

# An Empirical Study: Opportunities Available For Undergraduate Engineering Students to Groom Their “Performance Enhancement Skills (PES)” and its Usage

S.Bhaskar<sup>1</sup>, K.V.A.Balaji<sup>2</sup>

<sup>1</sup>Research Scholar, Department of Mechanical Engineering, S.J.College of Engineering, Mysore, India

<sup>2</sup>Professor, Department of Mechanical Engineering, S.J.College of Engineering, Mysore, India

**Abstract:** *Today’s working environment requires engineering graduates to possess a combination of hard and soft skills. The soft skills namely team work, interpersonal skills and communication skills (all three grouped together and called as “performance enhancement skills (PES)” in this paper) are required to a great extent by the corporate world. This study focuses on assessing the extent to which students and faculty perceive that opportunity is available for the students to groom their performance enhancement skills and the extent of its usage. Research instruments with a 05 point scale and 17 items were developed (separately for faculty and students), its reliability with Cronbach’s alpha measures and content validity were ensured. The data collected was analyzed using the software “Statistical Package for Social Sciences (SPSS)” by conducting independent sample t-test and paired sample t-test, both item wise and dimension wise. Inferences were drawn and conclusions on the availability of opportunities and utilization of the existing opportunities by UG engineering students to groom their performance enhancement skills were made.*

**Keywords:** Soft skills, SPSS, Team work, interpersonal Skills, Communication Skills

## 1. Introduction

Skill is something that one learns to do competently. Skills are categorized into hard skills and soft skills. People with both hard soft skills are required by today’s competitive world. Hard skills are the technical skills required to perform a certain type of task [1]. “Soft skills refer to the cluster of personality traits, social grace, communication, language, personal habits, friendliness, and optimism that characterize relationships with other people. Soft skills complement hard skills, which are the occupational requirements of a job” [2]. The skills of “team work, interpersonal skill and communication skills” have been combined and called as “Performance Enhancement Skills (PES)” that have been researched on in this paper. Among the 12 Graduate Attributes (GAs) for under graduate engineering programmes listed by “National Board of Accreditation (NBA)” in India and the “International Engineering Association (IEA)” , the attributes of “team work and communication” have been directly spelled out and the “interpersonal skill (developing and maintaining relationships)” has been indirectly incorporated as an attribute [3]. In this scenario this paper reports a study on the extent to which opportunities available for UG engineering students to groom their performance enhancement skills and their usage. This research paper is constructed in five parts. Following this introductory part are the literature survey, the objective of the study, methodology with phases of the research and final part provides the concluding remarks.

## 2. Literature Survey

The corporate world requires engineers with a blend of hard and soft skills. To a great extent “hard skills” have been

integrated in the university programmes, where as “soft skills” needs attention and is to be brought into the portals of institutions. Roselina Shakir [4] has stated that “hard skills” training for fresh graduates is relatively easy given as they have acquired the necessary knowledge in college, in contrast with , “soft skills or ,people skills“: Aimao Zhang [1] has concluded that professionals with hard and soft skills (communicate effectively and to resolve conflicts) are needed. Bernd Schulz [5] has stated that soft skills (interpersonal skills, such as communication, teamwork, and conflict management) complement hard skills and educators have a major influence on the development of their students” soft skills and everyone needs to acquire them adequately beyond academic or technical knowledge. Hairuzila Idrus, Hazadiah Mohd. Dahan and Normah Abdullah [6] have stated that for technically based occupations like engineering, soft skills are also very important for engineers to apply their technical knowledge at work effectively. Employers are now emphasizing that success as an engineer requires more than simply strong technical capabilities. Stephen Johnston and Helen McGregor [7] in a study have concluded that the evidence is strong that both technical competence and well developed broad professional skills are needed for effective professional practice. The study conducted by the Idaho Engineering Works [IEWORKS][8], indicated that a training in interpersonal skills, management practices and sales strategies has increased the performance of the engineers, and decreased drastically customer complaints and grievances. Rowena Crosbie’s [9] research stresses the role of training as a methodology for the development of personal and interpersonal soft skills for leaders. Arun.S.Patil’s [10] research shows the needs of engineering professionals and student’s preparedness for the increasing use of advanced technology and appropriate soft skills and attributes that are primarily required in their future

work places. Christine Overtoom's [11] research identifies the soft skills that employers want, how these skills match those that youth and adults are developing through their college and work experiences, how education and training programs can prepare individuals to enter a rapidly changing workplace environment. Goeran Nieragden and Cologne's [12] article states that soft skills determine a person's ability to fit into a particular structure, such as a project team, and includes personality traits like emotional maturity, eagerness to learn and willingness to share and embrace new ideas. According to Arnold & Davey [13], from graduates' perspective Soft Skills are seen to be deficient in graduates relative to hard skills. Similarly according to Dave Hodges and Noel Burchell, [14], Soft Skills are generally viewed as less important by academicians in comparison with workplace professionals. Seethamraju & Agrawal [15] indicated in their study that although large numbers of engineers are in management, it is generally believed that they still lack soft skills such as: communication, business management and interpersonal skills which are required to be successful in management positions. Seema Singh [16] has listed the key Soft Skills required for engineers. Anne Lytle [17] of the Australian Graduate School of Management (AGSM) says there is a growing awareness of the importance for Soft Skills, which are in reality the most difficult and challenging skills for adults with ingrained patterns of behavior to learn.

### 3. The Study (Objective)

This study has been carried out with an objective to assess the opportunities available for undergraduate engineering students to groom their "Performance Enhancement Skills (understand the need to work in teams, to improve their interpersonal skills and communication skills)" and the extent of usage of the opportunities.

### 4. Methodology

The research has been carried out in four phases: In the first phase - research instrument was developed, in the second phase data was collected, in the third phase reliability and validity analysis was conducted and in the fourth phase a comparative study of opportunities available and extent of usage of "Performance Enhancement Skill" was conducted through Independent sample t-test and Paired t-test.

#### 4.1 Phase 1: Development of Research Instrument:

From a study by Somashekar. P [18] that has prioritized 90 soft skills ranked by HR managers of corporate, the authors took the top 45 soft skills, conducted factor analysis and grouped the soft skills resulting in 06 groups and one of the groups was titled as "Performance Enhancement Skills" [19]. Under the group "Performance Enhancement Skills, three soft skills namely working in teams, interpersonal skills and communication skills got listed".

Two research instruments with 05 point rating scales and 17 items were prepared to collect data from teaching faculty

and students of UG engineering programmes on opportunities available for grooming one's soft skills (PES) and the extent of its usage.

#### 4.2 Phase 2: Data Collection

In this study data has been collected from the second, third and fourth year students of four year under graduate (UG) engineering programmes. The data was collected from 60 teaching faculty handling UG engineering courses and 160 UG engineering students from various branches of study.

#### 4.3 Phase 3: Reliability and validity analysis:

Bryman and Cramar [20] has mentioned that "it is generally agreed that when a mean of measuring a concept is proposed, the measurement mean must be both reliable and valid" and hence the research instrument was tested for its reliability and validity.

**a. Reliability analysis:** With Cronbach's alpha as shown in table (1) a reliability measure (a reliability coefficient of 0.70 or more is considered good [21]), reliability was analyzed.

**Table 1: Reliability Statistics**

Sl.No	Dimension	No. of items	Cronbach's alpha
1.	Opportunities available to groom PES (OPES - by faculty)	17	0.890
2.	Utilization of the opportunities available to groom PES (UPES - faculty)	17	0.849
3.	Opportunities available to groom PES (OPES - by students)	17	0.829
4.	Utilization of the opportunities available to groom PES (UPES - students)	17	0.864

**b. Validity analysis:** With inputs from twenty experts, content validity has been used as a measure (content validity is not evaluated numerically, it is subjectively judged by researches [22]) to ensure that the research instrument consists of a group of items that covers the issues to be measured. The instrument was proved to be valid.

#### 4.4 Phase 4: Comparative study of opportunities available and extent of usage of "Performance Enhancement Skill".

The data collected using the research instrument was used as input to the software "Statistical Package for Social Sciences (SPSS)" and two tests namely (i) Independent sample t-test and (ii) Paired t-test were conducted.

##### a) Independent sample t-test:

**i. Inferences of independent sample t-test (item wise):** From the output of the software „SPSS“ the items with significant difference in perception (alpha level or sig value < 0.05) have been tabulated for opportunities [table (2)] and for utilization [table (3)].

**Table 2: Inferences of independent sample t-test (item wise): Opportunity**

Dimensions	Item for which sig. (2 tailed) is less than 0.05	Opportunities related		Who perceives there is less opportunity
		For the items with sig. (2 tailed) less than 0.05		
		Mean		
		Students	Faculty	
Performance Enhancement Skills	7	2.83	3.22	Students
	8	2.38	3.07	Students
	9	2.81	3.70	Students
	10	2.64	3.17	Students
	13	2.60	3.05	Students
	17	2.35	3.22	Students

**Table 3: Inferences of independent sample t-test (item wise): Utilization**

Dimensions	Item for which sig. (2 tailed) is less than 0.05	Utilization related		Who perceives there is less utilization
		For the items with sig. (2 tailed) less than 0.05		
		Mean		
		Students	Faculty	
Performance Enhancement Skills	1	2.54	2.93	Students
	4	1.64	2.32	Students
	7	2.19	2.53	Students
	8	2.1	2.53	Students
	9	2.19	3.07	Students
	10	1.95	2.45	Students
	17	1.71	2.57	Students

Table (2) reveals that the students perceive the opportunities available in the items above to be less in comparison with that being perceived by faculty. Table (3) reveals that the students perceive the utilization of the opportunities available in the items above to be less in comparison with that being perceived by faculty.

**ii. Inferences of the independent sample t-test (dimension wise):**

From the output of the software SPSS the variables with significant difference in perception [alpha level or sig. value < (0.05)] are tabulated in table (4) for opportunity and table (5) for utilization.

**Table 5: Inferences of the independent sample t-test (Utilization)**

Dimensions	Sig. value of dimension	Utilization related		Who perceives there is less utilization
		For the items with sig. (2 tailed) less than 0.05		
		Mean		
		Students	Faculty	
Performance Enhancement Skills	0.006	2.1709	2.4268	Students

Table (4) reveals that the students perceive the opportunities available for the dimension as a whole to be less in comparison with that being perceived by faculty. Table (5) reveals that the students perceive the utilization of the opportunities available for the dimension as a whole to be less in comparison with that being perceived by faculty.

**b) Paired Sample t-test:**

**i. Inference of paired sample t-test (item wise):**

From the output of SPSS the items with significant difference in perception (alpha level or sig value < 0.05) have been tabulated for students in table (6) and for faculty in table (7).

**Table 4: Inferences of the independent sample t-test (Opportunity)**

Dimensions	Sig. value of dimension	Opportunity related		Who perceives there is less opportunity
		For the items with sig. (2 tailed) less than 0.05		
		Mean		
		Students	Faculty	
Performance Enhancement Skills	0.003	2.8651	3.1814	Students

**Table 6: Inference of paired sample t-test (item wise): Students**

Dimensions	Students related				
	Pair (Opportunity & Utilization)		Sig. (2 tailed) value	Mean of pair	
				Opportunity Utilization	For which mean is less (that is, which is perceived is less – opportunity or utilization)
PERFORMANCE ENHANCEMENT SKILLS (PES)	Pair 1	OPES1	.000	3.11	Utilization
		UPES1		2.54	
	Pair 2	OPES2	.000	3.79	Utilization
		UPES2		2.69	
	Pair 3	OPES3	.000	3.11	Utilization
		UPES3		2.53	
	Pair 4	OPES4	.000	2.81	Utilization
		UPES4		1.94	
	Pair 5	OPES5	.000	3.33	Utilization
		UPES5		2.71	
	Pair 6	OPES6	.000	3.27	Utilization
		UPES6		2.43	
	Pair 7	OPES7	.000	2.83	Utilization
		UPES7		2.19	
	Pair 8	OPES8	.000	2.39	Utilization
		UPES8		2.10	
	Pair 9	OPES9	.000	2.81	Utilization
		UPES9		2.19	
	Pair 10	OPES10	.000	2.64	Utilization
		UPES10		1.95	

Continued... Table 6

**Table 6: Inference of paired sample t-test (item wise): Students**

Dimensions	Students related				
	Pair (Opportunity & Utilization)		Sig. (2 tailed) value	Mean of pair	
				Opportunity Utilization	For which mean is less (that is, which is perceived is less – opportunity or utilization)
(PES)	Pair 11	OPES11	.000	2.82	Utilization
		UPES11		2.05	
	Pair 12	OPES12	.000	2.56	Utilization
		UPES12		1.73	
	Pair 13	OPES13	.000	2.60	Utilization
		UPES13		1.83	
	Pair 14	OPES14	.000	2.69	Utilization
		UPES14		1.98	
	Pair 15	OPES15	.000	2.83	Utilization
		UPES15		2.28	
	Pair 16	OPES16	.000	2.78	Utilization
		UPES16		2.06	
	Pair 17	OPES17	.000	2.35	Utilization
		UPES17		1.71	

**Table 7: Inference of paired sample t-test (item wise): Faculty**

Faculty related				
Pair (Opportunity & Utilization)	Sig. (2 tailed) value	Mean of pair		For which mean is less (that is, which is perceived is less – opportunity or utilization)
		Opportunity	Utilization	
Pair 1	.000	OPES1	3.40	Utilization
		UPES1	2.93	
Pair 2	.000	OPES2	3.95	Utilization
		UPES2	2.82	
Pair 3	.000	OPES3	3.12	Utilization
		UPES3	2.48	
Pair 4	.000	OPES4	3.07	Utilization
		UPES4	2.32	
Pair 5	.000	OPES5	3.48	Utilization
		UPES5	2.58	
Pair 6	.000	OPES6	3.20	Utilization
		UPES6	2.53	
Pair 7	.000	OPES7	3.22	Utilization
		UPES7	2.53	
Pair 8	.001	OPES8	3.08	Utilization
		UPES8	2.53	
Pair 9	.005	OPES9	3.70	Utilization
		UPES9	3.07	

Continued...Table 7

Faculty related				
Pair (Opportunity & Utilization)	Sig. (2 tailed) value	Mean of pair		For which mean is less (that is, which is perceived is less – opportunity or utilization)
		Opportunity	Utilization	
Pair 9	.005	OPES9	3.70	Utilization
		UPES9	3.07	
Pair 10	.000	OPES10	3.17	Utilization
		UPES10	2.45	
Pair 11	.000	OPES11	2.88	Utilization
		UPES11	2.25	
Pair 12	.000	OPES12	2.57	Utilization
		UPES12	1.65	
Pair 13	.000	OPES13	3.05	Utilization
		UPES13	1.98	
Pair 14	.000	OPES14	2.90	Utilization
		UPES14	2.12	
Pair 15	.000	OPES15	3.12	Utilization
		UPES15	2.23	
Pair 16	.000	OPES16	2.98	Utilization
		UPES16	2.22	
Pair 17	.000	OPES17	3.22	Utilization
		UPES17	2.57	

It is perceived that there is less usage of opportunities available for all items by both students and faculty.

**ii. Inferences of paired sample t-test (dimension wise):**

The statistical analysis carried out using SPSS was analyzed and the inferences are tabulated in table (8) and table (9).

**Table 8: Inferences of paired sample t-test: (dimension wise): Students**

Dimensions	Sig. value of Pair	Student related		Which is perceived less (opportunity or utilization)
		For the items with sig. (2 tailed) less than 0.05		
		Mean		
		Opportunity	Utilization	
Performance Enhancement Skills	0.000	2.8651	2.1709	Utilization

**Table 9: Inferences of paired sample t-test: (dimension wise): Faculty**

Dimensions	Sig. value of Pair	Faculty related		Which is perceived less (opportunity or utilization)
		For the items with sig. (2 tailed) less than 0.05		
		Mean		
		Opportunity	Utilization	
Performance Enhancement Skills	0.000	3.1814	2.4268	Utilization

It is inferred that there is a significant difference both by the faculty and students on the opportunities available and extent of usage. Both faculty and students perceive that there is less utilization of the available opportunity.

## 5. Conclusion

From the analysis, the following is concluded.

- 1) The utilization of the existing opportunities by UG engineering students to groom their performance enhancement skills is less.
- 2) Making a premise that if the average of the mean values of the two groups (faculty and students) is  $\geq 3$  for the opportunity available or the utilization of opportunity to be positive, it is concluded that enough opportunity is available (3.023) for UG engineering students to groom their performance enhancement skill and the utilization of the opportunity (2.298) is less.

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## Author Profile



Associate Professor, **S. Bhaskar** in Mechanical Engineering Department at Kumaraguru College of Technology (KCT), Coimbatore, India and Head of the Center of Academic Excellence of the Institution. Has experience of 24 years in teaching at KCT and 01

year in industry and is an All India Management Association (AIMA) certified trainer. Has authored books on Engineering, Management and personality development.



Professor, **K. V. A** in Mechanical Engineering Department at S. J. College of Engineering, Mysore, India with 35 years of experience in academics. A doctorate from IIT, Madras, India. He served Visvesvaraya Technological University, Belgaum, Karnataka, India as Registrar (Academics/ Evaluation) for more than 04 years