Importance of Non-Technical Skills for Employment Opportunities: A Gap Analysis of Students and Employers Perception

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Abstract— In this paper, an attempt has been made to examine the gap between the perceptions of the employers and the engineering students about the importance of Non-Technical Skills for better employment opportunities. Data was collected through a structured questionnaire-based survey targeting the students and the employers. Responses were collected from 104 students and 50 employers based in the National Capital Region, India. The results obtained showed that there is significant difference in the skill set that are highly prioritized by the employers when hiring young engineering graduates and in the skill set which an engineering student ranks higher. The findings are insightful and beneficial to students, employers and Universities also. There is need for universities also to understand the various parameters where the students and the employers share the same view and the universities can act as a catalyst in giving more focus on some particular non-technical skills like oral and written communication along with good presentation and soft skills for the overall value addition to the personality of a young engineering graduate.

Keywords— Non-Technical skills, Soft skills, Students, Engineering, Employers, Employment

I. INTRODUCTION

In a quest to attain and move up with the pace of the dynamic globalization, the firms and business organizations are subject to the after effects of the global phenomenon. The fast changing global business environment, especially in terms of markets and productivity due to technological advancements, with a more demanding and challenging roles of the employees, academic researchers as well as industry practitioners agree to the fact that the twenty-first century engineers must be capable enough to handle situations which require a complex set of technical as well as non-technical skills. In the past, focus of educators has always been to provide excellent technical education, but lately the importance of soft skills like teamwork, communication and management has been widely acknowledged. Globally, several universities have initiated new courses in their programs to facilitate an engineering graduate as well-rounded engineering managers.

Studies on the non-technical skills of engineering students are either from an employers' perspective [1] [2] or students' perspective [3] [4] [5]. In this study, the researchers aim to fill the gap by taking inputs from both employers as well as the students which will present findings at a common platform for a better understanding and policy making.

II. LITERATURE REVIEW

A. Engineering Graduates in India

Over the last five decades, the technical education in India has grown enormously. It is technology that lies at the core of 'spiraling economic growth." [6].

Children in India constitute 19% of world's youth population [7]. As per Nasscom Press Release, From India's young demographic profile which is an inherent advantage, to its vast network of academic infrastructure that churns out 3.1 million graduates annually, to its English speaking workforce, the country offers an unmatched mix of human –power benefits to organizations."

But despite this huge potential only a handful of the 1400 engineering schools in India are recognized as providing world-class education with graduates' worthy of consideration for employment (Globalization of Engineering Services, 2006). This is very clear that the world, the technologies will keep on changing; the young engineers have to be ready for new challenges and convert them into new opportunities. As educators and professionals we have to enable our students to

grow and equip them with all the needed technical as well as non-technical skills.

B. Non-Technical Skills

The skills learned by the graduating students during their academic career can be categorized into two broad categories: (1) Technical and (2) Non-technical [8]. Technical skills in general are defined as subject-specific knowledge and hence competencies while on the other hand, non-technical skills are those skills which are generic in nature and are relevant across various jobs or professions [9]. Non-technical skills can also be termed as generic skills, basic skills, soft skills, employability skills, key skills, core skills and essential skills [10].

Under non-technical skills, many skill categories are defined by the researchers. Conrad and Leigh in 1999 suggested non-technical skills into four types: problem solving & other cognitive skills; oral communication skills; personal qualities & work ethics; and interpersonal & teamwork skills [11]. According to Awang et al. [9] and Nasir et al. [10], different non-technical skills are divided into two categories: functional and adaptive. Functional skills are basic skills to perform tasks and solve new problems (communicating, questioning, analysing, and decision-making). Adaptive skills are skills by which employees conduct themselves and interact with the working environment (teamwork, leadership and organizational skills). Wilson et al. in 2012 highlighted the various non-technical skills; communication, critical thinking, problem-solving, team work; lifelong learning, information management, entrepreneurial skills, moral and professional ethics and leadership skills [12].

C. Gap

Globally, many researchers from various parts of the world have been studying the causes of graduate unemployment. The main cause highlighted by most of them is the mismatch between the skills students develop during their courses and the skills that employers need [13].

Today's employers require fresh engineering graduates to add immediate value to the process/business, hence undergraduates must develop both technical and non-technical skills to fulfil the criteria laid down by the employers [14]. Non-technical skills (non-industry specific desired skills) are the most effective way for students to stand out among the crowd [15]. To be successful in the tougher environment, the job candidates must distinguish themselves from other candidates with similar qualifications [16] [12]. Non-technical skills play an important role during the differentiation.

Universities need to develop and equip the engineering graduates not only with the entry-level knowledge and skills only but also work to develop abilities for the future leadership roles as a custodian of knowledge [17].

D. Research Objectives

(1) To explore and analyse the various non-technical skills needed for the engineering graduates;

(2) To assess the students' and employer's perception to the importance of non-technical skills for employment opportunities.

III. Research Methods

In this study, exploratory research approach was made to achieve research objectives. Survey method is the most popular technique to gather information about respondents' perception. Two sets of questionnaires (one for students and another for employers) were constructed after rounds of discussions among the contributors in the research after on the literature survey. The questions in both the questionnaires were grouped under three sections. The section 1 about the demographic details like student age, engineering branch, availability of a job offer (students questionnaire) while similar questions related to the employer's demographic details like age, experience and organization were asked (employer's questionnaire). Section II enquired about the importance of non-technical skills to the engineering students. The section had eight statements asking the respondents to rate their perceptions on a five point Likert scale. The third and last section had questions about the relative importance of the various non-technical skills identified through the literature review and group discussions as the basic skills, social skills, conceptual skills and personal skills. The respondents were asked to rate the relative importance of these skills availing better employment opportunities. The study was conducted for both the students and employers and the data obtained was preprocessed and analyzed before the formulation of results.

Data collection was made from the National Capital Region (NCR) of India. The region was selected because of the presence of large number of engineering colleges as well as the corporate houses, both national as well as multinational companies, both being the respondents for the study. On the students' side, engineering students were contacted to fill the online questionnaire on a random basis resulting in 100 students completely filled questionnaires. Comparatively, data collection from the employers was relatively challenging due to busy schedule and unavailability of time to the managers, mainly HR managers, who had an experience of recruiting the engineering graduates. Most of the time HR professionals conduct the recruitment and selection procedures to hire engineering graduates but sometimes project managers and company directors are also involved. In all, 50 employers responded with the completely filled questionnaires. Online collected data was analyzed using the IBM SPSS Version 25.0.

IV. FINDINGS

The employers who were a part of the survey belonged to 50 different organizations or firms which included some leading technological giants like Oracle, HCL, Wipro, TCS, Toshiba and some others like Walmart India, RIVIGO, Monster.com etc. Among these, 54% of the employers possessed experience of 5-10 years, 13% had the experience of 10 plus years while 33 % had less than 5 years of recruiting or related work experience.

In all, data from 104 engineering students was collected. Around 87% of students belonged to the age group of 19-23 years which included students from a variety of popular under-grad engineering fields in India. Computer science engineering students had the majority representation with a staggering 42.3% whereas the second and the third highest percentage of students belonged to Biotech and Electronics Departments with 38% and 16% respectively. The remaining 12% students belonged to the fields of Civil or Mechanical engineering. Almost 25% students belonged to the final year or about to graduate or recently graduated category making them ideal targets for the survey and its findings.

Among all the students who participated in the study, only 23% had some form of job offers from various National or Multinational firms whereas a vast majority of 76.9% was still without jobs. This is probably due to the fact that 20-30 % of them are still a year or more away from their engineering graduation.

The second part of the study is about identifying and ranking the various non-technical skills which the student and employer perceive as important skill for engineering student to have better employment opportunities. The graph in Figure 1 shows the comparative ranking of various skills by the students and the employers. On the other hand, Table 1 shows the relative ranking (through mean scores) of various important Non-Technical skills by the employers as well as the students.

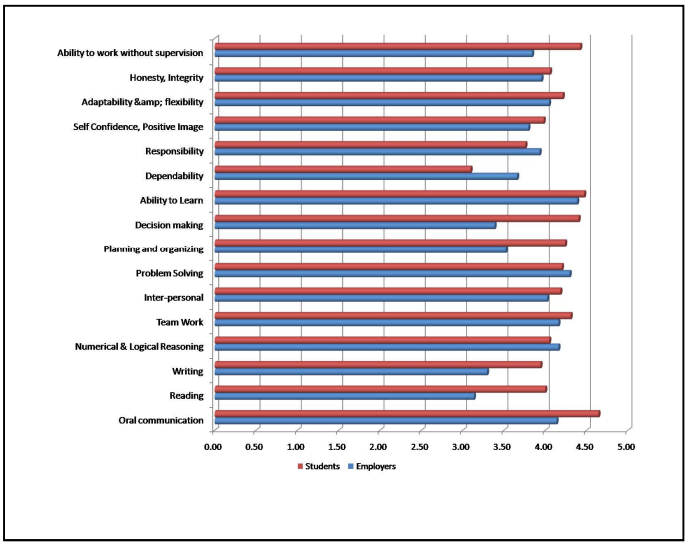

Fig 1: Comparative Ranking of Skills

Table 1: Ranking of Non- Technical Skills as perceived by Students and Employers

SKILLS	*Students*		*Employers*	
	Mean Score	***Rank***	***Mean Score***	***Rank***
Basic Skills				
Oral communication skill (speaking, listening)	4.64	1	4.14	5
Reading skill	4.00	12	3.14	16
Writing skill	3.94	14	3.30	15
Numeracy and quantitative literacy	4.05	11	4.16	3
Social Skills				
Teamwork skill	4.31	5	4.16	4
Inter-personal skill	4.18	9	4.02	7
Conceptual skills				
Problem solving skill	4.20	8	4.30	2
Planning and organizing skill	4.24	6	3.52	13
Decision making skill	4.40	4	3.39	14
Learning skill (ability to learn)	4.47	2	4.39	1
Personal skills and traits				
Dependability	3.10	16	3.66	12
Responsibility	3.76	15	3.93	9
Self-confidence, positive image	3.98	13	3.80	11
Adaptability, flexibility	4.21	7	4.05	6
Honesty, integrity	4.06	10	3.95	8
Ability to work without supervision	4.42	3	3.84	10

As we can see in Table 1, there is difference in the perceptions of students and employers. According to students, first rank with the mean score of 4.64 is given to Oral Communication Skills while employers have ranked it fifth on their priority list. According to employers, the most important non-technical skill is the student's learning capacity i.e. student's ability to learn. Employers find it very beneficial when new recruits learn the organization process and its working quickly and effectively. This way they have to invest less on the training of the new recruit as well. Another major mismatch is in the Numerical and quantitative Aptitude skills which students rate at number 11 but employers rate as number 3 on the list of skills the look for when hiring young engineering graduates.

To further strengthen the results few t-tests are performed on the relative importance of various non-technical skills. T-tests were done to analyze the difference in perceptions to deduct

whether students and employers are on the same page in analyzing the importance of various non-technical skills. To achieve these following hypotheses are formed:

H1: There exist a significant difference in the perception of student and employer about importance of non-technical skills for employment opportunities

H1a: There exist a significant difference in the perception of student and employer about importance of basic non-technical skills for employment opportunities

H1b: There exist a significant difference in the perception of student and employer about importance of social skills for employment opportunities

H1c: There exist a significant difference in the perception of student and employer about importance of Conceptual skills for employment opportunities

H1d: There exist a significant difference in the perception of student and employer about importance of personal skills for employment opportunities

Table 2: Difference in the mean Scores of Non-technical Skills as perceived by Students and Employers

SKILLS	***F-Value***	***Sig.***	***Mean Difference***
Basic Skills	2.018	0.158	0.47684
Oral communication skill (speaking, listening)	0.558	0.456	0.524
Reading skill	10.715	0.001**	0.873
Writing skill	9.353	0.003**	0.665
Numeracy and quantitative literacy	0.004	0.952	-0.111
Social Skills	6.928	0.009**	0.15428
Teamwork skill	17.023	0.000**	0.149
Inter-personal skill	5.042	0.026*	0.160
Conceptual skills	0.235	0.629	0.43160
Problem solving skill	4.076	0.045*	-0.094
Planning and organizing skill	3.462	0.065	0.718
Decision making skill	4.792	0.030*	1.017
Learning skill (ability to learn)	3.120	0.079	0.085
Personal skills and traits	1.092	0.298	0.05026
Dependability	1.903	0.170	-0.563
Responsibility	2.410	0.123	-0.172
Self-confidence, positive image	0.278	0.599	0.185
Adaptability, flexibility	8.712	0.004**	0.166
Honesty, integrity	0.256	0.614	0.103
Ability to work without supervision	0.549	0.460	0.582

*significant at 0.05 level; **significant at 0.01 level

As seen from the Table 2, we found the significant difference between the perception of student and employer with respect to seven out of sixteen non-technical skills. For these seven non-technical skills, the F value was significant as p is less than 0.05 in all the seven cases (p=0.001, p=0.003, p=0.000, p=0.026, p=0.045, p=0.030, p=0.004 respectively). Based on the F scores, there was a significant difference in the importance of "Reading skill" as perceived by students and employers. Students do not perceive reading as that important a skill as employers do. Similarly, Employers give high importance to "Decision making skill "as compared to students.

Collectively out of the four non-technical skills sets, the significant difference was found in the importance of "Social Skills". Students consider social skills as more important as compared to employers. So on the basis on the analysis, H1a, H1c and H1d are rejected as there is no significant difference. H1b is accepted as there is significant difference between student and employer's perception of social skills.

Table 3: Non-Technical Skills Importance

Statements	***F-Value***	***Sig.***	***Mean Difference***
Non-Technical Skills are value addition to students.	2.776	0.098	-0.294
Non-Technical Skills help in better employment.	2.397	0.124	-0.100
Non-Technical Skills are difficult to develop/acquire.	1.965	0.163	0.163
Non-Technical Skills are more important than technical skills.	2.331	0.129	-0.374
It is difficult for a student to get good job without Non-Technical skills.	1.395	0.239	-0.539
Non-Technical Skills are highly demanded by the employers.	11.168	0.001**	-0.528
Non-Technical Skills are important for career development.	7.813	0.006**	-0.485
There is a need for universities to focus more on Non-Technical Skills.	8.886	0.003**	-0.545

*significant at 0.05 level; **significant at 0.01 level

Part three of the analysis caters to the importance of non-technical skills for better employment opportunities for young engineering graduates. Eight statements were asked to be rated on the basis of their agreement or disagreement. T-tests are conducted for these 8 statements and the results are displayed in the Table 3. As we can see from Table 3, significant difference was found for three statements that cater to the following: 1) Non-technical skills are required by employers, 2) Non-technical skills are important for career development, 3) There is need for universities to give due importance to non-technical skills. These three statements have significant F values as p is less than 0.05 (p=0.001, p=0.006 and p=.003). As compared to employer's perception, students do not feel that non-technical skills are as much required by their prospective employer. On the similar line the statement, "non-technical skills are important for career development" is given more importance by the employer and less by students. Lastly employers significantly differ in their opinion whether there is need for universities to give due importance to non-technical skills. Employers feel universities need to pay more attention towards the development of engineer's non-technical skills.

V. CONCLUSION

The study has been very fruitful in understanding and analyzing the gap between an engineering student and an employer's perception of various non-technical skills, their requirements and the respective priority order as to which non-technical skill is valued most and which one is valued least. There are many skills which have been ranked differently by both the parties involved; student and employer. As a student this study could provide an eye-opening insight about the various non-technical skills which an employer actually expects from young graduates compared to what the students assume an employer might be expecting from them. From the employer's point of view, the study provides an analysis of what the managers can expect from the young recruits coming fresh out of college; their perceptions and orientation will help the employers in planning the right kind of training programs for their career growth not just w.r.t their own firms but also in a more comprehensive way for their overall long-term benefit.

VI. IMPLICATIONS AND FUTURE WORK

Implications are multifold to the various entities involved: Students, Employers and Universities too. Though not respondents here, but the study is very useful for the universities to understand the various parameters where the students and the employers share the same view and the universities can act asa catalyst in giving more focus on some particular non-technical skills like oral and written communication along with good presentation and soft skills for the overall value addition to the personality of a young engineering graduate. They can also look into skills related to organizational behavior, professional ethics, etc. which can be included in the formal engineering curriculum for shaping the overall student's persona.

In future, we can also take into consideration the views and suggestions of the faculties in various Engineering institutions and try to analyze their take on the subject and how it can play a major role in shaping the policies of both the universities and the employers w.r.t the development of engineering students who aspire for good employment opportunities right after their graduation while they have been acquiring genuine knowledge and skill set both in terms of technical as well as non-technical value that comes with their precious, valuable and hard earned Bachelor's degree in engineering.

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