

**“What is Future Skill Focus in Engineering Education ? Technical skills or Non-engineering general education component i.e. soft skills or Both skills ?? – Analytical study from Employers Survey”**

**Mr. Prashant N. Badgajar <sup>1</sup>**

**Research Scholar, Department of Business Management & Business Administration,  
R.T.M. Nagpur University, Nagpur, Maharashtra, India**

**Dr. Pratap M. Chauhan <sup>2</sup>**

**Assistant Professor, V.M.V. College of Arts, Commerce and Science, Nagpur (M.S.)  
R.T.M. Nagpur University, Nagpur, Maharashtra, India**

### **Abstract–**

*This article is based on the analytical findings of the survey of employers which recruits fresh engineering graduates. The study helps to find the employers' perceptions on the desired skills from the engineering graduates. This study also studies whether technical skills need to be possessed by the students, or non-engineering general education component (soft skills) or both skills. In today's competitive world engineers are always uncertain about employment due to lack of skill set desired by employer. This is due to technological advancement, industry-academic skill gap, availability of resources, global recession, economic factors, competition etc. So, focusing on the desired skill set by employer i.e. Technical skills or Non-engineering general education component i.e. soft skills or Both skills will definitely help not only employers to get right person for right job within short time but also to future engineers who wish to achieve good career.*

**Keywords:** Employability Skills, Employer's Perception, Engineering Education Skill Gap

### **1. Introduction**

The world of employment has changed dramatically, technology is impacting practices and experiences. With the rise of globalization, employability is becoming one of the main goals for engineering education systems. Therefore, with rapid technological changes, skill gaps in the workforce will always exist and workers with technical skills only will not effectively function in today's industries. Today's employers require employees to have soft or non-technical skills in addition to technical skills. While such skills may vary with industries to industry. Thus, this study deals with knowing employer expectation from newly recruited engineers. That is up to which extent technical skills or non-engineering general education component i.e. soft skills or both skills are needed by employer.

### **2. Literature Survey**

Evidence from studied literature suggests that Soft Skill Attributes contribute to the sustainable employment of the engineering graduates significantly. Majority of Employer are always interested to hire engineering graduate with professional skills. Truong and Laura (2015) opined that the development of soft skill as an academic discipline is still under development, and that's why different researchers defined it differently. According to Nair & Mukharjee (2015), an organization's image is reflected through the image presented by employees in that company. The technical as well as non-technical skills impact a lot to create this image of an employee. Nusrat and Soliman (2016) suggest that the sustainability of any business is dependent upon the issues like employee welfare, financial matters and most importantly competitive business advantage. The adaption of new technology or technological skills within engineers contributes a lot to gain competitive business advantage.

According to study conducted by Ramakrishnan, K. and Yasin, N.M. (2010), A mismatch between the qualifications of graduates and the needs of employers has been found in Malaysia. Specifically, the inconsistencies were identified among the levels of demand and supply of graduates with appropriate soft or non-technical skills needed for employment; causing students to remain ill prepared for the job environment.

According to Bancine and Zevalkink (2007), when non-technical skills (Soft skills) are developed to complement technical skills. This eventually turn into improved business success rates, sustainable competitive advantage and increased profitability.

After studying lot of literature, the need of the study has been identified which decides weathers technical skills or non-technical skills or both skills are important for developing engineer.

### 3. Objective of the Study:

To find weather technical skills more important or Non-engineering general education component i.e. soft skills or both skills are more important in employer's point of view.

### 4. Research Methodology

**4.1 Target Population:** Population is the assessable group of people who meets well defined set of eligibility criteria. In this study, the group of experienced engineers or HR managers or working engineering professionals from various fields who observes the day-to-day behaviour of newly recruited graduates were considered to estimate best possible results of the study.

**4.2 Sample Size:** Sampling is process of choosing representative portion of the population. In this study survey is conducted among 204 respondents who belongs to target population of the study.

**4.3 Sampling Methodology:** Heterogeneous sampling and Stratified random sampling method is used for the sampling purpose. In homogeneous sampling, all the items in the sample are chosen because they have similar or identical traits. It is a type of purposive sampling and is the opposite of maximum variation sampling. Stratified random sampling is a method of sampling that involves the division of a population into smaller groups known as strata. In stratified random sampling, the strata are formed based on members' shared attributes or characteristics. A random sample from each stratum is taken in a number proportional to the stratum's size when compared to the population.

**4.4 Research Instrument:** The 18 employability skills were selected based on 3-component model of engineering education curriculum i.e. (Basic science, Core engineering and Non-engineering general education component). The employers were asked to rate these skills on a 5 point likert scale in two parts. First part asked the importance of these skills required while doing job. Second part asked to rate the freshly recruited engineers in terms of satisfaction about performed job.

**4.5 Method / Procedure of data collection:** The questionnaire started with a pilot study involving a few employers to get important feedback to the researcher regarding the clarity and suitability of the questionnaire. Primary data was collected into two ways. Firstly, the structured questionnaires were sent through surveymonkey website. Secondly, the data was collected by actually visiting industry personnel in various M.I.D.C. areas around pune district. A total of 204 respondents from various organizations responded to the structured questionnaires.

**4.6 Method of Data Analysis :** The collected data is analyzed with statistical method like mean analysis, rank analysis. Expectations and satisfaction difference yields the skill gap exists. Pearson Coefficient, Charles Spearman Coefficient for rank correlation analysis are calculated to get the findings.

Charles Spearman's Coefficient is a non-parametric measure of statistical dependence between two variables. It assesses how well the relationship between two variables can be described using a monotonic function. If there are no repeated data values, a perfect Spearman correlation of +1 or -1 occurs when each of the variables is a perfect monotone function of the other.

Pearson correlation coefficient is a measure of the linear correlation between two variables X and Y. It has a value between +1 and -1, where 1 is total positive linear correlation, 0 is no linear correlation, and -1 is total negative linear correlation. Pearson's correlation coefficient is the covariance of the two variables divided by the product of their standard deviations. The form of the definition involves a "product moment", that is, the mean (the first moment about the origin) of the product of the mean-adjusted random variables; hence the modifier product-moment in the name.

**5. Research Findings**

The following table 5.1 can be used to get results i.e. weather technical skills more important or employability skill or both skills are more important in employer’s point of view. The method used to determine relationship between technical skills and non-engineering general education component i.e. soft skill is “Charles Spearman’s Coefficient of Rank Correlation Analysis”.

No	Employability Skills	Importance			Satisfaction		Skill Gap	
		Skill	Mean (X)	Rank (X <sub>d</sub> )	Mean (Y)	Rank (Y <sub>d</sub> )	Skill Gap (I-S) Rank GAP d=(Y <sub>d</sub> -X <sub>d</sub> )	d <sup>2</sup>
1	Ability to grasp the knowledge of Basic Sciences Skills & to apply it to engineering.	B	3.74	12	3.18	4.5	-7.5	56.25
2	Ability to use appropriate & modern tools, equipment, technologies specific to their jobs	E	3.81	10	3.17	6.5	-3.5	12.25
3	Ability to identify, formulate & solve technical problems	E	3.99	5	3.21	3	-2	4
4	Ability to design, conduct new experiment and to analyze data	E	3.54	15.5	3.04	12	-3.5	12.25
5	Aptitude and Analytical Skills	E	3.88	8	3.17	6.5	-1.5	2.25
6	Technical /Engineering Skills	E	4.05	3	3.33	1	-2	4
7	IT / Computer related skills	E	3.79	11	3.28	2	-9	81
8	Convincing/ Counselling / Negotiation Skills	S	3.54	15.5	3.04	12	-3.5	12.25
9	Communication / Language Skills (Written & Verbal)	S	3.95	6	3.13	8	2	4
10	Presentation Skills	S	3.9	7	3.01	14	7	49
11	Team Work	S	4.24	2	3.18	4.5	2.5	6.25
12	Leadership	S	4	4	2.99	15	11	121
13	Self-Discipline & Self Motivated	S	4.29	1	2.98	16	15	225
14	Creativity, Confidence & Risk Taking Ability	S	3.71	13	3.07	9	-4	16
15	Information Collection & Report Writing Ability	E	3.7	14	3.04	12	-2	4
16	Time Management	S	3.83	9	3.06	10	1	1

No	Employability Skills	Importance			Satisfaction		Skill Gap	
		Skill	Mean (X)	Rank (X <sub>d</sub> )	Mean (Y)	Rank (Y <sub>d</sub> )	Skill Gap (I-S) Rank GAP d=(Y <sub>d</sub> -X <sub>d</sub> )	d <sup>2</sup>
17	Conflict management	S	3.15	18	2.76	17	-1	1
18	Knowledge of Corporate Social Responsibility	B	3.36	17	2.68	18	1	1

**Skill:** B – Basic Science Component Skill; E– Core Engineering Skills;  
 S – Non Engineering General Education Component Skill (Soft Skill)  
 \*\* (Average of ranks is assigned if two or more skills have same rank)

**Table 5.1: Employer’s perception on desired skills from fresh engineering graduates.**

**6. Data Analysis**

**Calculation of Spearman’s Rank Correlation Coefficient**

The Spearman correlation coefficient is defined as the Pearson correlation coefficient between the ranked variables. For a sample of size n, the n mean scores are converted to ranks X and Y, and ρ is computed from it as:

$$\rho = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

$$\rho = 1 - \frac{6 * 612.5}{18(324 - 1)}$$

$$\rho = 1 - \frac{3675}{5814}$$

$$\rho = 1 - 0.632$$

$$\rho = 0.368$$

Where d = Y<sub>d</sub> - X<sub>d</sub>, is the difference between ranks & n = 18.

In above table 5.1 , identical values (rank ties or value duplicates) are assigned a rank equal to the average of their positions in the ascending order of the values. The final spearman’s rank correlation coefficient obtained is 0.368.

**Calculations for Pearson Coefficient and Strength of Association:**

From Table 5.1

$$\sum X = 68.5,$$

$$\sum X^2 = 261.84,$$

$$\sum Y = 55.3,$$

$$\sum Y^2 = 170.5,$$

$$\sum X.Y = 210.91,$$

$$S_{xx} = \sum X^2 - \frac{(\sum X)^2}{n} = 1.16,$$

$$S_{yy} = \sum Y^2 - \frac{(\sum Y)^2}{n} = 0.61$$

$$S_{xy} = \sum X.Y - \frac{(\sum X)(\sum Y)}{n} = 0.463$$

$$\text{Pearson's Coefficient } (r) = \frac{S_{xy}}{\sqrt{S_{xx} \cdot S_{yy}}}$$

$$r = \frac{0.463}{\sqrt{1.16 * 0.61}} = 0.5504$$

$$r = 0.5504$$

Strength of Association = 34.78 %

In general, Pearson's coefficient is used for larger data set to get accurate results in comparison with Spearman's rank correlation coefficient. Here, both coefficients i.e. spearman's rank correlation coefficient and Pearson's coefficient are within 0.18 range which is up to acceptable level. **Both coefficients yield same result i.e. positive correlation between both variable** i.e. Both, Core Engineering Skills and Non Engineering General Education Component are complementary to each other.

## 7. Data Analysis / Findings

- After ranking the mean of importance level by employer, the top skills desired by employer are self-discipline, self motivation, team work, technical/engineering skills, leadership, technical problem identification and problem solving, communication, presentation skills and aptitude/analytical skills etc. This means in employer point of view, soft skills are more important than core engineering skills.
- After ranking the mean of satisfaction level by employer, the skills that employers are most satisfied with the engineers are technical skills. These skills are Computer/IT skills, problem identification and problem solving, apply basic science knowledge, aptitude/analytical skills etc. The lower value of satisfaction level mean has been observed through survey of employers which indicates the skill gap exists among engineering graduates.
- The critical skill gap has been found in the Non-Engineering General Education Component i.e. soft skills. The skill gap of core engineering component is very less and have negative or lower rank. From table 5.1, it is clear that soft skills are equally important in development of engineers. Employer may train engineers on different technologies but before that the self-motivation and ability to sustain in that environment is desired for developing learning attitude.
- From Charles Spearman's Coefficient of Rank Correlation Analysis we may interpret as, importance of desired skills and satisfaction about existing skills among fresh recruited

engineers has 0.368 positive correlation. Assuming basic science skills as base of Core engineering skills, we have calculated importance and satisfaction due to core engineering skills and Non Engineering General Education Component. Thus, there is direct relation between both variable due to presence of Core engineering skills and Non-Engineering General Education Component.

- Both spearman's rank correlation coefficient and Pearson's coefficient yield same result i.e. positive correlation between both variable. Both, Core Engineering Skills and Non Engineering General Education Component are complementary to each other. Also from result, addition of 30 to 35% Non-Engineering General Education Component may give desired result in terms of productivity among fresh engineers.

### Conclusion

From above findings it is clear that Core Engineering Skills and Non Engineering General Education Component are complementary to each other. The soft skill gap exists among fresh engineering graduates. Employers expect to hire engineer with desired skills from both technical skills and employability skills. Thus, students from skill based training institutions are skillful in technically as well employability skill point of view. So these students are preferred to offer the job in industry and placed faster into industry.

### References

- Nusrat, M., & M, S. (2016). A Study of Employee Welfare leading to Corporate Sustainability in Garments Industries of Bangladesh. *Asian Business Review*, 6(1), 7-14.
- Truong, H., & Laura, R. (2015). Essential Soft Skills for Successful Business Graduates in Vietnam. *Sociology Study*, 5(10), 759-763.
- Nair, N., & Mukherjee, G. (2015). Soft Skills: The Employability Success Mantra. *Language in India*, 15(10), 209-14.
- Ramakrishnan, K. and Yasin, N.M. (2010) Knowledge Management Portal: Connecting Higher Learning Institution and Employer. *Journal of Data Mining and Knowledge Discovery*, 1,1-18.
- Bancino, R., & Zevalkink, C. (2007). Soft Skills: The new Curriculum for Hard-Core Technical Professionals. *Techniques: Connecting Education and Careers*, 82(5), 20-22.