The Influence of Soft Skills on Employability of Newly Graduate Mechanical Engineer in Different Industries Sector of India

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Abstract— Core skills are important factor which employers demands for appointing graduate mechanical engineer because it is extremely important factor for to be successful in their job. Soft Skills are also important parameter which attract employers for recruiting newly graduate mechanical engineer in addition to core skill. This study focusses to find the importance of soft skill in different types of industries in India. This study also focusses on the level of soft skill in newly graduate mechanical engineer.

Index Terms— Employability; Soft Skill, Mechanical Engineer, India

I. INTRODUCTION

India has attracted many Multi-National Companies in last few decades due to liberal government policies, globalization, and low cost of workforce. This provides many employment opportunities and this opportunity in employment has resulted in remarkable growth of engineering educational institutions.

Skills are important factor which employers demands for recruiting graduate mechanical engineer because it is extremely important factor for to be successful in their job. Employers therefore wants that graduates mechanical engineer must have the skills to perform the allotted task. Employer wants the graduates engineer must be able to deal with real-world problems.

The demand and supply of skilled work force from engineering institutions is a concern for the employers, as employable engineering graduates are about 25% Lakshminarayanan R. et. al. (2014, 2015). Several studies have been undertaken in past few years to determine the causes of unemployability of passing out graduate mechanical engineering students in India and how academia can better fulfill the requirement of industries.

Today we are in a multidisciplinary era therefore engineers must have expertise in hard skill (technical skill) as well as soft skill. Universities must redesign their curriculum to incorporate these skills in teaching programs.

II. LITERATURE REVIEW

DEST (2006) found skill is an ability to perform a specific task. Hillage & Pollard, (1998), define employability is about having the capability to gain initial employment, maintain employment and obtain new employment if required. Robinson & Garton, (2008) defined the employability skills as the required skills to acquire, keep and doing well on a job. Employability and Skill Set of Newly Graduated Engineers in India found that in a fresh Engineering Graduate, large skill gaps are found in the higher order thinking skills like, problem solving, logic, numerical ability Blom, and Saeki (2011). Gokuladas, (2011), explain employability is measured by the success of students in getting through the campus placement drives conducted by businesses visiting the colleges for fresh talent. Adebakin (2015) reported that university graduates are poorly prepared for world of work because there is a mismatch between the education and training (undergraduate programmes) provided by universities and vacancies available in the labour market. Pitan and Adedeji (2012) concluded that there is a disparity between the skills acquired by university graduates and the ones needed by employers. National Knowledge Commission India (2009) states that currently, most graduates do not possess the skills needed to compete in the global economy, and the industries have been facing a consistent skills deficit.

III. AIM & OBJECTIVE OF THE RESEARCH

The aim of the research is to analyses role of soft skills in employability of newly graduate mechanical engineering in different industry sector of India and objectives was to study the industry expectation regarding soft skills of fresh mechanical engineering graduate

IV. RESEARCH DESIGN & METHODOLOGY

4.1 Formation of Hypothesis

Identification of problems and process of formulation concluded in formation of Hypothesis. Deepak Chawla et.al. (2011) quoted "Any assumption that the researcher makes on the probable direction of the result that might be obtained on completion of the research process is termed as hypothesis". Hypothesis framed for the study were as follows:

H0: The employer expectation of different industries does not differ significantly regarding soft skills of mechanical engineering graduates.

Research is a specific approach towards gaining new information about the research problem through framed process of investigations. This research specifically deals with finding out the expectation of employers on the employability issue specific to mechanical engineering graduates. To achieve above goal first step is to identify the successful attributes for Mechanical engineer through literature survey. Data collection through questionnaire is an appropriate method. This method needs some independent and dependent variables. For the purpose of the research, employability skills of mechanical engineering graduates have been considered as dependent variable and questionnaire has been developed considering soft skill (with six attributes) as independent variable and employability as dependent variable for data collection as shown in table 1.

Dependent Variable	Independent Variable	Attributes of Independent Variable
Employability	Soft Skills	Personal Skill (SS1)
		Presentation Skill (SS2)
		Documentation Skill (SS3)
		Communication Skill (SS4)
		Teamwork Skill (SS5)
		Social, environmental & ethical awareness skill (SS6)

Table 1

4.2 Population

In this research population indicates the employer of all industrial segment in India who appoint graduate mechanical engineer. For this research FICCI 's member data as quoted by Blom A. & Saeki H. (2011) of over 3,000 firms was considered. In addition to above as quoted by AICTE there were 3124 engineering colleges for academic section 2018-19 in India, which plays very important role in requirement also has been considered. AS per ASHIE (All India Survey on Higher Education), MHRD, Government of India 2018-19 report there were 993 universities. Therefore, population of 7117 has been considered for this study.

4.3 Sample Design

Sample design is the process of selecting sample from population. There are two types of sample design:

I. Probability Sampling
   a) Simple random sampling
   b) Systematic sampling
   c) Stratified random sampling
   d) Multi stage cluster sampling
II. Non-Probability Sampling
   a) Convenience sampling
   b) Judgmental sampling
   c) Snow ball Sampling
   d) Quota sampling.

This research use Stratified random sampling. The questionnaire was sent to various professional of mechanical engineering background involve in hiring newly mechanical engineer.

4.4 Sample Size

Determination of Sample size is very crucial for this study. Glenn D. Israel (1992) prescribed following formulas to calculate sample size for infinite population and finite population.

$$n = \frac{z^2 pq}{e^2} \quad (1)$$

Were,

n= Sample size (for infinite population)

Z= Abscissa of the normal curve

p= estimated proportion of an attribute that is present in the population

q=1-p

e= desired level of precision

By using above equation sample size is estimated as 369 for infinite population at confidence level of 95%, estimated proportion 0.6 and desired level of precision 0.05.

Sample size for finite population calculated by using following formula

$$n_0 = \frac{n}{\left(1+\frac{n-1}{N}\right)} \quad (2)$$

Were,

no= sample size for finite population

n= sample size for infinite population (from equation 1)

N= Population

Using equation (1) estimated sample size for infinite population at confidence interval of 95%, desired precision level 0.05 and estimated proportion 0.6 is 369. Using equation (2) estimated sample size for finite population of 7117 at confidence interval of 95%, desired precision level 0.05 and estimated proportion 0.6 is 351.

For above study responses was collected by 398 respondents out of which 43 were incomplete. A response of 355 respondents were taken for this study across all regions of India. Respondents belongs to all major Industry/ employment sector, and they also involved in recruitment process (Table 2).

Academics & Consultancy	71
Aerospace & Defence	71
Automobile and Locomotives	71
Machine Tool & Mechatronics	71
Other Engineering Service	71
Total	355

Table 2

The data were collected through questionnaires. The questions were asked on five-point Likert scale.

IV. RESEARCH FINDINGS

5.1 Normality Test

Data set was assisted for normality this maybe checked through Skewness and Kurtosis. Skewness and Kurtosis of a perfectly normal distribution is 0. [Lowry & Gaskin 2014] quoted that most of the respondents responded in a similar fashion if Kurtosis value are greater than 2 for large data set i.e., when N greater 300.

Attributes	Skewness		Kurtosis	
	Statistics	Std. Error	Statistics	Std. Error
SS1	-0.825	0.129	1.188	0.258
SS2	-0.688	0.129	0.735	0.258
SS3	-0.558	0.129	-0.094	0.258
SS4	-0.335	0.129	-0.361	0.258
SS5	-0.696	0.129	0.609	0.258
SS6	-0.430	0.129	0.040	0.258

Table 3

In current study the Skewness and Kurtosis values for each item falls between standard range as shown in table 3.

5.2 Confirmatory Factor Analysis

The objective of confirmatory factor analysis is to check whether the data fit a hypothesized measurement model which is built on previous analytic research and theory. Confirmatory Factor Analysis is a multivariate statistical procedure that is used to test how well the measured variables represent the number of constructs.

Kline RB (2010) quoted it as "A special form of factor analysis which used in research. Prodon P. (2013) quoted "The objective of Confirmatory Factor Analysis is to test whether the data fit a hypothesized measurement model which is built on previous analytic research and / or theory.

Confirmatory factor analysis was performed so that measurement model could be validated by correlating all the latent variables. More specifically properties of measures are examined via confirmatory factor analysis based on factor structure soft skills.

5.2.1 Identification of Model

Model identification focuses on whether there is a unique set of parameters consistent with the data or not.

To get to know whether the model is identified or not two important things need to consider for comparison that is number of data points in the model and number of estimable parameters in the model. Data points accounted for variances/co-variances of the measured variables can be computed mathematically with the help of following formula:

O (O+1)/2, where O= Number of Observed Variables

Byrne 2010, summed up model identification into three forms which are as follows-:

- "If number of data points=number of parameters to be estimated then model is just identified i.e., saturated". Such a model fit data perfectly so of little use.
- "If number of data points<number of parameters to be estimated then model is under identified".
- "If number of data points>number of parameters to be estimated then model is over identified".

An overidentified model is highly desirable for estimating parameters. Order condition is based on degree of freedom. Positive or zero value is required for identification of a model. The following table (Table 4) shows that model is over identified as degree of freedom is positive.

Number of distinct sample moments	21
Number of distinct parameters to be estimated	12
Degrees of freedom	9

Table 4

5.2.2 Summary of Model Fit

Model fit determines the degree to which a fine fit exist between the sample data and proposed model. There are many varied fit indices that describe the model to the data and every fit index provides distinct information about model fit (Table 5).

Fit Index	CMIN	DF	CMIN/DF	GFI	IFI	TLI	CFI	RMR	RMSEA	PCLOSE
Value	22.26	9	2.47	0.974	0.96	0.94	0.96	0.04	0.047	1

Table 5

Tso-Ying Lee, 2021 and Elizar 2017 prescribed the cutoff values of model fit indices as follows:

Good of Fit Measures	Cut-off Values Based
CMIN/DF	< 3
GFI	0 to 1
IFI	0 to 1
TLI	0 to 1
CFI	0 to 1
RMR	< 0.05
RMSEA	< 0.05

Table 6

5.2.2.1 Post Hock Test

If data are analysed using ANOVA, and a significant value obtained, a more detailed analysis of the differences will be required. In these circumstances, post-hoc tests are necessary.

Details of respondent (I)	Details of respondent (J)	Mean Difference (I-J)	Std. Error	Sig.
Academics & Consultancy	Aerospace & Defence	.60094*	.02951	.000
	Automobile & Locomotives	1.23474*	.02951	.000
	Machine Tool & Mechatronics	2.58685*	.02951	.000
	Other Engineering Service	3.16901*	.02951	.000
Aerospace & Defence	Academics & Consultancy	-.60094*	.02951	.000
	Automobile and Locomotives	.63380*	.02951	.000
	Machine Tool & Mechatronics	1.98592*	.02951	.000
	Other Engineering Service	2.56808*	.02951	.000
Automobile & Locomotives	Academics & Consultancy	-1.23474*	.02951	.000
	Aerospace & Defence	-.63380*	.02951	.000
	Machine Tool & Mechatronics	1.35211*	.02951	.000
	Other Engineering Service	1.93427*	.02951	.000
Machine Tool & Mechatronics	Academics & Consultancy	-2.58685*	.02951	.000
	Aerospace & Defence	-1.98592*	.02951	.000
	Automobile & Locomotives	-1.35211*	.02951	.000
	Other Engineering Service	.58216*	.02951	.000
Other Engineering Service	Academics & Consultancy	-3.16901*	.02951	.000
	Aerospace & Defence	-2.56808*	.02951	.000
	Automobile & Locomotives	-1.93427*	.02951	.000
	Machine Tool & Mechatronics	-.58216*	.02951	.000

* The mean difference is Significant at the 0.05 level.

Table 7

Above table shows the following:

- Soft skill expectation of employer in academics & consultancy and aerospace & defence is significantly different.
- Soft skill expectation of employer in academics & consultancy and Automobile and locomotives is significantly different.
- Soft skill expectation of employer in academics & consultancy and machine tool & mechatronics is significantly different.
- Soft skill expectation of employer in academics & consultancy and Other Engineering Service is significantly different.
- Soft skill expectation of employer in aerospace & defence and automobile and locomotives is significantly different.
- Soft skill expectation of employer in aerospace & defence and automobile and locomotives is significantly different.
- Soft skill expectation of employer in aerospace & defence and machine tool & mechatronics is significantly different.
- Soft skill expectation of employer in aerospace & defence and other engineering Service is significantly different.
- Soft skill expectation of employer in automobile & locomotives and machine tool & mechatronics is significantly different.
- Soft skill expectation of employer in automobile & locomotives and other engineering service is significantly different.

5.3 Reliability

Reliability is defined as "The extent to which measurement instrument produces same result on collecting same set of information." In this regard Cronbach's alpha is the most popular method of testing reliability. Glenn L. Koonce & Michael D. Kelly (2014) coted Cronbach's alpha value should be equal or more than 0.7 is identification of strong co-variance. The Cronbach's alpha computed in this study is 0.945.

However, alpha has several limitations as prescribed by Raykov T. (1997):

1). Loadings of each factor and variances in error are forced to be identical.
2). It is population specific.
3). The existence of correlated error makes these statistics as an approximation of reliability.
4). "It may over-or underestimate reliability"
5). It underestimates the reliability of congeneric measures.
6). It represents only the systematic item variance.

Considering the above limitations of Cronbach's alpha, most of the researchers suggest to find composite reliability. This reliability test takes varying factor loadings of each item into consideration. It is calculated as follows-

"Composite reliability (CR) = (sum of standardized loading) 2 / (sum of standardized loading) 2+sum of indicator measurement error".
"Measurement error= ∑(1-square of each loading)"
All the values were found to be above than threshold of 0.7

Independent Variables	Cronbach's Alpha	Composite Reliability
Soft Skills and its attributes	0.945	0.947114

Table-7

5.4 Hypothesis Testing
Depending upon significant value in ANOVA, the results are as follows

Hypothesis	Significant Value	Remarks
H_0	.001	Significant difference exists therefore reject H_01

Table-8

V. FINDINGS OF THE RESEARCH

In India, soft skills will increase employment opportunities for fresh graduate mechanical engineer as null hypothesis is rejected here (Table 8). Therefore, soft skill can be considered one of the strengths that can be used in finding suitable job opportunities in different types of industries in India. Soft skills have a very important role in any industries in terms of productivity and efficiency and in survey it is found that 88.45% respondent agreed that soft skill is important aspect regarding employment of newly graduate mechanical engineer.

CONCLUSION

The unemployability issue of Indian fresh graduate's mechanical engineer has been studied for years and this unemployment is because of the shortage in soft skills and hard skills among graduate students from engineering institutions. The importance of soft skills for the success of all the industry sector has been discussed here and this is as important as hard skills in the case of mechanical engineer. This research focused to explore the importance of soft skills so engineering institute must thing to bridge the gap between the soft skill required by industries and what graduate mechanical engineer are having through redesign of curriculum.

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