

RESEARCH ARTICLE



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APPROACH TOWARDS REDUCING SOFT SKILL GAP OF ENGINEERING GRADUATES IN INDIA FROM EMPLOYERS' PERSPECTIVE TO EMPLOYABILITY

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ABSTRACT

Very low percentage of employable engineering graduates in India is a concern not only for the Institutions and their survival, but also a concern for employers and all the stake holders of the process. This paper is a portion from the research work of the first author in identifying significant factors that would impact and improve the employability of mechanical engineering graduates. The work reflects the Voice of Customers (VoC) of engineering institutions. The prospective employers of fresh engineering graduates and their perception of easy to plug low hanging fruits at the institutional level to improve employability are the focus.

Keywords: Employability, Engineering Graduates, Soft Skills, Educational Quality

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I INTRODUCTION

Employable engineering graduates in India are reported to be around 20%. This implies that the educational process leaves a large percentage (~80%) of engineering graduates unemployable, is a national concern. Though the employability issue and consequent defect of engineering educational process due to not meeting the industry expectations is a global phenomenon, but the very high defect rate in employability (~80%) of engineering appears to be specific to India as found in literature surveys for this work [1 to 9]. Under the globalized scenario of Industrial production, large

employment opportunities are awaiting fresh engineering graduates, if they meet industry expectations. Though there are many factors that are responsible for the low employability rate, government and national bodies are cognizant of the issue and developing solutions at the macro level. Quality improvement strategies and models have also been proposed by various researchers as reported [1 to 9]. Solutions to this high rate of defect on employability require a multi-pronged approach. Ramanan et. al [1] have proposed few factors through their research work from employers perspective, focused on improving the employability

of mechanical engineering graduate community. These factors proposed by them are like few factors that are low hanging fruits and can be plucked at the institution level, with simple solutions. This paper is the portions the research work of the first author, related to soft skill and the factors related to them from employers perspective.

Other factors apart from soft skills are presented in other research articles, that are to appear. Though work focuses on soft skill needs in improving the employability of mechanical engineering graduates as perceived by the employers, but can be largely applied or interpreted to other segments of graduate engineers.

II OBJECTIVES OF THIS RESEARCH

The objective of this research, which is explorative in nature, is to find few significant factors which are like low hanging fruits as perceived by the employers and if not met, shall lead to the defects in employability of mechanical engineering graduates and is more related to soft skills in applying the theoretical knowledge to practice [1] These are the few Critical To Quality (CTQ) factors related to soft skills and are low in difficulty to implement as a solution at the institutional level as perceived by the employers and shall also benefit the employers with significant impact on employability.

III RESEARCH METHODOLOGY

Sampling Approach to VoC

As reported in [1] most of the literature restricts the samples to a specific region of India and have not considered span of the respondents across regions and industries segments. Under the current scenario of globalized industrial design, production and manufacturing it is observed that the professionals are mobile not only within geographical locations of India, but also within Industrial segments. Hence, as proposed by Ramanan et.al, [1] the responses were collected from experts across industry segments and geographical locations of India.

As the VoC collected from employers is for addressing issues of employability related to target audience of mechanical engineering graduate community, it is essential that survey respondents are experts who are knowledgeable on mechanical engineering job needs and are involved in the process of recruitment like screening, first level of interviews, selection decisions and mentoring on-the-job role after recruitment etc.,. Hence, the respondents to the research survey are industrial professionals of varying experiences, roles, across functions of mechanical engineering domain and are involved in recruitment process.

Sample Size and Distribution of Respondents

Multi stage sampling approach was adopted for this explorative research work. As reported in [2] a sample size of 260 was found to be adequate, as Andreas et.al, work was for a similar research but across domains of engineering graduates. However, as reported in [1] the perceived views are sensitive and more particularly to soft skills, hence a higher sample size more than 260 was targeted. In first stage the respondents were directly approached through the survey questionnaire with a request for snow-ball sampling. In the second stage the respondents are reached out through the network in professional bodies. The confidentiality to the individual identity and identity of the organization has been committed and ensured.

Thus a total of 352 responses were collected from the individuals across India and segments of Industry as seen in Fig.1. The respondents are spread across India, though not in equal percentages. This is fairly justifiable and could be correlated from Fig.1, that large opportunities of employment for mechanical engineers arises from automotive and allied industries and these segments are concentrated in South and western regions of India.

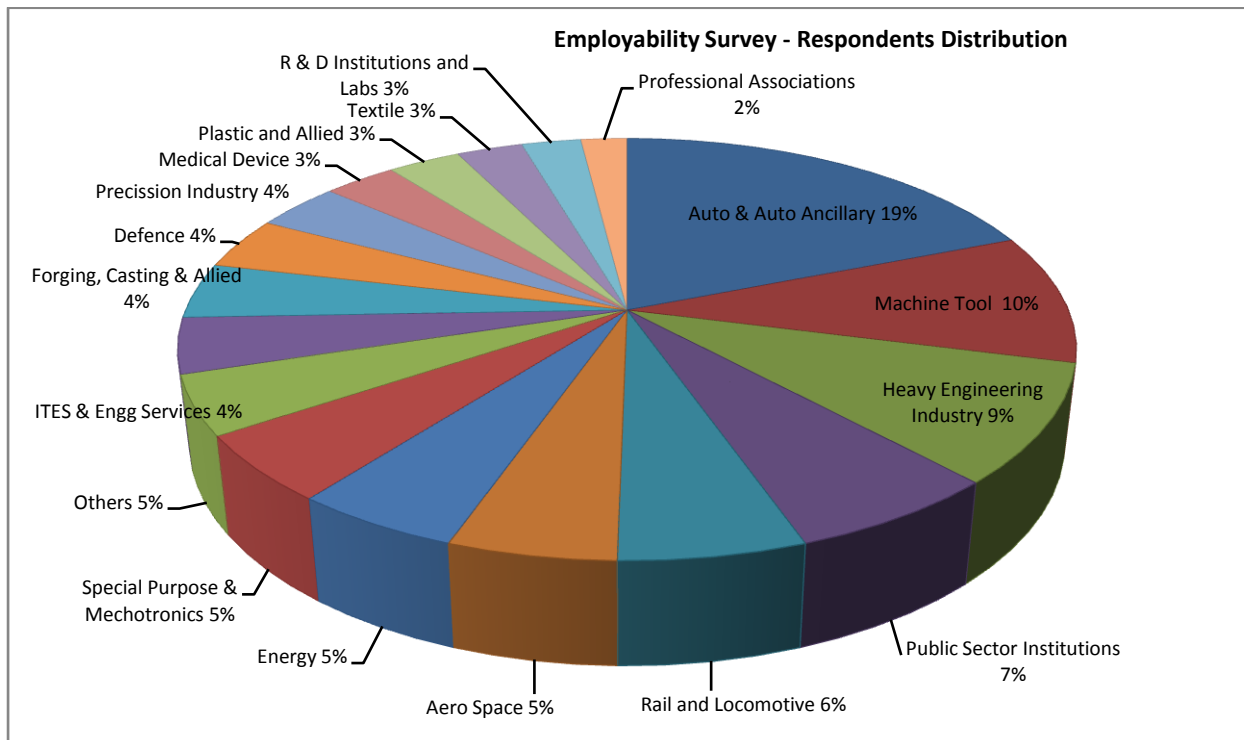


Fig.1 Survey Respondents by Industry Segment

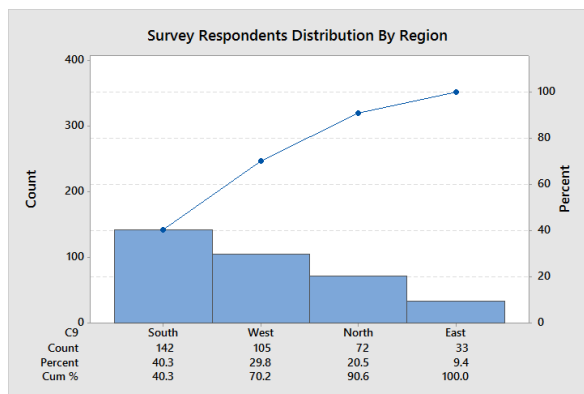


Fig.2 Survey Respondents by Regions of India

Survey Design

A research questionnaire for all the factors as brought-out in [1] was constructed as a 'self-administered questionnaire' by consulting the attributes needs as reported in NBA (National Board of Accreditation), Washington Accord, literatures and opinions expressed during initial survey [1] that are perceived to have an impact on the factors and purpose related to applying theoretical knowledge to practice. This paper restricts the discussions that are related to the Soft skill needs as reported in [1].

Survey Instrument

The research survey questionnaire structured has two components 1) rating on the importance of the factors towards employability needs 2) ranking on the skills of the fresh engineering undergraduates related to the factor. Both of these components of importance and availability of skills for the respective factors are rated and ranked by the employers as perceived by them. This approach is essential, as all the factors need not be at the same level of importance. Most of the literatures have missed capturing the rating for importance, while capturing the score for ranking the skills of fresh graduates. The questionnaire designed helps in capturing the real gap for the factors analyzed, thus helping the development of solution phase. The dependent and Independent variables are as in Table 1 and simplified questionnaire in Table 2, related to soft skills as one of the factors as explained in [1].

Table 1. Dependent and Independent Variable

Independent Variable	Dependent Variable
Presentation	Soft Skill
Documentation	
Communication	
Team work	
Digital Format	

Table2. Simplified Questionnaire Related to Soft Skill

Question Code	Simplified Question from the description of survey questionnaire	Pl. rate the importance of the Need	Pl. rank the skill of fresh graduate
		Strong Agree - 5 Agree - 4 Neither agree nor disagree - 3 Disagree - 2 Strong Disagree - 1	Good - 5 Above Ave - 4 Average - 3 Below Ave - 2 Bad - 1
SS	Soft skill and its importance in employability		
SS-1	Presentation skill in employability and its importance		
SS-2	Documentation knowledge for employability and its importance		
SS-3	Communication verbal & Oral Skills and its importance		
SS-4	Team Work, Listening & Grasping and its importance		

SS-5	Digital format of lab record practice and its benefits to other soft skills		
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The questionnaire has been color coded to distinguish the scores for rating of importance and ranking of skills. The questionnaire was designed to fill the individual cells with respective color code as it gets populated, but prevented from entering anything less than 1 or more than 5 by color codes. The responses were received by the researcher through emails and were helpful in getting back to the respondents for clarifications and corrections wherever it was needed. Data related to this questionnaire is as in Table 2.

Research Hypothesis

Following research hypothesis were developed for the research questions related to the soft skills

Hss-a – Soft Skill gap amongst graduates is not significantly different across regions.

Hss-b– Soft Skill gap amongst graduates is not significantly different industry segments.

Hss-1a– Presentation skill gap is not significantly different across regions.

Hss-1b– Presentation skill gap is not different across industry segments

Hss-1c– Presentation skill does not have an influence on soft skills

Hss-2a– Documentation knowledge gap is not significantly different across regions

Hss-2b– Documentation knowledge gap is not different across industry segments

Hss-2c– Documentation knowledge does not have an influence on soft skills

Hss-3a– Communication skill gap is not significantly different across regions

Hss-3b– Communication skill gap is not different across industry segments

Hss-3c– Communication skill does not have an influence on soft skill

Hss-4a– Team work as an attribute is not significantly different across regions

Hss-4b– Team work as an attribute is not significantly different across industry segments
 Hss-4c– Team work as an attribute does not have an influence on soft skills
 Hss-5a– Digital format of lab record practice and its benefits is not perceived significantly different by respondents across regions
 Hss-5b– Importance of digital format of lab record keeping is not perceived different across industry segments
 Hss-5c– Digital format of lab records in college will not have an influence and benefit on soft skills

IV RESEARCH FINDINGS

Data collected from the respondents are used in computing the gap as perceived by the respondents. Data analysis with statistical tools was carried-out using the multipurpose commercial statistical algorithm Minitab version 17 [10].

Test for Reliability and Consistency of the Construct

Before rolling-out the questionnaire for larger audience, a pilot survey was conducted to test the reliability and consistency. An overall Cronbach Alpha value of 0.92 for importance of needs, 0.96 for ranking of skills was predicted indicating high correlation and consistency of the questionnaire.

Gap in Soft Skills

The perceived opinions and views of the employers as expressed through the rating for the needs and ranking for the skills of fresh mechanical engineering graduates skills have been used in computing the gaps by every respondents. Fig. 3 explains the gap with the means of the dependent and independent variables, through interval plot, related dependent and independent variables of soft skills for this research paper.

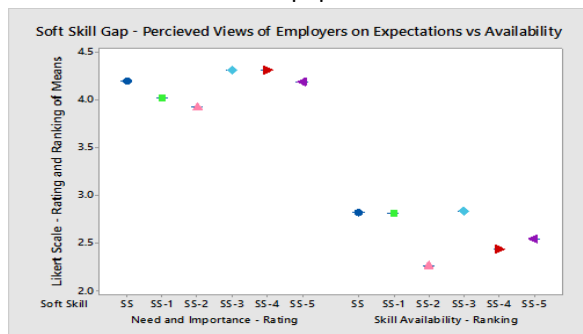


Fig. 3 Interval Plot to Explain the Gap in Soft Skills

However, individual respondent's data is used in computing the gap perceived in soft skills and used for further statistical analysis. The distribution of gap for each factor is as captured in Fig. 4

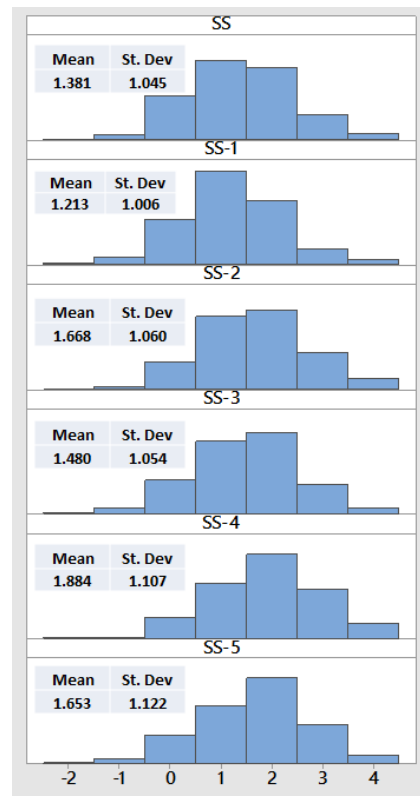


Fig.4. Distribution and Data of Gap in Soft Skills

As could be seen from Fig. 4 & 5, significant percentage (19%) of the respondents feel that there is no gap between their expectations and soft skill availability with mechanical engineering graduates (SS). Interestingly 2% of respondents feel the soft skill availability with engineering graduates is higher than their expectations. Considerable respondents (79%) feel there is a gap between their expectations with the soft skill knowledge of mechanical engineering graduates, but with varying proportions. 35% of the respondents feel the gap as 20%, while 31% feel a 40% gap, 11% of them feel the gap is as high as 60% and 2% of them project the gap is as high as 80%. This trend needs a confirmation on whether it is across regions of India and also across industry segments. Hypothesis testing (Hss-1a & Hss-1b) using one way Anova, reveal that the gap for soft skill is across regions of India and segment of

the industry. As $p > 0.05$, for the 95% confidence considered, hence the null-hypothesis Hss-1a & Hss-1b are accepted, thus statistically concluding there is no difference on the trends of the gap related to soft skills either by industry segment or by regions of India.

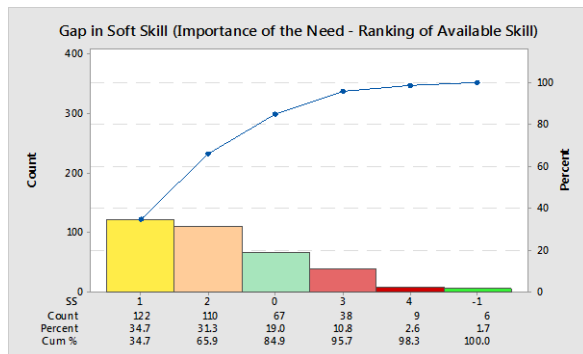


Fig.5 Gap in Soft Skills of Mech Engg Graduates

Anova and Regression Analysis

To test the hypothesis as stated earlier for the statistical significance for the importance of individual factors, one way Anova and simple linear regression have been performed. The details of the hypothesized codes of questions with relevant statistical tools applied and the p values are as posted in Table 3.

Table 3. Simplified Questionnaire Related to Soft Skill

Hypothesis	Statistical Tool	p Value	Details
Hss-a	One Way Anova	0.582	Regions of India
Hss-1a		0.851	
Hss-2a		0.791	
Hss-3a		0.727	
Hss-4a		0.467	
Hss-5a		0.471	Industry Segments
Hss-b		0.162	
Hss-1b		0.679	
Hss-2b		0.405	
Hss-3b		0.446	
Hss-4b		0.542	Relation of Independent variables with
Hss-5b	0.496		
Hss-1c	Linear Regression	0.000	
Hss-2c		0.527	
Hss-3c		0.000	
Hss-4c		0.019	

Hss-5c		0.018	
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It could be concluded from the analysis of the data, that there is no significant difference on the dependent and independent variables either by the regions of India or by the segment of the industry. All the null hypothesis related to them as shown in Table 2 and detailed in earlier pages are accepted since the respective p values > 0.05 for the confidence level of 95%.

The linear regression performed for finding out the relationship between dependent and independent variables is indicative of statistical significance for all the factors (p values are < 0.05), except for the documentation knowledge (Hss-2c) as its p values is > 0.05 . The fits and residuals are indicative of decent fit as seen in the histogram of residual in Fig. 6. The R-Sq value of 36.93% and R-Sq(adj) of 36.02% and R-Sq (pred) 34.8% and their closeness explains the fit of the perceptions measured and the corresponding regression equation is as follows

$$SS = 0.215 + 0.2879 * SS-1 + 0.0323 * SS-2 + 0.2156 * SS-3 + 0.1285 * SS-4 + 0.1219 * SS-5$$

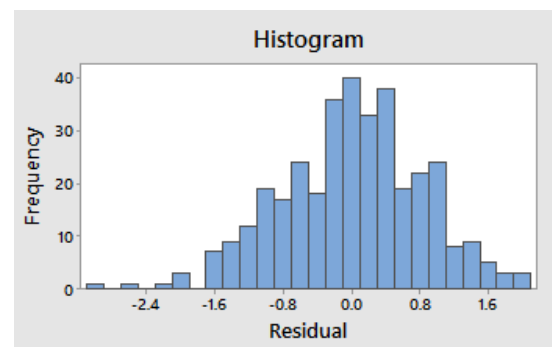


Fig. 6. Histogram of Residuals

VI APPROACH TO SOLUTION IN REDUCING GAP

Predictive Modeling

It could be visualized from the Monte-Carlo simulation performed using the developed transfer function in Devize [11], if the spread could be addressed to bring down the large variations on the gap by controlling variations in independent variables, then it would benefit in developing solutions towards shifting the mean to minimize the gap. The predictive model with existing gap and new

gap is captured in Fig. 6 & 7. One has to recollect, as presented in [1] the transfer function developed is sensitive towards more sample, hence larger sample would benefit development of more robust transfer function.

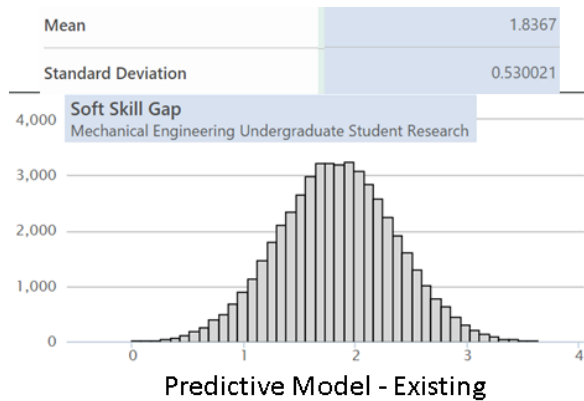


Fig.7. Skill Gap Predicted with Existing Mean Standard deviations for Xs as Collected from Survey

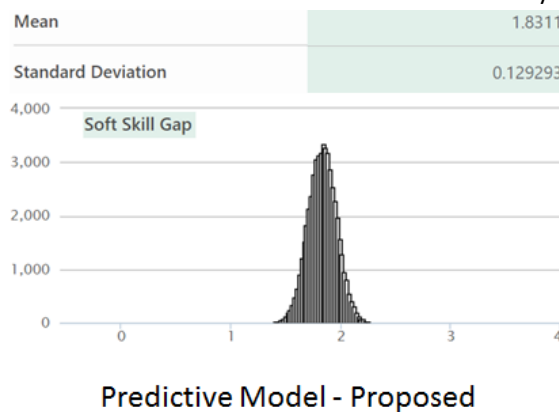


Fig. 8. Skill Gap Range

Soft skill Gap (Y) range can be reduced from (max at 3.42) to (max at 2.22) by reducing the variations in the independent variables by controlling them with ease. Existing and proposed statistical data of mean and standard deviation are as in Table 4. Existing data for Xs are from the survey and proposed ones are reduction of variation in existing process, while retaining the mean.

Table.4 Mean and Standard Deviations in the Model

	Existing		Proposed	
	Mean	St. Dev	Mean	St. Dev
SS-1	1.213	1.006	1.213	0.239
SS-2	1.668	1.060	1.668	0.265
SS-3	1.480	1.054	1.480	0.258
SS-4	1.884	1.107	1.884	0.277
SS-5	1.653	1.122	1.653	0.281

Shifting the Mean to Reduce Gap Further

It is important to reduce the soft skill gap further. As we reduced the variations in the gap; next focus has to be shifting the mean of the process towards Zero. Following proposed solutions if implemented at the institutional level, which has been arrived after analyzing existing curriculum and ascertaining the implementation feasibility with academic experts through interactions, shall benefit in shifting the mean towards zero.

- Presentation of practical lab reports as a group activity in the class rooms, with observations and findings.
- Reasoning for variations with-in the group
- Debate and Discussions for variations in the results with other groups in the same class at the end of semester in
- Mistakes in documentation and its impact

VII RESULTS AND CONCLUSION

The following conclusions can be arrived from this research work.

- Soft skill gap is across regions of India and not specific to a region
- Soft skill gap is across industries segments and not specific to a industry segment
- Presentation Skills, communication skills, team work attitudes and digital format of lab records has a significant impact on Soft Skills in applying theoretical knowledge to practice.
- Regression model developed can be adopted by the engineering educational institutions for improving soft skills
- Predictive model approach developed and as presented in this work can be embraced by institutions to reduce the Soft Skill Gap by reducing the variations on the independent variables as demonstrated in this work through predictive modelling
- The recommendations as suggested in this work, if implemented shall facilitate in reducing the skill gap mean to zero.

VIII SCOPE FOR FURTHER RESEARCH

Individual institutions can use this approach to capture the VoC of their existing customers to identify the gap and deploy solutions towards sustaining the credibility.

Individual institutions can use this use this approach to capture the VoC of their new customers to identify the gap and deploy solutions towards achieving higher levels of excellence.

Individual institutions can use this approach by capturing the VoC of students from the institutions which are performing at a higher level when compared to them as a bench mark and continuous improvement strategy.

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