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Novel outlook to analyzing a gap between industrial and institutional skills at students in the faculty of engineering and natural sciences

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Abstract---In today's scenario, Information Technology industries are compromising their expectations to fulfil the requirement of fresher candidates due to non-availability of job ready students. Industry invests huge cost to train the recruited manpower and make them ready for the on-job work. In this research paper, the researcher identified engineering graduate students' employability skill sets and validated with the support of data provided by the students' institute. All skills were grouped into four categories on the similarity and characteristics for the research work i.e., Aptitude, Communication, Technical and Personality skills set. Primary data was collected by using pen & paper test and secondary data was collected by using questionnaires method. The analysis of collected samples was carried out by using Software Package of Social Sciences (SPSS10). The researcher compared the expected performance by stakeholders and

actual students' performance in the designed test. Recruiters were unsatisfied on communication and technical skill sets from recruited engineering students in campus placement recruitment process. All technical institutes need to focus on employment skill sets from the first year to raise their employment possibilities.

Keywords---placement, skill sets, technical institutes, industry.

Introduction

Industry and institute have been working in separate domains since long time. Due to globalization and complex business module, the skill gap between industries and institutions has developed. As per NASSCOM study, 3 million of under-graduate and postgraduates are added to the Indian workforce every year. Only 25.4 percent of technical graduates are found job ready [1]. Trading Economics study predicted that around 4.60 percent unemployment rate is expected in 2020 [2]. So, it is very important to have strongly interlinking between industry and institute for the mutual benefits. Institutes need their students to get placed in reputed multinational companies with higher salary package to bring fame to the institute. Every year, the industries are having vacancies due to non-availability of industry expected skills in the students. Industry executives regularly complaints that the curriculum which is followed in various universities is outdated and students are lagging in industry required skills. Industries are giving more emphasis on finding the "right person" with the help of campus placement recruitment process in the technical institutes. It forces the institutions to think more to work together for bridging skill gap what is expected by industries and what is produced by the institutes. The institutes need to work on industry-based activities such as real time on job experience; internships, case studies, live projects and simulations to develop employability skills [3]. Engineering institutes must focus on training the students from first year to raise the employment possibilities. Non-formal professional institutes are also contributed by providing skilled manpower required as per the sector [4].

Identification of industry skills

After exhaustive literature review, the researcher identified 41 industry skill sets which affect the employment of technical students as shown in table 1. Domain core knowledge, soft skills and management skills shows significant effect on the employment of technical graduates [5]. The design of new curriculum in university with more industry connected activities will surely enhance the employment among engineering graduates [6][14]. The knowledge of engineering and proficiency in English language are the important predictors of employment of technical UG students in campus interviews of Information Technology sector companies [7]. The researchers were suggested to use Statistical Quality Control, Total Quality Management, Quality Circle tools to upgrade teaching learning process of the institutes [8][9][10]. No reference was found to make attempt to predict probability of employment with the help of skills performance of students. The authors attempted to develop a systematic approach to establish mathematical model between industry skills and employment of technical

students. The stakeholders' such as Senior Training & Placement Officers, Senior Corporate Trainers, Students (Placed in Campus Placement Drive in Technical Institute) and Industry Executives opinions were considered for finalizing important industry skills.

Table 1. List of 41 industry skills

Industry Skills	
1. Oral communication skills	22. Desire for challenge
2. Written communication skills	23. Consistency in performance
3. Reading skills	24. Presentation skills
4. Listening skills	25. Tolerance to stress
5. Problem-solving skills	26. Reliability
6. Analytical skills	27. Self confidence
7. Mathematical skills	28. Self-motivated
8. Business awareness/skills	29. Positive attitude
9. Logical thinking skills	30. Time Management
10. Visualizing skills	31. Goal setting skills
11. Basic computer Knowledge	32. Planning & organizing
12. Subject concept Knowledge	33. Self-assessment skills
13. Applications of technical knowledge	34. Punctuality
14. Advance computer knowledge	35. Committed
15. Sector specific knowledge	36. Ambitions
16. Team working skills	37. Sincerity
17. Leadership/ Initiative skills	38. Optimism
18. Flexibility / adaptability	39. Negotiating skills
19. Creative/Innovative	40. Work ethics
20. Willingness to learn	41. Foreign Language skills
21. Decision making skills	

Finalization of important 22 industry skills

The researchers finalized 22 important skills based on research work constraints. Research work is focused on employment of technical students in campus placement recruitment process for IT multinational companies. As per stakeholder's opinion, 16 skills were measured during induction program at industry as shown in table 2. Hence, the researcher considered only 22 skills which can be measured during campus placement recruitment activity for the research work.

Table 2. List of skills measured during induction program at industry

Sr. No.	Skills	Sr. No.	Skills
1.	Willingness to learn	9.	Punctuality
2.	Decision making skills	10.	Committed
3.	Consistency in performance	11.	Ambitions
4.	Tolerance to stress	12.	Sincerity
5.	Time Management	13.	Optimism
6.	Reliability	14.	Negotiating sills

7.	Planning & organizing	15.	Work ethics
8.	Self-assessment skills	16.	Desire for challenge

Multinational Information Technology industries are searching for trainable candidate through campus placement recruitment activity. Nearly 50-60 percentage fresher candidates were recruited from the technical institutes. They do not expect candidates who have advance computer knowledge and sector specific skill to work on job from day 1. They usually select such candidates from Skill Development Training Centers who can work on ongoing project in the company as per requirement. Identified 22 skills were further grouped into four major skill sets based on their similarities and character for the research work as shown in table 3.

Table 3. Skill set groups

Sr. No.	Aptitude skill Set	Sr. No.	Technical skill set
1.	Problem solving skill	1.	Basic computer knowledge
2.	Analytical skill	2.	Subject concept knowledge
3.	Mathematical skill	3.	Application of technical knowledge
4.	Business awareness skill	Sr. No.	Personality skill set
5.	Logical thinking skill	1.	Team working skill
6.	Visualizing skill	2.	Leadership Initiative skill
Sr. No.	Communication skill Set	3.	Flexibility
1.	Oral communication skill	4.	Creative/Innovative
2.	Written communication skill	5.	Self confidence
3.	Reading skill	6.	Self motivated
4.	Listening skill	7.	Positive attitude
5.	Presentation skill	8.	Goal setting skill

Data Analysis

The researcher collected the opinion of 45 stakeholders on 1-10 scale based on importance of skills at the time of recruitment in campus placement recruitment process. One Way ANOVA, T-Pair Test, Chi Square Test analysis of collected data were carried out by using Statistical Package for the Social Sciences Software (SPSS) version 10 [11] [12] [13]. Outliers from collected stakeholders' opinion were removed and the average scores were calculated for all the selected 22 skills as shown in table 4.

Table 4. Average scores of 22 skill sets

Industry skills	Recruiter Avg Score	Trainer Avg Score	T & P Officer Avg Score	Student Avg Score	Total Avg Score
Aptitude skill set					
Problem-solving skill	8.92	9.18	8.56	8.82	8.87

Analytical skill	8.92	9.00	8.00	8.75	8.67
Mathematical skill	8.36	7.82	7.88	7.25	7.83
Business awareness/skill	7.00	7.00	7.11	7.58	7.17
Logical thinking skill	8.50	8.58	7.78	8.75	8.40
Visualizing skill	7.25	7.91	7.00	7.82	7.49
Average Scores					8.07
Communication skill set					
Oral communication skill	8.67	7.92	8.00	8.92	8.38
Written communication skill	8.25	7.08	7.00	8.50	7.71
Reading skill	7.42	7.17	6.78	7.91	7.32
Listening skill	7.58	8.22	6.57	8.55	7.73
Presentation skill	7.42	7.91	7.57	7.75	7.66
Average Scores					7.76
Technical skill set					
Basic computer Knowledge	8.67	8.92	8.33	8.45	8.59
Subject concept Knowledge	8.09	8.18	6.33	7.75	7.59
Applications of technical knowledge	8.08	7.92	6.63	8.00	7.66
Average Scores					7.95
Personality skill set					
Team working skill	8.17	8.73	8.25	8.73	8.47
Leadership/ Initiative skill	7.09	8.00	7.44	8.17	7.68
Flexibility / adaptability	8.09	8.64	7.44	8.45	8.16
Creative/Innovative	7.50	8.25	8.13	8.00	7.97
Self confidence	8.20	8.33	7.78	9.09	8.35
Self motivated	7.50	8.00	7.67	8.45	7.91
Positive attitude	8.82	8.38	7.75	8.45	8.35
Goal setting skills	6.45	7.75	7.00	7.67	7.22
Average Scores					8.01

From table 4, IT industries expectations are more in Aptitude skill set as compared to others. But overall, they expected candidate to perform on all skill sets i.e., Aptitude, Communication; and Technical and Personality.

Identification of industry-institutes skills gap in engineering students

The questionnaire method is used to measure the performance of engineering students on selected skills. Pen & paper test was designed with 25 scores in each section and conducted in Rashtrasant Tukadoji Maharaj Nagpur University (RTMNU), Nagpur affiliated engineering institutes. The campus placement records of all participated students were collected from respective engineering institutes. Collected samples were filtered based on assumptions in research work and data smoothening technique box plot. Mostly all IT companies considered students with 60 % score in academics from 10th schooling. The actual performance of placed students on selected skills set are measured while expected performance already calculated from the stakeholder's opinion as shown table 5.

Table 5. Actual and expected average scores of skills set

Details	Aptitude	Communication	Technical	Personality
Skill sets expectation based on stakeholder's weightage	80.7 %	79.5%	77.6%	80.1%
Optimum Level of each Skill sets	25*0.807 =20.17	25*0.795 =19.87	25*0.776 =19.40	25*0.801 =20.02
Average skills set scores of placed students	22	16	19	21
Industry-Institute Gap in placed students	+1.83	-2.13	-0.40	+0.98

From table 5, Communication skills set is found to have more gap followed by technical skills set in selected students by multinational IT sector companies through campus placement recruitment drives. As a result, the company conducts induction program for fresher candidates where they focus on Communication and Technical skills set to make them job ready. As per above findings, it is clear that Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur affiliated engineering students satisfy the recruiters on Aptitude and Personality skill sets.

Relation of skills set with employment

The ranking of 4 group skills set i.e., Aptitude, Communication, Technical and Personality were done on degree of significance on employment by using SPSS-10. To check the significance, hypothesis designed i.e., Null Hypothesis H0: No significance relation between skills set and employment. Alternate Hypothesis H1: Significance relation between skills set and employment. Pearson Chi Squares Test was conducted by using SPSS and noted the Chi Square for each pair. The standard Chi Squares with same degree of freedom are recording from the Chi Square table. To find out the level of skills set effect on employment, the chi square differences are calculated as shown in table 6.

Table 6. Pearson Chi square values

Pair	Pearson Chi Square	Chi Square from χ^2 Std table	Diff. of χ^2	Rank
Aptitude & Employment	123.86	33.92	89.99	1
Communication & Employment	64.62	19.65	44.97	3
Technical & Employment	115.5	28.86	86.64	2
Personality & Employment	43.93	31.41	12.52	4

From table 6, the difference of Chi Square is found more in aptitude skills set and employment pair, it means that Aptitude skills set is a deciding skill set for early selection in campus placement recruitment drive at technical institutes. Due to less difference of Chi Square in personality skills set and employment pair

indicates that RTMNU engineering students are satisfying IT companies on personality skills set.

Correlation of skills sets with each other

To find out correlation of skills set, the researcher finalized the sample size based on research assumptions and data smoothening technique. Research assumptions are

1. Students having 60 % and above in 10th, 12th & B.E aggregate are considered.
2. Only bulk recruiter multinational IT sector companies like TCS, Wipro, Accenture, and Infosys are considered.
3. Students selected in first 5 multinational IT companies are considered.

The performance of all selected and fitted in above research criteria are considered for the further analysis in the research work. T-Pair test at 95 % confidence level conducted by using SPSS and correlation coefficient of all possible skills sets pairs are recorded. The ranking of the skills sets pair are done based on correlation coefficient value as shown in table 7.

Table 7. Correlation coefficient of skills set pair at 95 % CL

Pair	Samples	Correlation	Sign at 95% CL	Rank
Aptitude & Communication	362	.265	.000	4
Communication & Technical	362	.270	.000	3
Technical & Personality	362	.315	.000	2
Aptitude & Technical	362	.322	.000	1
Aptitude & Personality	362	.166	.002	6
Communication & Aptitude	362	.196	.000	5

From table 7, it is clear that all skill sets have positive correlation with each other; it means if one skill set is improved, other automatically gets improved. Aptitude and Technical skill sets shows higher degree of closeness in relation whereas Aptitude and personality skill sets shows poor relation. The above discussion can be summarized as follows:

- The expectation of IT industries is more on aptitude skill set.
- All skills significantly affect the employment of engineering graduate students.
- IT Industries compromising the communication skill set during fresher's recruitment from RTMNU, Nagpur engineering institutes.
- IT Industries are satisfied on Aptitude & Personality skills set of selected students.
- Aptitude skill set is a deciding skill set to get early placement in institute campus drive.
- Aptitude skill set shows strong relation with technical skill whereas it shows poor relation with Personality skills set.

Conclusion

This study identified 22 skill sets on which employment of technical students depends and confirmed from Senior Training & Placement officers, Senior Corporate Trainers, Students, and Industry Executives. Knowing skill sets required and degree of significance well in advance, supports institute faculty and students to prepare plan to enhance skill sets during the four-year engineering course. Aptitude skill sets shows strong effect on employment appeal to institute to keep their focus on Aptitude skill training from day one to raise their employment in campus placement. Recruiters were unsatisfied on Communication and Technical skill sets from placed students in campus recruitment process. Technical institutions need to adopt new way of academics and make systematic effort to develop employability skill sets that best foster the employment.

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