



## CROSS -SECTIONAL STUDY OF CAREER CHOICE DETERMINANTS OF ENGINEERING STUDENTS AND ITS ASSOCIATION WITH ACADEMIC PERFORMANCE AND SOCIO DEMOGRAPHIC CHARACTERISTICS

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*Abstract: In India Engineering had been the sought for stream of education, however the recent reports on employability indicated the gap of demand and supply of engineers. Therefore this study aimed to know state of mind for B.tech students, influencing factors of choosing this stream and their association of determinants of their career choice and academic performance and socio demographic characteristics. The study uses primary investigations and used questionnaires method to get inputs from four engineering colleges in Western UP. The study highlighted that largely, students did not take decision independently to opt B.Tech. This dependent decision making and forced entry of student in the engineering field without motivation to opt engineering as profession. In terms of individual image, opting for science was majorly considered as an individual image of being a good student despite the management could be occupation for earning.*

### **INTRODUCTION:**

Pursing engineering has been a prestigious and sort for carrier option across India. Coping to the high demand of student mushrooming of institutions offering B.Tech courses were seen. As per the report entitled 'Aspiring Minds National Employability Report-2013' shown that number of engineering colleges have gone up from 1,511 colleges in 2006-07 to high of 3,345 in 2014-15 from where 1.5 million Engineers pass out every year in India. It has been seen that engineers are taking up jobs for which they are over qualified. A large percentage of the engineering graduates who fail to grab an employment in their respective industry, end up joining call centers or BPO units in MNCs.

In this regard, it becomes pertinent to know state of mind for B.tech students, influencing factors of choosing B.Tech course, awareness of working opportunities in Research and Design (R&D), their perception towards Science and Technology (S&T), their career progression and many more aspects.

Hence, this study was conducted with current final year students of B.Tech in some selected Universities or colleges in the Western Uttar Pradesh with the objective to do cross -sectional study of career choice determinants of engineering students and its association with academic performance and socio demographic characteristics.

### **OBJECTIVES OF THE STUDY:**

- To find out the proportion of students whose decision to join B. Tech was independent
- To analyse the reasons of joining B .Tech course of the final year students of B.Tech course in UP
- To find out the association of determinants of their career choice and academic performance and socio demographic characteristics

## REVIEW OF LITERATURE

In 2009 a study jointly done by Ernst and Young (E&Y) and Associated Chambers of Commerce and Industry (ASSOCHAM) showed that India outperforms US, Europe and Japan on the number of students graduating in the streams of maths and science. India is being ranked 17 with 690,000 students of science and maths graduating every year which is much higher than the US ranked at 48, Japan ranked 33 and China stayed at 38. However, Germany heads the list closely followed by Singapore and France. The positive trend of number of students apparently indicates level of interest in S&T subjects and career thereof. (<http://www.oneindia.com/2009/11/05/india-has-more-maths-science-graduates-than-us.html>)

This study easily validates the general presumption that in India, parents hold the decision key of their children education for their career growth. Pushak (2013) also give more insight to the reasons that motivate students to take up engineering degrees in India. Whereby, financial dependence of children and experience of being elder became the major causes of influence of parents on options of higher education for career options. Study underscore that a Bachelor of Technology (B-Tech) degree which is prized by most Indian parents, especially for sons. After which, a switch to a management arena by MBA degree is seen as a sure step to success. (<http://www.asianscientist.com/2013/06/features/indian-students-engineering-degrees-2013>)

Engineering students opted for other additional streams like management was questioned by having open dialog about quantitative, qualitative, and mixed research methods in engineering education research (M. Borrego, P. Douglas, T. Amelink, 2009). The established disciplines like engineering must undergo tradition shattering and the formation of a paradigm is necessary to assists researchers in building a discipline. In order to establish itself as a research field, engineering education is negotiating input from both qualitative and quantitative methods advocates, both with strong investment in the field.

Study of the perceptions among 1200 first-year engineering students at an Australian university highlighted that students are mostly characterized engineers in line with the EA competency Professional and Personal Attributes. Striking differences emerged between international and local (domestic) students' perceptions of difference between the characteristics of engineers and their own attributes (Bennett, D Maynard, N Kapoor, R Kaur, Rajinder, 2014). This study highlighted the perception importance of career options is prevalent across other countries as well.

One reason for this study is that students entered engineering having no motivation and commitment towards the stream, and could be entered due the external pressures without understanding the realities of engineering work.

The difference of motivation and gap of skill and education was highlighted in the Aspiring Minds report (2019) of employability assessment company found only 3 % of Indian engineers have new-age technological skills in areas like artificial intelligence, data science and machine learning. Even the AICTE review committee report of 2015 also stated the field of technical education has also been a victim of fundamental infirmities in the educational system in the form absence of trust, extremes of anarchy and over-regulation, multiplicity of agencies and vagueness in the drafting of legislation.

Recent scenario was explained by Jia-Qi Cheong, S Narayanan (2020) who analyzed data from 441 currently employed graduates from three major urban centres to determine factors that increased the probability of securing permanent employment. Their findings indicated that the transition is eased largely by personal activities like language learning and participating in extracurricular activities found a negative association between public university qualification and the length taken to secure the first permanent job.

## RESEARCH METHODOLOGY

Data was collected from the primary sources through questionnaire method. Primary investigations were carried out by taking representative sample of engineering colleges in Western UP. There were four colleges in Western UP. Out of which 2 were randomly selected. Out of the list of students in both colleges sampling was done based on random method. Non proportion method was chosen 260 students each were selected from both colleges. As there was no prior study to see the proportion of students whose decision to join B.Tech was independent, so we took proportion of students whose decision was independent in choosing B-Tech as 50 and allowable error as 5%. Applying sample size formula

$$Z^2 \cdot \frac{X P X(1-P)}{L^2}$$

Where Alpha is .05, 95 pc Confidence Interval and L is allowable error that is 5 pc. Adding 30 pc non response we get final sample size approximately 520. We took non proportionate sampling and took 260 each. Out of 520, there were 70 non responders and we received back the questionnaires of 450 final year students.

COLLEGES	REGION	
REC, Bijnour	Western Uttar Pradesh	520
Teerthankar Mahavir University, Moradabad	Western Uttar Pradesh	
IET, BR Ambedkar University, Agra	Western Uttar Pradesh	
Hindustan College, Mathura	Western Uttar Pradesh	

### DESIGN OF QUESTIONNAIRES

The questionnaire for the final year students encompassed questions on reasons for joining engineering course, decision making partners (parents/teachers/peers), areas of interest in terms of industry, if they would go for higher education, perceived and expected value of engineering, level of interest in research, awareness towards scope of research. A few statements were designed on Likert scale of 5 to quantify the results. There were a few statements on Yes/No and the last statement was open ended.

### PRE TESTING & VALIDATION OF QUESTIONNAIRE

After framing the questionnaires, it was sent to eminent experts for content validity and were also sent to 30 current final year students. These students were not included in study. The Cronbach alpha came out to be .86 for the questionnaire which was found to be satisfactory.

### DISCUSSION ON THE RESULTS

. Out of 520 students, we got responses for 450 student. There was 13.5 % non response. The descriptive statistics or characteristic feature of the 450 respondents is mention below in the table 1.

**Table 1**

Characteristic Feature		Number	Percentage (%)
<b>GENDER</b>	Male	270	60%
	Female	180	40%
<b>INCOME LEVEL</b>	IV & V	50	11%
	III	140	31%
	II	160	36%
	I	100	22%
<b>PARENT'S EDUCATION</b>	ABOVE 6 <sup>th</sup> Class	280	62%
	BELOW 6 <sup>th</sup> class	170	38%
<b>FAMILY TYPE</b>	Joint	200	44%
	Nuclear	250	56%
<b>ACADEMIC</b>	Above 65%	200	44%
	Below 65%	250	56%

<b>COACHING</b>	Have	360	80%
	Have	90	20%
<b>MEDIUM OF EDUCATION</b>	English	240	53%
	Hindi	210	47%

Income classification was done according to B.G Prasad

Highlighting feature from the study is summarised as:

1. Lot of students around 63% opted B.Tech course largely due to influence
2. Only 37% of the respondent decided to pursue due to their passion.
3. 5% feel that entry in B.Tech is easy due to which they opted for this course
4. 27% of the respondents felt that B.Tech course leads to a better career growth
5. 28% students wish to go for higher education. The reasons to opt for higher education vary with region and genders. For example 26% male & female respondents in feel that there are lack of appropriate job opportunities after completing B.Tech due to which it is important to pursue higher education
6. For further education it was found that out of 28% students, 60% prefer to go for management stream especially by doing MBA & 40% wish to specialise in same stream through M.Tech.
7. 6% of students wish to pursue higher studies as they feel it an easy route to go abroad. While 32% respondents wish to go abroad to work.
8. Despite awareness of work opportunities in R&D, few students were interested to work in the same stream of education. Around 61% of males are aware of the opportunities in R&D however, only 7% of them were interested to work in R&D. Among the total respondents 7.5 % students showed interest in self-employment.
9. Perception towards S&T was measured in terms of individual image, societal appreciation, scope of B.Tech course in terms of placement and career progression. In terms of individual image, 62% of the respondents perceived opting for science as an individual image and feel that a good student should always choose science.
10. As the working preference maximum students (35%) have preference of working in Computer Science & Engineering. It was closely followed by Information Technology with 30% students; Electronics & Communication Engineering was preferred by 15% while 12% and 8% students preferred Mechanical Engineering and Electrical Engineering respectively.
11. Among the suggestions for improvement in the engineering stream, students felt that the syllabus is out-dated & needs an overhauling especially in teaching methodology. Many suggested that the modules should be Industry-linked and specialised faculty must be employed for value addition.
12. Suggestion for specific branches, many reported that number of companies invited for campus placements specifically for civil, mechanical & electrical should be increased. There should be sessions on scope of industry & opportunities in the field and regular sessions & preparation on employability skills (communication skills) must be increased. Further, there should be some focus on research work.

### ASSOCIATION of VARIABLES

For further inference from the study non-parametric test Chi-square test on various characteristics were done. The significant chi-square statistics underscored that the gender do play a role in decision making of engineering students. Here  $X^2 (1, 450) = 12.76, p < 0.001$

	<b>Independent Decision</b>	<b>Dependent decision</b>	<b>Row Totals (row %)</b>
<b>male</b>	120 (44%)	150 (56%)	270 (100%)
<b>female</b>	50 (28%)	130 (72%)	180 (100%)
<b>Totals</b>	170 (38%)	280 (62%)	<b>450 (100%)</b>

The data reveals that majority of 62% of students decision are dependent on their gender, where 72% of female student's decision are more dependent as compared to 56% of male.

We took the association of income on the independence of decision where the chi-square significant shows that income level do influence the decisions of students in pursuing engineering stream. Here  $X^2(1, 450) = 37.04, p < 0.001$ .

Income group As per B G Prasad classification	Independent Decision	Dependent decision	Row Totals (row%)
IV and V	20 (20%)	30 (60%)	50 (100%)
III	30 (21%)	110 (79%)	140 (100%)
II	60 (37%)	100 (63%)	160 (100%)
I	60 (60%)	40 (40%)	100 (100%)
<b>Totals</b>	170 (38%)	280 (62%)	<b>450 (100%)</b>

The test shows that high income group have dependent decision attribute as compared to low income group. As per the BG Prasad classification the III income group is seen to be more dependent while least income group (level I) is more independent in decision making.

Further the chi-square tests on family type shows family do impact the independence of decisions. The nuclear families are making more dependent choices while the students from joint families are more independent.

Family Type	Independent Decision	Dependent decision	Row Totals (row%)
Joint	90 (45%)	110 (55%)	200 (100%)
Nuclear	80 (32%)	170 (68%)	250 (100%)
<b>Totals</b>	170 (38%)	280 (62%)	450 (100%)

$X^2(1, 450) = 7.99, p < 0.001$

Significant Chi-square test shows that parent education is closely associated with the independence of decision. Here, educated parents is important factor for student making their independent decisions for pursuing engineering as career.

Parent Education	Independent Decision	Dependent decision	Row Totals (row%)
ABOVE 6 <sup>th</sup> Class	120 (43%)	160 (57%)	280
BELOW 6 <sup>th</sup> Class	50 (39%)	120 (71%)	170
<b>Marginal Column Totals</b>	170 (38%)	280 (62%)	450 (100%)

$X^2(1, 450) = 8.135, p < 0.001$

The above table shows that the 71% of reporting students' parents having education less than the 6<sup>th</sup> class don't make the situation for the students making independent decisions. While only 43% of reporting students having education parents have independent decision making.

Further, considering the academic performance of students the chi-square test shows close association of education and independence of decisions.

$X^2(1, 450) = 7.98, p < 0.001$

academic performance	Independent Decision	Dependent decision	Row Totals (row%)
Above 65% marks	90 (45%)	110 (55%)	200
Below 65% marks	80 (32%)	170 (68%)	250
<b>Totals</b>	170 (38%)	280 (62%)	450 (100%)

The table highlighted that better academic performance of student give more independence in decision making. As 68% of student with not so god performance make dependent decision as compared to only 32% making independent decisions.

In relation of education, the chi-square test highlighted that the medium of education is not a major factor in the decision of students. As the Chi-square test is not significant with

$$X^2 (1, 450) = 0.169, p > 0.001.$$

Medium of education	Independent Decision	Dependent decision	Row Totals (row%)
English	90 (37%)	150 (63%)	240(100%)
Hindi	80 (38%)	130 (62%)	210 (100%)
<b>Totals</b>	170 (38%)	280 (62%)	<b>450 (100%)</b>

The data shows that the around 62% of student in both English or Hindi medium of education associated with dependent decisions. While around 37-38% of student have made independent decision to pursue engineering stream.

In relation of education, the chi-square test highlighted that the coaching is a not major factor in the decision of students. As the Chi-square test is not significant with  $X^2 (1, 450) = 4.39, p < 0.05$ .

Coaching	Independent Decision	Dependent decision	Row Totals (row%)
With	140 (36%)	250 (64%)	390
Without	30 (50%)	30 (50%)	60
<b>Totals</b>	170 (38%)	280 (62%)	<b>450 (100%)</b>

The table highlighted that student having coaching make more dependent decision. As 64% of student with coaching has made dependent decision as compared to only 50% of without coaching students.

## **CONCLUSION:**

From the study it was concluded that largely, students did not take decision independently to opt B.Tech. Either parents or teachers or peer were the influencing forces in the decision making of opting B.Tech. This behaviour has caused forced entry of student in the engineering field without motivation to opt engineering as profession. A large number of respondents also used B.Tech course as a platform with the intent to switch over to other unrelated areas with additional advantage.

There was a significant difference found between the expectation at the entry of B-Tech course and the actual perceived experience gained during the course. For further education it was found that out of 28% students, 60% prefer to go for management stream especially by doing MBA & 40% wish to specialise in same stream through M.Tech. Many respondents showed interest to pursue higher studies since they felt that there were no jobs after completing B. Tech. Computer Science, Information Technology and Electronics & Communication were found the most preferred industry irrespective of their branches. Among the suggestions for improvement students felt that the syllabus is out-dated & needs an overhauling especially in teaching methodology. Suggestions indicated that the forward and backward link between education and

industry required alterations. This needs to be addressed through further research and action researches and appropriate modifications can be taken by policy makers and other stakeholders, like parents, employers & faculty members.

This study do faced limitation of limited population size. Although, we have applied Wilcoxon rank sum test in a small sample against the large population, the other statistical tools could be applied if the sample size would have been larger. Further the study faces limitation of biasness as data of only respondents were analysed, if the non respondents could have give some inputs the study could be Due to the rigid academic calendar, where students were not available during the festivals, mid term/end term examinations, summer & winter break, it was tough to reach students.

Despite the limitations of study, this a can be easily concluded from the cross -sectional study of career choice determinants of engineering students and its association that decision to pursue engineering courses was influenced and is dependent on academic performance and socio demographic characteristics. Therefore further study into the force field analysis and expected surveys can be conducted with first year students of B.Tech, as there was a significant difference found between the expected and actual perceived value. Also the need to conduct entrepreneurship development workshops and incubation centres during the B. Tech course was highlighted.

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