the 'Internal Brain Drain' indicating that a Mining Engineering Graduate joins a software firm where he/she works as a sales executive. That is because he does not get a job at comparable salaries which requires his expertise in mining and software firms with or without foreign collaboration, are biased towards IIT alumni offering attractive remunerations.

Another crucial finding is that IIT Education is not oriented towards appropriate technology development. It caters to the needs of the top brass and generates technology which could stand in competition in the international market. Often it feeds the development of foreign knowhow with its expertise. It is definitely desirable to become a successful competitor in the international market but at the same time a significant effort should go into the development of technology which will be of use in the nation and would benefit the mass.

Research undertaken in the Institute often cannot claim to have a fundamental contribution and at the same time does not have a practical messege. It hardly has any bearing on the process of Science and Technology development theoretical as well as practical. Most often they remain as volumes indicating research outturn.

The present research coupled with the views of the alumni provides certain directions of reorientation of the IIT education to suit the needs of the nation and at the same time to establish its role as the torch bearer in science and technology education.

The first and foremost need that crops up is the development of a system of education which will provide the theoretical base and at the same time would be practically oriented. This could be achieved through.

- Repeated IIT_Industry interaction.

- Development of an agency which would assess the need of the technology and guide in updating the curricula according to it.

- The IIT Training & Placement could act as a machinery for continuous assesment of demand for the particular specialisation.

Further depending on the need or demand, departments could be created or merged with other departments. Specialisation which is often introduced at the M.Tech level should be taken up at the B.Tech level also so that students get familiarised with the subject from the early years which could help them to generate a meaningful output at the Masters level. For this, a particular department can offer more than one B.Tech which has been introduced in IIT KGP in recent years. However the relative prospects of such programmes under the universal banner are yet to be tested.

On the social front, IIT alumni consider themselves to be socially conscious beings. But the fact remains that they are hardly exposed to the realities of our country and what social consciousness means in this context. Believing and acting for it are two different issues which they often fail to fathom. Hence if really impact on the society is to be established appropriate co-curricular or extra curricular courses are to be in built within the system of education from the B.Tech level.

The IIT alumni are the established successful citizens of our nation. They are believed to be the 'cream' in terms of quality, efficiency and outturn. They occupy the topmost levels of the societal system. But its trickle down effect is not that promising. It is mainly because of our economic and social system does not instill within them the attitude of mass propagation. They are the self contained, self sufficient representatives of our society.

INDIAN
INSTITUTE OF
TECHNOLOGY
KHARAGPUR : 721 302

OFFICE OF THE DEAN
Prof. A. K. Mitra
Dean of Postgraduate Studies

Dt. : September 01, 1992

Dear Sir / Madam / Alumnus,

Department of Science and Technology of the Government of India is sponsoring a project under the auspices of IIT, Kharagpur, to report on the placement, nature of work and the impact on the society and economy of the Graduates, Postgraduates and Doctorate alumni of IIT Kharagpur for the years 1974-84. Information relating to academic career, jobs held, current work and other relevant details of our alumnus during this period, is very vital to this report and I shall like to get in touch with him / her in this connection soon. Since our alumnus has passed out long back there is every possibility that his contact address has changed. I shall greatly appreciate if you kindly fill in his / her present contact address in the enclosed self-addressed post card. If the contact address is the same as that in this letter please let us know. Further if you happen to know addresses of any other alumni let us know his/her contact address and the year of passing. If the list is too long please put down in an extra sheet and mail it to us. We would remain ever grateful to you.

In conclusion, may I make the personal request to you to kindly reply to this letter and mail the completed post card before your next appointment claims your attention. I thank you for your kind cooperation.

With best wishes,

Yours Sincerely,

(A. K. Mitra)

PHONE : (03222); 2221 TO 2224, Extn. (O) 2210, (R) 7516; GRAM : TECHNOLOGY KHARAGPUR; TELEX : 06401 - 201 ITKG IN

QUESTIONNAIRE FOR THE ASSESSMENT OF THE NATURE AND EXTENT OF IMPACT OF IIT KHARAGPUR ALUMNI ON THE NATIONAL ECONOMY AND SOCIETY

INDIAN INSTITUTE OF TECHNOLOGY
KHARAGPUR 721 302

INDIAN
INSTITUTE OF
TECHNOLOGY
KHARAGPUR : 721 302

OFFICE OF THE DEAN
Prof. A. K. Mitra
Dean of Postgraduate Studies

Dear Alumnus,

This letter and the enclosed questionnaire is a follow up to our earlier letter seeking your current contact address. We appreciate your timely response.

IIT Kharagpur established in 1952 is the premier of all IITs. The forty years of its existence has always been a landmark in the history of science and technology education and the students of this institute have been the torch bearers in setting the course of its development. However, the supremacy of the institute though a well known fact, has to be substantiated by adequate accounts and inferences and the present study aims to establish this.

The period 1974-1984 has been chosen for the study because it covers more than 6000 graduate, post graduate and doctroral alumni and at the same time it encompasses two plan periods of the Government. Moreover, it is expected that alumni who have passed out during this period have settled in their profession. The present project plans to study the nature of work, jobs held and the nature and extent of the impact of alumni on the economy and society. Apart from this a study on the nature of migration and the relevance of the curriculum which the alumni have undergone constitute the subsidiary objectives.

The broad spectrum of the study has compelled us to pose a number of questions and the questionnaire has been designed to capture these aspects. We estimate that the questionnaire will not take much of your time. We earnestly request you to kindly find out time from your busy schedule for answering the questionnaire and mailing back to us as early as possible. We are enclosing herewith a stamped & addressed envelope for your convenience in mailing back the filled up questionnaire. Address in the envelope is that of Prof. R.N. Chattopadhyay who is a Co-coordinator in this project. Your responses will be extremely valuable in enabling us to establish the role of IIT Kharagpur within the broad national perspective.

Lastly, we assure you that your responses will not be made public and will be used only for an academic endeavor.

With best wishes,

Yours Sincerely,

(A. K. Mitra)

Date : 1st September, 93

Some tips to answering the Questionnaire

(1) The Questionnaire has six distinct sections. You are requested to answer all the sections and all the questions. Some sections have subsections all of which may not be relevant in your case. So please pick up the subsection that is relevant and answer the questions in that subsection only.

(2) Please be precise and to the point in answering questions.

(3) In case of options (a), (b), (c) etc. you could answer either by writing the relevant option in the allotted space or could tick the relevant option.

(4) For your evaluation on a (0-10) scale, consider 0 to be the lowest and 10 the highest positions.

(5) You are free to express your opinion regarding the approach to the study.

(6) Any other suggestion is also welcome.

No TPP / 3183/47

QUESTIONNAIRE FOR THE ASSESSMENT OF THE NATURE OF PLACEMENT, EXTENT OF MIGRATION, NATURE AND EXTENT OF THE IMPACT OF IIT KGP ALUMNI FOR THE PERIOD (1974 - 1984) ON THE NATIONAL ECONOMY AND SOCIETY

A. PERSONAL INFORMATION

A1. Name :

A2. Date of birth :

A3. Nationality :

A4. Religion :

A5. Sex :

A6. Marital Status :

A7. Address for Correspondence :

B. EDUCATIONAL INFORMATION :

B1. **Formal education** (from your Bachelor's degree onwards) :

Degree	Branch	Institute & Place	Years of stay in the Institute From To	Reasons for shifting to a particular Institute

C. **PROFESSIONAL INFORMATION :**

C1. Please indicate the number of jobs you have changed since the time you have started your career :

C2. Please give some more information on the current job and two previous jobs (if any)

Particulars	Current job	Previous Jobs 1	Previous Jobs 2
C2.1 Name of the Organisation			
C2.2 Duration of service offered (Please specify years of joining and leaving)			
C2.3 Type of Organisation (a) Government (b) Public Sector (c) Private Sector (d) Others (Please specify)			
C2.4. Designation			
C2.5. Gross annual income with perquisites (approx.)			
C2.6 Professional status (a) Practising engineer (b) Research Scientist/ Engineer (c) Executive/Manager (d) Industrialist/Enterpreneur (e) Academic Researcher/ Teacher (f) Consultant (Self employed) (g) Others (Please specify)			
C2.7 Nature of job (a) Academic/Teaching (b) Consultancy (c) Enterpreneurship (d) Financial (e) Managerial (f) Administrative (g) Planning (h) R & D (i) Technical (j) Others, (Please specify)			
C2.8 Relevance of IIT education to the job on a (0-10) scale			

Particulars	Current job	Previous Jobs 1	2

C2.9 Relevance of other degree (other than IIT's) to the job on a (0-10) scale

C2.10 Reasons for leaving the previous job

(a) Financial dissatisfaction
(b) Dissatisfaction with nature of work
(c) Dissatisfaction with work atmosphere
(d) Dissatisfaction with relationship with superiors
(e) Alternative job on better terms and conditions
(f) Family reasons
(g) Other, (Please specify)

We would require some more details relating to your current job for economic impact assessment.

C3. How many technical persons of your professional status (please refer to C2.6 for the definition of professional status) serve the organisation and out of them how many are from IIT/KGP ? Instead of the organisation, you could refer to any other feasible unit e.g. branch, department or section for reference.

Organisation / Branch/ Department / Section	Status	Total No.	No.of IIT/ Kgp alumni

C4. Total number of persons employed in your organisation :

C5. Provide the following information on skilled professionals (engineers & non-engineers) of your organisation, and their salary scales.

Employment Category	No.of employees in that category	Salary Structure Min	Max
(a) Practising engineers, teaching staff, research scientists etc.			
(b) Other non-engineering skilled professionals like managers, lawyers, accountants etc.			

C6. Name three other organisations where you could have joined and served indicating your probable status :

Possible names of employing organisation	Probable status	Expected gross annual salary

C7. Do you have earnings from any other source?
(a) Yes (b) No

If yes, please specify.

C8. Do you have investments of any form?
(a) Yes (b) No
If yes, answer the following questions.

C8.1 Type of investment

C8.2 Amount of invested capital and year of investment

C8.3 Average annual earnings from investment

C9. Are you a member of the following

C9.1 Professional Societies
(a) Yes (b) No

C9.2 International Commission or Apex Body
(a) Yes (b) No
If yes, mention the name of the body.

C9.3 Editorial board of Journals

National		International	
(a) Yes	(b) No	(a) Yes	(b) No

We have some more questions on your work profile. Since IIT alumni have a versatile professional career we have posed a number of questions under different headings. Please choose the one from sections C10 to C16, that is appropriate to your profession. Answer with respect to your current profession only.

C10. **If you are employed in the Industry kindly attempt question nos. (C10.1- C10.15)**

C10.1 To which broad industrial sector (e.g. Heavy chemicals, Machine tools and parts, Electronics and Computers Construction etc.) does your industry belong ?

C10.2 Name the products of your firm (if it is in the manufacturing sector).

C10.3 Type of services rendered by your organisation (if it belongs to the service sector).

C10.4 Please indicate your hierarchical position on a (0-10) scale in the organisation.

C10.5 Please rate on a (0 - 10) scale your direct involvement in the production policy or managerial policy decisions of your industry.

C10.6 If you have any research contribution ,

C10.6.1 What is your area of research ?

C10.6.2 Do you work

(a) Independently (b) In a team (c) In both

C10.6.3 If in a team, where do you rate your individual contribution to the company to be on a (0-10)scale?

C10.6.4 Please indicate the following

Publications	Yes/No (If yes, the number)
(a) Papers published	
(b) Research monographs/ books written	
(c) Presentations in National/International Conferences	
(d) Patents taken	
(e) Any other products developed (viz.experimental material, algorithms, designs, etc.)	

C10.7 Does your organisation impart training towards skill formation ?
(a) Yes (b) No
If yes, please mention the nature of training.

C10.8 Where do you rate your role to be, on a (0-10) scale,in the training programme ?

C10.9 Does your company have interactions with foreign concerns?

(a) Yes (b) No
If yes, please specify.

C10.10 Do you play any role in such interactions ?

(a) Yes (b) No
If yes, please rate your role on a (0-10) scale.

C10.11 What is the annual turnover or income of your organisation.

C10.12 Please assess and indicate on a (0-10) scale the proportional contribution of your industry/unit to the industrial sector. It could be in terms of the proportional turnover or proportional income or proportional market catered.

C10.13 Do you have any award or recognition of merit to your credit?

(a) Yes (b) No
If yes, please specify.

C10.14 What do you consider to be the remarkable achievement(s) in your entire professional career?

C10.15 Please mention any other aspect of your professional life that you would like to.

C11. **If you are working in a Research Institute (CSIR lab, Defence lab etc.) please attempt question nos (C11.1-C11.16).**

C11.1 What is your area of research ?

C11.2 Do you work (a) Independently (b) in a team (c) In both

C11.3 If in a team where do you rate your individual contribution to be on a (0-10) scale?

C11.4 Is your research output

(a) Theoretical

(b) A marketable product

(c) Others (please specify)

C11.5 Have you contributed in attaining self sufficiency with respect to any product.

(a) Yes (b) No,
If yes, please specify.

C11.6. Please indicate the following aspects that you have to your credit.

Publications	Yes/No (If yes, the number)
(a) Papers published	
(b) Research monographs/ books written	
(c) Presentations in National/International Conferences	

Other Products	Yes/No	If yes, specification of the product
(a) Patents taken		
(b) Any other product like instruments, material, algorithms, designs etc.		

C11.7 Did you receive any funds for research or research contracts from any orgnisation like DST, MHRD or any foreign agency

(a) Yes (b) No

If Yes,

Name of Organisation	No of projects

C11.8 Has your research output gained international recognition ?
(a) Yes (b) No

C11.9 Have you chaired sessions in national/international conferences ? Please specify.
(a) National (b) International

C11.10 Kindly rate your role in research management or research policy decision on a (0-10) scale in your institute.

C11.11 Please assess and indicate on a (0-10) scale the role played by your institute in the national economy in your field.

C11.12 Do you work as a consultant for other organisations ?
(a) Yes (b) No

C11.13 Do you hold any administrative position in your institute ?

(a) Yes (b) No

C11.14 Do you have research guidance?
(a) Yes (b) No
If yes, specify, mention the category (e.g. Ph.D) and number

C11.15 Did you receive any award or recognition of merit
(a) Yes (b) No
If yes please specify

C11.16 If you have any other information to put forward please write briefly.

C12. If you are employed in an Educational Institution please attempt the questions in this section (C12.1-C12.14).

C12.1 At which level do you teach ?
(a) PG (b) UG (c) Both

C12.2 Please indicate the following that you have to your credit.

Publications	Yes/No (If yes, the number)
(a) Papers published	
(b) Research monographs/ books written	
(c) Presentations in National/International Conferences	

Other Products	Yes/No	If yes, specification of the product
(a) Patents taken		
(b) Any other product like instrument,materials, algorithms, designs etc.		

C12.3 In how many research projects have you been associated as investigator.

C12.3.1 Did you receive any funds for research or research contracts from any organization like DST, MHRD or any foreign agency.

Name of Organisation	No of research contracts

C12.4 Project guidance

C12.4.1 Masters' level (number)

C12.4.2 Ph.D guidance (number)

C12.5 How would you characterise your research activity?

(a) Fundamental research

(b) Applied research

(c) Both

C12.6 Have you worked on improvement or development of any product that has been adopted by industries or transfered to appropriate areas ?
(a) Yes (b) No
If yes, please specify.

C12.7 Do you work as a consultant for other organisations ?
(a) Yes (b) No

C12.8 Do you have any enterpreneural engagement?
(a) Yes (b) No
If yes, please give approximate estimate of the annual turnover and the number of persons employed.

C12.9 Do you have any awards or recognition of merit to your credit?
(a) Yes (b) No
If yes, please give details.

C12.10 Do you have experience of teaching or research abroad as a visiting professor or researcher ?
(a) Yes (b) No
If yes, please give the name of the University and place.

C12.11 Do you hold any administrative position in your institute?
(a) Yes (b) No

C12.12 Have you chaired sessions in conferences ?

(a) Yes (b) No
If yes, indicate (a) National (b) International

C12.13 Could you estimate approximately the percentage of your work time devoted to the following activities.

Activities	Percentage
(a) Teaching	
(b) Research	
(c) Extra Curricular	

C12.14 Any other points that you would like to bring to our notice :

C13. **If you are in Government Administration please attempt question in this section (C13.1-C13.9).**

C13.1 Specify the type of administration/service.

C13.2 How involved are you in taking up national decisions. Rate on a (0-10) scale.

C13.3 Do you have any contribution in decision making in international affairs. Rate on a (0-10) scale.

C13.4 Do you have any contribution in the field of research in the relevant area ?
(a) Yes (b) No

C13.5 Have you attended national/international conferences?

(a) Yes (b) No
If yes, please specify the number of times you have attended.

(a) National (b) International

C13.6 Have yoy published any research paper/book/monograph?
(a) Yes (b) No
If yes, please specify.

C13.7 What according to you has been a remarkable achievement in your professional career ?

C13.8 Please rate on a (0-10) scale your direct contribution in relation to the welfare of the common people?

C13.9 Any other aspects that you would like to mention :

C14. **If you are self-employed please give the following information (information based on last year's data) (C14.1-C14.19)**

C14.1 Type of business

(a) Manufacturing
(b) Service oriented
(c) Consultancy/Project planning/Execution
(d) Marketing/Trading
(e) Others, (Please specify)

C14.2 Ownership
(a) Single (b) Joint

C14.3 Year of establishment

C14.4 Value of invested capital

C14.5 Source of finance

C14.6 Number of employees

C14.7 Total money paid as salary to workers per month

C14.8 Type of product manufactured or service rendered or consultancy offered or tradin business undertaken

C14.9 Value of output or total annual turnover of the firm (you can give an approximate estimate)

C14.10 What is the average value of a project that you handle every year.

C14.11 How many projects do you handle per year.

C14.12 Does your firm produce prototypes for which you or your agents are the sole manufacturers ?
(a) Yes (b) No
If yes, please specify.

C14.13 What proportion of the market is taken care of by your organisation. Please mention in terms of percentage.

C14.14 Do you have foreign collaborations ?
(a) Yes (b) No
If yes, please specify.

C14.15 Do you export products of your firm?
(a) Yes (b) No

C14.16 Do you have any recognition of merit to your credit ?
(a) Yes (b) No
If yes, please mention in details.

C14.17 Does your organisation impart training for skill formation ?
(a) Yes (b) No

C14.18 Have you attended national/international conferences or exhibited your products in trade fairs ?
(a) Yes (b) No

C14.19 Any other points that you would like to put forward:

C15. If you are employed as an architect etc. please attempt the questions in this section (C15.1-C15.11)

C15.1 Please specify the type of architectural service that you render.

C15.2 What is the average value of projects you handle (you could mention the range, if necessary)?

C15.3 How many projects do you handle per year?

C15.4 Do you work

(a) independently (b) in a team or (c) both.
If you work in a team, where do you rate your individual contribution to be on a (0-10) scale ?

C15.5 How significant is the contribution of your organisation to the business. Please rate on a (0-10) scale.

C15.6 Do you have any contribution in the field of research in the relevant area?

(a) Yes (b) No.
If yes, please specify.

C15.7 Have you published any research paper/monograph/book?

(a) Yes (b) No.

C15.8 Do you have any award or recognition of merit to your credit?

(a) Yes (b) No
If yes, please mention in details.

C15.9 Have you participated in any national/international conference/meeting or trade fair?
(a) Yes (b) No

C15.10 What according to you, has been a remarkable achievement in your professional career ?

C15.11 Any other point that you would like to mention.

C16. **For the alumni whose profession does not fit into any of the above mentioned categories: C10-C15 (e.g. Journalist, Writer, Politician etc.) please attempt the following questions (C16.1-C16.7).**

C16.1 Please specify the type of job

C16.2 What has been your involvement in enriching the consciousness of the people? Please rate on a (0-10) scale against each.
Social consciousness

Political consciousness

Cultural consciousness

Literary consciousness

C16.3 Do you have any recognition of merit to your credit?
(a) Yes (b) No
If yes, please specify.

C16.4 Do you have interactions overseas in relation to your professional career ?
(a) Yes, (b) No.

C16.5 Do you have any contribution in the field of research in the relevant area?
(a) Yes, (b) No.
If yes, mention the type.

C16.6 What do you consider has been a "challenge" or a remarkable achievement in your professional career ?

C16.7 Any other remarks :

D. INFORMATION ON ALUMNI WHO HAVE BEEN ABROAD

Questions for those who have been abroad and have either returned or have continued to stay overseas.

D1. When did you go abroad ? Please mention the year of departure.
(a) After B. Tech
(b) After M. Tech
(c) After Ph.D
(d) While serving/in job

D2. What was the predominant objective for going abroad initially
(a) Studies
(b) Training
(c) Job
(d) Business
(e) Any other, specify.

D3. What were the factors which have attracted you (pull factor) for going abroad *(tick and rank the factors responsible in your case, ranks in brackets)*

(a) Better academic facilities ( )
(b) Better opportunities for children ( )
(c) Better career prospects ( )
(d) Close relatives abroad ( )
(e) For a change ( )
(f) Financial opportunities ( )
(g) Living in an affluent society ( )
(h) Others (please specify) ( )

D4. **If you have been abroad for higher academic achievement kindly attempt the following :**

D4.1 To which University did you go for higher studies?

D4.2 How did you find the standard of academics at the place where you had studied ?

(a) Better than IIT/KGP
(b) Comparable with IIT/KGP
(c) Worse than IIT/KGP

D4.3 Would you like to mention about any of your special achievements during the stay abroad ?

D4.4 Has your education in IIT/KGP helped you in your achievement relating to higher studies outside your country ?

(a) Yes (b) No

If yes, in what ways ?

D5. **If you have returned to India, answer the following questions:**

D5.1 What were the major reasons for returning back to the country ?

(a) Adequate job opportunities in India
(b) Adequate educational facilities in India
(c) Cultural reasons
(d) Family responsibility
(e) National pride
(f) Prefer children to grow up in India
(g) Could not find suitable employment abroad
(h) Others (please specify)

D5.2 What was the duration of your stay abroad ?

D5.3 Has there been any change in your orientation towards your career after your return ?

(a) Yes (b) No

If yes, please elaborate.

D5.4 Do you regret returning to India ?

(a) Yes (b) No

D5.5 Do you think of going back ?
(a) Yes (b) No

D6. If you have not returned attempt the following :

D6.1 Was your decision regarding settling abroad.
(a) Planned
(b) Circumstantial

D6.2 What were the reasons for staying back overseas *(tick and rank the relevant ones in brackets)*

(a) Greater financial benefit ( )
(b) Better living conditions ( )
(c) Better opportunities for individual growth ( )
(d) Better opportunities for professional advancement ( )
(e) Better work environment ( )
(f) Better recognition of merit abroad ( )
(g) Marriage to a non-Indian ( )
(h) Loose family ties ( )
(i) Others (please specify)

D6.3 Did your education in IIT / KGP influence you in any way to take such a decision
(a) Yes (b) No
If yes, in what way ?

D6.4 Do you wish to come back to India and serve at any point of time?
(a) Yes (b) No (c) Not known

D6.5 Have you made any investment in India ?

(a) Yes (b) No
If yes, attempt the following

D6.5.1 Year of investment

D6.5.2 Amount of invested capital (approx. value)

D6.5.3 Please specify the form in which investment has been made *(e.g. buying a flat,purchasing a plot, buying securities etc.)*

D6.6 Do you remit currency at some regular intervals to India *(for supporting parents or relations, making purchases etc.)*
(a) Yes (b) No.
If yes, attempt the following

D6.6.1 Frequency of remittances made
(a) Monthly (b) Yearly (c) Occassionaly

D6.6.2 Amount of remittances made (annual average)

D6.6.3 Is this a general practice among other NRIs especially IIT. alumni ?
(a) Yes (b) No (c) Cannot say

D6.7 Do you take part in any social welfare activity in India
(a) Yes (b) No

D6.8 Have you made any financial endowment in the country for social welfare (e.g. helping a school, trust, hospital etc.)
(a) Yes (b) No
If yes, please specify.

E. INFORMATION ON SOCIAL ASPECTS

This section deals with the background and family information, your values and attitudinal structure, your consciousness and involvement in the process of social transformation and regional integration. These would help directly or indirectly in assessing your impact in the society. We sincerely request you to be frank and open.

E1. Background and Family Information

Parental attributes		Father	Mother
E1.1	Parent's educational qualification (a) PG (b) Graduate (c) High School (d) Below High School		
E1.2	Parent's age at the time of your joining IIT/KGP		
E1.3	Parent's income per month at the time of your joining IIT/KGP (a) Above Rs. 5,000/- (b) Rs. 3,000/- to Rs. 5,000/- (c) Rs. 1,000/- to Rs. 3,000/- (d) Below Rs. 1,000/- (e) Nil		
E1.4	Parent's Profession (a) Agriculture (b) Engineering (c) Medical (d) Law Practice (e) Teaching (f) Social Science (g) Science (h) Art and Design (i) Others (Please specify).		
E1.5	Native place, District, State		
E1.6	Parent's present place of residence		

E1.7 Please indicate the number of years you have lived in each of the following places in India :

E1.7.1 Village

E1.7.3 City

E1.7.4 Metropolitan city

E1.8 What is your family structure vis-a-vis your parental family structure [write (p) for parental and (s) for self against the ones relevant]

(a) Joint family

(b) Nuclear family

E1.9 If there is any change in your family structure in relation to your parental structure, was it
(a) Intended (b) Unintended

E1.10 If you are married indicate the following

E1.10.1 Educational qualification of your spouse

E1.10.2 Occupation of your spouse

E1.10.3 Income of your spouse (if she is working)

E1.10.4 Year of marriage

E1.11 How many children do you have ?

E2. Attitude and values

The questions in this section may seem to be too much of an intrusion into your personal domain. However we would request you to be frank and free and we assure you utmost privacy.

Issues	Your Opinion (rate on a 0-10 scale)	Relevance of IIT / KGP (rate on a 0-10 scale) in shaping up such attitudes
Do you support :		
E2.1 Women working for earning		
E2.2 Your wife working for earning		
E2.3 Intercaste marriage		
E2.4 Intercountry marriage		
E2.5 Inter-state marriage		
E2.6 Inter-religion marriage		

E2.7 The abolition of the dowry system

E2.8 Do you consider non-IIT graduates to be at par with the IIT graduates in the following aspects

E2.8.1 Profession
(a) Yes (b) No

E2.8.2 Attitudes
(a) Yes (b) No

E2.8.3 Personal drive
(a) Yes (b) No

E2.8.4 General competence
(a) Yes (b) No

E2.9. Do you have friends belonging to different social strata and different income classes ?
(a) Yes (b) No

E2.10 Did you have such friends before coming to IIT/KGP?
(a) Yes (b) No

E2.11 How do you usually spend your leisure hours? *Please tick the relevant one(s).*

(a) Go to clubs
(b) Attend parties
(c) Stay at home with the family
(d) Visit parents/relatives
(e) Visit friends
(f) Go out for drives
(g) Take part in literary activities
(h) Take part in cultural activities
(i) Others (please specify)

E2.12 Do you exercise your franchise whenever necessary ?
(a) Yes (b) No

E2.13 How far has your stay in IIT/KGP helped you in enriching the following aspects? Please rate on a (0-10) scale.

E2.13.1 - Social consciousness

E2.13.2 - Political consciousness

E2.13.3 - Cultural consciousness

E2.13.4 - Literary consciousness

E2.14 How far has IIT/KGP contributed in improving the following aspects of your professional career and in enriching your personal qualities.

	Issues	Contribution of IIT/KGP environment (Rate on a (0-10 scale)
(a)	Feeling of being socially elevated	
(b)	Feeling of achievement	
(c)	Opportunity to help the Country	
(d)	Opportunity to participate and influence important decisions of your company	
(e)	Scope for better financial opportunities	
(f)	Possessing better intellectual abilities	
(g)	Zeal and determination	
(h)	Self confidence	
(i)	Personal drive	

E3. Social welfare and regional integration

E3.1 Are you attached to any social welfare organisation ?
(a) Yes (b) No

E3.2 Do you have close friends hailing from different states ?
(a) Yes (b) No

E3.3 Has your status as an IIT alumni influenced anyone in your family or neighbourhood to join IIT / KGP ?
(a) Yes (b) No

E3.4 Please mention three major benefits that you had by studying in IIT/KGP

F. FEEDBACK ON CURRICULUM

We look forward to your feedback on the curriculum because we feel that the suggestions would be valuable in framing our future courses.

F1. Please give reasons for your joining IIT / KGP

F2. Levels of expectations met at IIT / KGP

(a) Fully
(b) Partially
(c) Not at all

F3. How far did the course help you in your job ?
(a) Fully
(b) Partially
(c) Not at all

F4. Please give your views/comments on any aspect of your branch of specialisation (viz. Electrical, Mechanical, etc.) which you feel will be helpful in the future developments of the department.

F5. Any other point that you want to comment on for the benefit of the Institute or the department.