EXPLORING THE IMPORTANCE OF EMPLOYABLE SKILLS AS PERCEIVED BY OJT ENGINEERING STUDENTS AND INDUSTRY PARTNERS

Frederick F. Patacsil
College of Computing
Pangasinan State University
Urdaneta City, Pangasinan
PHILIPPINES

Marilou M. Fernandez
College of Engineering
Pangasinan State University
Urdaneta City, Pangasinan
PHILIPPINES

Paulo V. Cenas
College of Computing
Pangasinan State niversity
Urdaneta City, Pangasinan
PHILIPPINES

ABSTRACT

This study aims to determine the importance of soft and hard skills as perceived by OJT engineering students and industrial partners, and analyze the skills gap between them. The study provides a better picture of what soft and hard skills that the industry needs and future graduates are expected to perform. A survey was conducted to engineering students of Pangasinan State University who were enrolled in OJT and supervisors of the engineering students in their respective industry partners. The survey-questionnaire were distributed to the respondents two weeks before the internship ended. The findings revealed that industry and student respondents agree on teamwork, leadership and communication are the most important soft skills. Results on technical skills revealed that, the industry responded positively on the areas of engineering skills and knowledge, formulation and solution of technical/engineering problems and designing a system/process to meet client needs. Thus, the needs to improve the skill of our engineering student is evident. The results of the study provide useful information for universities in designing better curriculum in meeting the increasing demands of industry skill needs.

Keywords*:* Soft skills, Hard Skills, OJT, Importance, Skill Gaps.

INTRODUCTION

In a world of globalization, employable skills are a consequential element for nations to flourish and compete for, primacy on the quality and relevance of acquired knowledge and skills of graduates. Aside from these, graduates should have the attitudes, and values that industries need. According to De Guzman and De Castro, “the changing nature of work environments, the emergence of technology-driven processes, and the diversified needs of clientele are challenging the ability of higher education institutions (HEIs) to meet the demand for employable graduates”.

McCoy (1991) defined skills as those required not only to gain employment, but also to progress within an enterprise in order to achieve one’s utmost potential and to successfully contribute to enterprises’ strategic directions. From an HEI perspective, employability refers to producing capable graduate, which affects all aspects of a student’s university or college life, including the ability to deliver effective academic programs and cocurricular activities (McQuid and Lindsay, 2005).

The Commission on Higher Education (CHED) states the importance of quality human capital for the sustainable development of the country. With this, universities have

undeniably played the main role in building such quality human capital. In the study conducted by the Department of Labor and Employment (DOLE) which aims to determine the hard-to-fill courses, skills and jobs that match the projected employment requirements of key industries revealed that engineering is one among the in-demand and priority courses due to the needed skills to run and maintain our industries. However, engineering graduates who enter the job market are unaware of the employment reality. Hence, they are either shocked or unprepared to adapt to the working environment or find it difficult to cope with their job responsibilities. One of the main reasons is the different perceptions between employers and engineering graduates. The real situation is that, graduates excel in their soft skills, however, employers preferred more on technical skills or vice versa depending on the type of industry and work environments. This is a question whether the skills acquired in schools meet the current needs of the industry.

Republic Act (RA) No. 7722, otherwise known as the "Higher Education Act of 1994," focuses on the rationalization of Engineering program in the country and keep pace with the demands of global competitiveness. Colleges and universities require their students to undergo trainings within a specific number of hours as part of the curriculum. On the Job Training (OJT) is one of curriculum requirements for the Engineering program. It is a method where the students acquire relevant knowledge and skills by performing in an actual work setting.

This research was carried to fulfill the following objectives.1. To determine the most important soft skills as perceived by OJT Engineering Students and Industry Partners.2. To determine the most important hard skills as perceived by OJT Engineering Students and Industry Partners. 3. To determine if there is a significant difference in the perception of the OJT Engineering Students and Industry Partners on the importance of the soft and hard skills. Also, this research study provides a better picture on the realignment of the soft and technical skills that the industry needs with the competencies that the future graduates are expected to perform. This realignment would then lessen the skill gap, and thus improves the productivity of our future graduates in the job market.

RELATED LITERATURE AND STUDIES

Skills gap is defined as the difference between the markets need (demand) and the current skills supplied by local education institutes (supply). In addition, it may refer to either or both of two types of skills. It is the point at which an organization can no longer grow or remain competitive because it cannot fill critical jobs with employees who have the right knowledge, skills, and abilities.(ASTD 2012)

Soft Skills

"Soft" skills include abilities in such areas as communication, problem solving, professionalism, interpersonal interaction, work flexibility and adaptability, as well as overall work ethics, attitude and reliability(Deloitte, 2011). The term soft skills, used interchangeably with nontechnical skills, is defined as the "interpersonal human behavioural skills needed to apply technical skills and knowledge in the workplace" (Weber, Finley, Crawford, & Rivera as cited by De Villiers, 2009, p. 2). Soft skills are categorized as being related to human issues, such as communication, teamwork, leadership, conflict management, negotiation, professionalism, and ethics (Azim et al., 2010). Furthermore, a research conducted by Andrews & Hugson, (2008) explains that soft skills include professionalism, reliability, the ability to cope with uncertainty and work under pressure. In addition, Holtbrugge and Mohr (2010) added the skills of leadership, relationship, communication, team working and information management as carrying the meaning of soft skills.

Hard Skills

Technical skills, which are also referred to as hard skills, are defined by Litecky, Arnett, & Prabhakar (2004) are "those skills acquired through training and education or learned on the job and are specific to each work setting". Litecky et al. (2004) further noted programming skills as an example of a technical skill in the field of computing. A clear distinction exists between technical and soft skills.

Technical Skill is divided into four elements according to Nasir et. Al. (2011) as shown in Table 1.

Table 1. Technical skills elements.

Technical Skills	Characteristic	Details
Engineering Knowledge	Breadth and depth of education and type of knowledge, both theoretical and practical	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems
Design/ development of solutions	Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified	Design solutions for *complex* engineering problems and *design* systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations
Modern Tool Usage	Level of understanding of the appropriateness of the tool	appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to *complex* engineering activities, with an understanding of the limitations
Environment And Sustainability	Type of solutions	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development

"Hard" skills tend to be technical in nature; examples include necessary qualifications (technical and vocational training), professional certifications, cross sectional technical knowledge and relevant trade skills experience (Deloitte, 2011).

Technical and soft skills are on the opposite sides of the skills spectrum, However, they complement each other. According to Dixon, Belnap, Albrecht, and Lee (2010), Shafie and Nayan (2010) soft skills are different from technical skills, although both sets of skills are complementary and is known as employability skills or job readiness skills.

The most common skills deemed to be lacking among existing staff are people and personal skills relating to workload management and teamwork. Specialist and job-specific skills are

also widely considered to be lacking, along with complex analytical skills, especially among those in high-skill occupations such as managers and professionals. **(**Winterbotham, 2016).

The research conducted by Harvard University, the Carnegie Foundation and Stanford Research Center has concluded that 85% of job success comes from having well-developed soft and people skills, and only 15% of job success comes from technical skills and knowledge (hard skills).

This is one indication that soft skills are essential for success in the workplace. Cultivating such skills will make all the difference for those seeking more out of their professional lives, whether it be a career change, a promotion or simply for professional development. All too often we hear about employees who don't make the cut due to their lack of soft skills. Although technical skills and knowledge are important, an employee must offer more than these hard skills to experience career success (Ottow, 2015).

Both HEI and industries play significant roles in providing information about skill gaps in the key industrial work areas. To achieve this, it needs to establish mechanisms for active, structured and meaningful consultation with industry players on a regular basis through OJT or Internship.

METHODOLOGY

Today, most industries provide opportunities for engineering students to experience the real works through a hands-on training. This opportunity enables them to realize that the training of future engineers is not the sole responsibility of the academe but a shared task with industry partners. Training aims to change trainees' performance through improved knowledge, skills, and attitude (M. J. Hoque and K. Usami, 2007). Several industries have shared generously their company resources to impart knowledge, skills and also work values to the on-the-job trainees of the College of Engineering in Pangasinan State University-Urdaneta Campus for the past several years. The training and experiences brought by the companies to the students have contributed to the development of their attributes to become true engineers and professionals in the real work environment even for a brief period of 240 hours.

Conceptual Framework

The framework implies engineering students will utilize their academic acquired skills through an OJT program while industry will provide a venue wherein engineering students will apply their skills in an actual work environment. Engineering students will observe the importance of their academic acquired skills based on the application of the actual work task/function under the supervision of the internship supervisor who evaluates the performance of the students based on the required skills to be performed. Thus, the OJT program provides students with the opportunity to realize that the important part of their skills are learned not just in school but also on the job. The result of the study will be used as input in enhancing the engineering curriculum through bridging the skill gap.

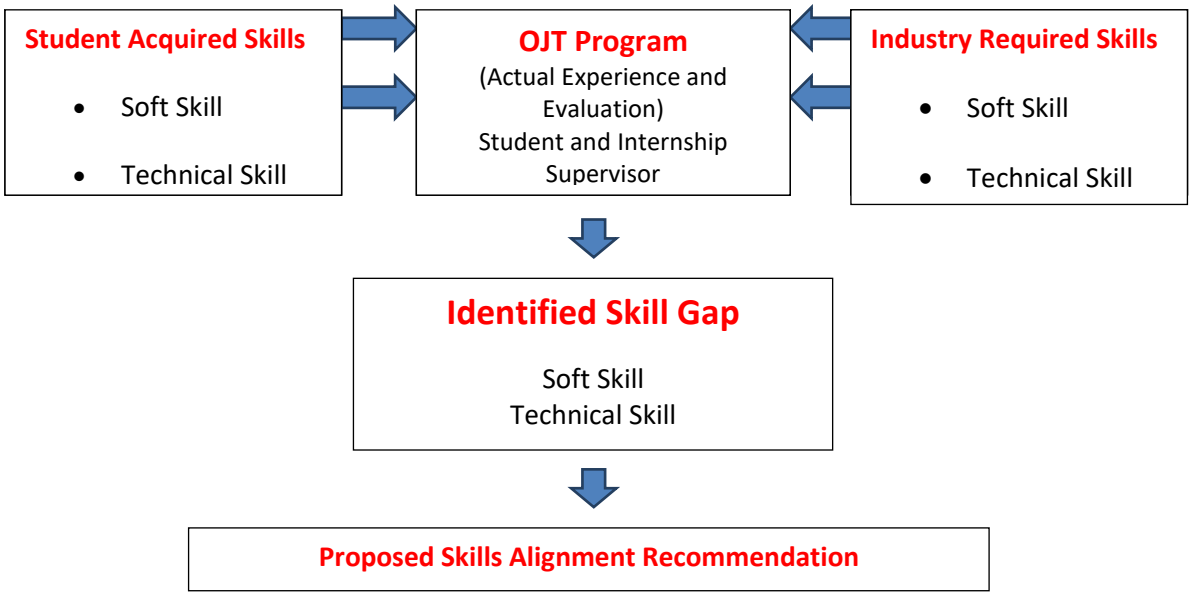

Figure 1. Framework of the study

This study was a descriptive research in nature. A descriptive survey was designed and utilized to examine the important skills needed as perceived by the industries and academic acquire skills by OJT engineering students as applied in the real engineering environment.

Instrument

A survey-questionnaire was established based on surveys-questionnaire developed and used by other researchers (Deloitte, 2011; Zaharim, 2008; May, E., & Strong, 2011; Murali. & Rajaram, 2015; Vadivu et. Al. 2016; Padmini, 2012 ; Nasir et. Al. 2011) in their study. Further modification and enhancement was applied by the researchers to include some additional items. The survey questionnaire is composed of three parts. Part 1 focuses on the profile of company respondents which includes type of company, number of employees, and services provided and was answered by the industry respondents. The second and third part was aligned to ask the respondents to rate the perceived level of importance of soft skills and technical skills in their assign industry/company. The items used a five-point Likerttype scale to measure a respondent's degree of agreement or disagreement with the statements (1 = "Least Important" and 5 = "Very Important"). The instrument was validated in terms of its content by five (5) OJT program coordinators from different engineering programs of PSU-Urdaneta City Campus and the Campus OJT coordinator. Comments and suggestions were incorporated in the survey instrument. Furthermore, the instrument was also pilot-tested with previous undergraduate engineering students who have finished their OJT and were not included in the actual survey, to eliminate survey question ambiguity and improve instrument reliability. The survey questionnaire was modified based on the results and feedback from the pilot try run.

Population

Purposive sample was used to identify the respondents of the study. Only engineering students enrolled in OJT were included while industry respondents were the supervisors of these engineering students in their respective company. OJT students were selected since they have a strong background on the needs of the company based on their internship

experience. In addition, the supervisor of these students from their OJT company was also asked to determine their company engineering skill needs based on the company needs and observations.

The survey questionnaire that covers the profile of the company, soft and hard skills were distributed to 4th year students of the Mechanical Engineering, Civil Engineering, Computer Engineering and Electrical Engineering departments who are undertaking OJT and their supervisors.

Research Procedure

Fourth year OJT engineering students and OJT supervisor (company where Engineering student going internship) were asked to rate the importance of the various items from not-required to essential using a five-point Likert scale. The survey-questionnaire were distributed to the respondents two weeks before the internship ended. OJT coordinators were tasked to distribute the questionnaire to the respondents were in engineering students were asked to answer the survey based on the perceived skills needed by the industry. In the case of the industry skill needs, respondents from the industry also answered the same survey based on their actual Engineering skill needs.

There were 132 students enrolled in the internship program and 31 companies were involved to answer the survey questionnaire, however, only 46 students and their respective company had the time to participate in the survey. The remaining respondents and their survey questionnaires were not completed and some participants failed to provide some critical answers so they had to be excluded from the data analysis. Further, some of the industries did not participate due to some policy concerns and industry supervisors are not around during the distribution of the questionnaire.

Data Analysis Measures

For the analysis, Average Weighted Mean (AWM) was utilized to determine the importance of a certain skill. The following were utilized to describe the importance of the skill based on the perception of the respondents:

Description	Range
5 – Very Important (VI)	4.21 - 5.00
4 – Important (I)	3.41 - 4.20
3 – Somewhat Important (SI)	2.61 - 3.40
2 – Less Important (LI)	1.81 - 2.60
1 – Least Important at all (NIA)	1.0 - 1.80

Furthermore, ranking was utilized to identify the most important perceived skills and rank one (1) was considered as the most important skill. The ranking of the skills were based on their mean average wherein the highest mean will have the highest rank.

Skills Gap Analysis

The measure of the difference is defined as the mean average difference between the perceptions of engineering students and company representative on the importance of soft and technical skills:

$$Skills\ Gap = \sum_{i-1}^{n} [\frac{(stuperception - iduperception)}{n}]$$

Where:

I	refer to the ith respondents
N	refers to the total number of respondents
stuperception	refers to the student perception on the importance of skills
iduperception	refers to the industry perception on the importance of skills

The bigger mean gap value depicts a more discrepancy between what is perceived by the industry and student as important skills of engineering students.

Furthermore, negative gap mean value indicates that the industry partners give more importance to the said skills as compared with student perception. Positive gap mean value shows that students gives more importance to the skills as compared to the industry perception.

T-test was also utilized to determine whether there are mean differences in the response of student respondents and industry representative.

FINDINGS

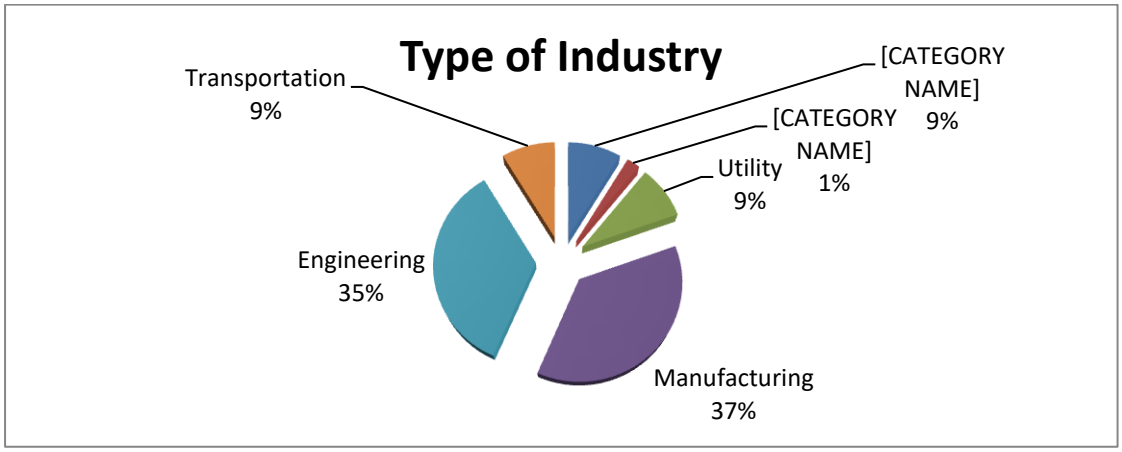

Figure *2*. Distribution of respondents according to industry

Information on the industry respondents is presented in Figure 2. Out of 23 identified industries in the survey questionnaire only six were actually selected by the industry respondents. The following were engineering, transportation, utility, manufacturing, delivery services and advertising industries. The figure shows that 17 or 37% comes from manufacturing, followed by 16 or 35% from engineering firms while transportation, delivery services and utility represent 27% or 4 in each type of industry. Majority of the industry was involved in the engineering works such as electrical, civil, mechanical and manufacturing. This result implied that our industry partners can provide the OJT engineering students with the necessary exposures on actual engineering works.

Figure 3 revealed that 93% or 43 of these industries are a private entity and only 7% or 3 comes from government or semi-private industry.

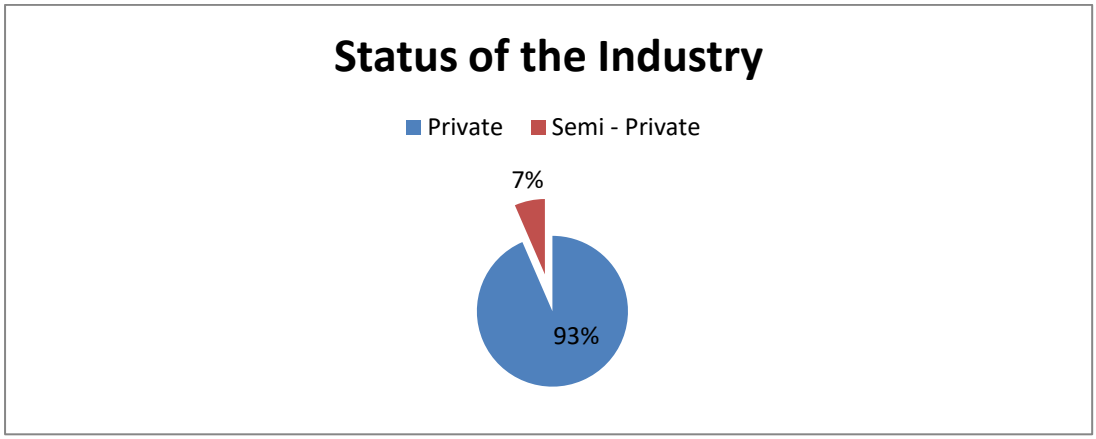

Figure *3.* Distribution of respondents according to status of the industry

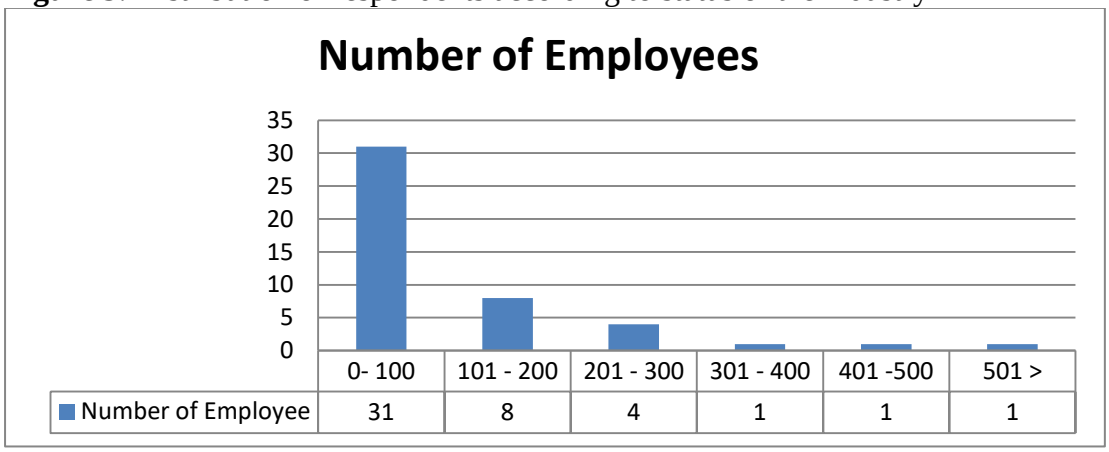

Figure 4. Distribution of respondents according to the number of employees

Figure 4 shows that thirty one (31) or sixty seven percent (67%) of the industry respondents were from organizations with less than 100 employees. This is followed by eight (8) or seventeen percent (17%) of the industry with less that 200 employees. This result indicates that industry respondents employed engineering workers, especially in the area of electrical, civil, mechanical and manufacturing. Based on the 2012 census, 23.8 % of the total number of employees were on architectural and engineering activities and related technical consultancy (Phil. Statistics Authority, 2014) .

Importance of Soft Skills

Table 2 and Figure 5 present the summary of the results for the soft skills as identified by the respondent. The result shows that industry and student respondents agree that teamwork, leadership and communication are the most important soft skills based on their rank. Further insights arise from results show that both respondents identified all soft skills as very important. However, statistical tests suggest that there is a significant difference in the importance in leadership as perceived by the industry and student respondents. In addition, the result of t-test indicated that there is a significant difference in the perception of engineering students and industry represented in terms of the importance of soft skills. Figure 2 revealed that presentation and leadership obtained the highest skills gap of 0.24 and 0.22, respectively. Smaller gaps are found in dealing with difficult personalities and facilitating with 0.02 mean gap.

The result also shows an important view of the industry on soft skills, all soft skills were rated higher by the industry respondents as compared to the rate given by the students except

in the area of management. This is an indication that industry value the importance of soft skills in the workplace.

Table 2. Respondents' Perceptions on the Importance of Soft Skills in the Industry

Soft Skills	*Student Perception*	*Description*	*Rank*	*Industry Perception*	*Description*	*Rank*	*Gap*	*Significant*
Communication	4.63	VI	3	4.74	VI	3	-0.11	*t* = 1.11 ***
Interpersonal	4.43	VI	7	4.57	VI	4	-0.13	*t* = 1.25 ***
Management	4.57	VI	4	4.5 2	VI	5	0.04	*t* = 0.41 ***
Team Work	4.76	VI	1	4.87	VI	1	-0.11	t=1.18 ***
Presentation	4.28	VI	8	4.52	VI	5	-0.24	t=-1.70 ***
Dealing with Difficult Personalities	4.46	VI	5	4.48	VI	8	-0.02	*t*=0.15 ***
Facilitating	4.46	VI	5	4.48	VI	8	-0.02	*t*=0.17 ***
Leadership	4.65	VI	2	4.87	VI	2	-0.22	*t*=2.23**
Calculated t exceeds the critical value (2.8411>2.365)								**

Legend : Description	Range		
5 – Very Important (VI)	4.21 - 5.00	**	Significant Difference
4 – Important (I)	3.41 - 4.20	***	No Significant Difference
3 – Somewhat Important (SI)	2.61 - 3.40		
2 – Less Important (LI)	1.81 - 2.60		
1 – Least Important at all (NIA)	1.0 - 1.80		

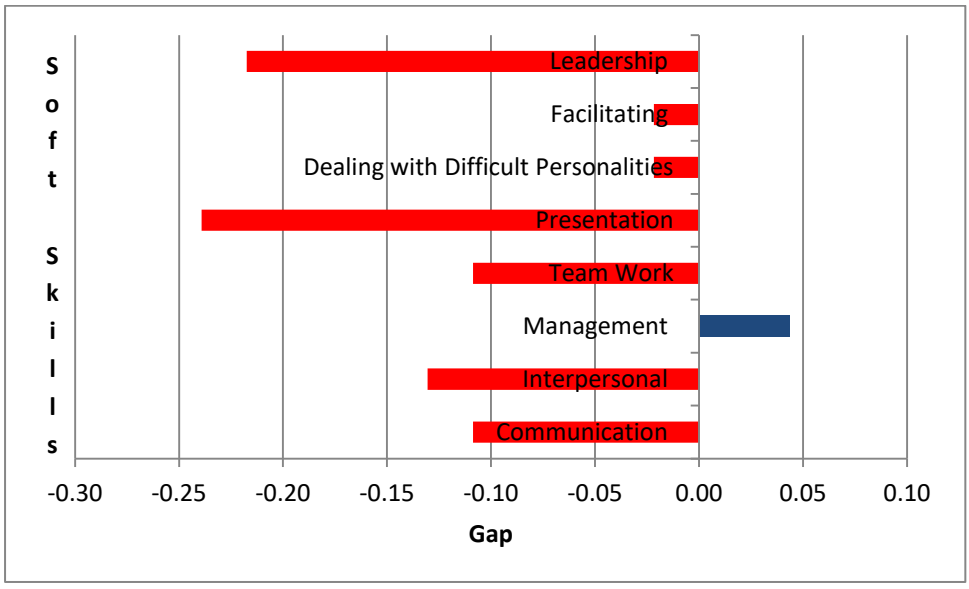

Figure 5. Soft skills mean gap as perceived by the industry and engineering student respondents

Importance of Technical skills

Table 3 and Figure 6 illustrate the perception level of the respondents on the importance of identified technical based engineering works and experiences. Industry respondents responded positively on the importance of all engineering knowledge and design plus development skills like the application engineering skills and knowledge, use of appropriate

tools to design client needs and knowledge of mathematics, science, engineering. However, low mean scores for the environment and sustainability and use modern tool skills like knowledge of foreign languages, global issues, law, policies, presentation, environment and ICT as reflected in the results. This indicates that these environments and sustainability and the use of modern tool skills were less important to the industry and student respondents, however a high degree of importance was given to essential engineering knowledge, design and development skills in the application engineering.

Furthermore, results shown that there is a significant difference in terms of its importance in the perception of the respondents in applying knowledge of mathematics, science, and engineering and knowledge of ICT packages and systems. Industry perceived that ICT packages are only important skills in a work environment and they preferred technical skills like applying math, science and engineering as very important skills that graduates should possess. This indicates that respondents give less importance on the policy, environment and new technology.

On the other hand, results revealed that knowledge of ICT packages and systems, apply knowledge of mathematics, science, engineering and project presentation skills obtained the highest skills gap of 0.46, 0.26 and 0.28, respectively. The result shows that industry gave more importance to engineering knowledge and design skills while a student's emphasis is on technology.

Table 3. Respondents's Perceptions on the Importance of Hard Skills in the Industry

Hard Skills	*Student Perception*	*Rank*	*Description*	*Industry Perception*	*Rank*	*Description*	*Gap*	*Significant*
Apply knowledge of mathematics, science, and engineering	4.39	2	VI	4.65	1	VI	-0.26	*t*-2.05 **
Knowledge of mechanical /construction/electrical process	4.43	1	VI	4.30	7	VI	0.13	*t*=0.79 ***
Design a system, component, or process to meet desired needs	4.37	3	VI	4.43	3	VI	-0.07	*t*=0.48 ***
Knowledge of associated technology	4.30	6	VI	4.35	6	VI	-0.04	t=0.31 ***
Knowledge of ICT packages and systems	4.07	10	IV	3.61	15	IV	0.46	*t*=2.56 **
Project Presentation skills	3.85	15	IV	4.13	8	IV	-0.28	t=1.70 ***
Ability to negotiate	4.22	8	VI	4.00	9	IV	0.22	*t*=1.49 ***
Familiarity with the associated legislation /law /policy	3.98	12	IV	3.74	14	IV	0.24	*t*=1.17 ***
Ability to model using CAD	4.15	9	IV	3.91	12	IV	0.24	*t*=1.44 ***
Knowledge of environmental issues	3.89	13	IV	3.87	13	IV	0.02	*t*=0.13 ***
Ability to work with detailed information	4.30	6	VI	4.39	4	VI	-0.09	*t*=1.55 ***
Ability to present a reasoned argument	3.93	12	IV	4.00	9	IV	-0.07	*t*=-0.35 ***

Ability to think commercially	3.98	11	IV	4.00	9	IV	-0.02	*t*=0.11 ***
Use appropriate/modern tools, equipment, technologies	4.35	4	VI	4.39	5	VI	-0.04	*t*=0.24 ***
Identify, formulate, and solve technical/ engineering problems	4.33	5	VI	4.57	2	VI	-0.24	*t*=-1.65 ***
Awareness of Global issues / Contemporary issues	3.54	16	IV	3.61	15	IV	-0.07	*t*=0.37 ***
Knowledge of foreign languages	3.39	17	IV	3.61	17	IV	-0.22	*t*=1.02 ***
Calculated *t* is smaller than the critical value (0.1067<2.12)								***

Legend : Description Range
5 – Very Important (VI) 4.21 - 5.00
4 – Important (I) 3.41 - 4.20
3 – Somewhat Important (SI) 2.61 - 3.40
2 – Less Important (LI) 1.81 - 2.60
1 – Least Important at all (NIA) 1.0 - 1.80

** Significant Difference
*** No Significant Difference

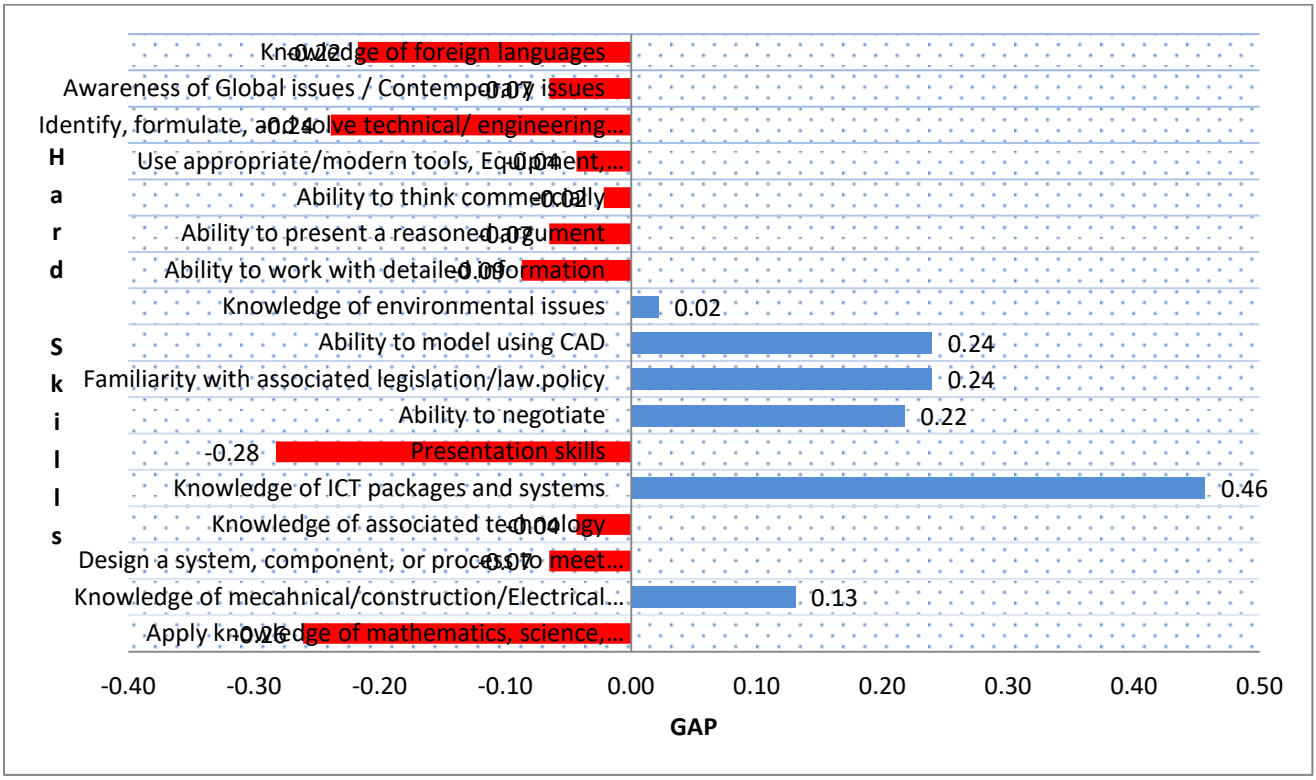

Figure 6. Skills mean gap as perceived by the industry and engineering students

CONCLUSIONS

On the job training or OJT is a method by which students are given a chance to apply the theories, computations, knowledge and skills that they have learned from the university. This is a good venue wherein we can evaluate whether the skills and knowledge they have acquired at the university meet the needs of the industry. The result indicates that the participating industry employed engineering workers, especially in the area of electrical, civil, mechanical and manufacturing. Thus, the application of soft, hard, and specially

engineering skills is evident. Further, the result shows that industry and student respondents agree that teamwork, leadership and communication are the most important soft skills while industry respondents replied positively on the importance of all engineering knowledge and design and development skills in the application of engineering skills and knowledge, the use of appropriate tools to design client needs and knowledge of mathematics, science, engineering. In addition, low mean scores were obtained for the environment and sustainability and the use of modern ICT tool skills like knowledge of languages, global issues, law, policies, presentation, environment and ICT. This indicates that respondents give less importance on the policy, environment and new technology. There is a significant difference between the perceptions of the respondents in the case of applying knowledge of mathematics, science, and engineering and knowledge of ICT packages and systems. Industry perceived that ICT packages is not so important skills in a work environment and they preferred skills like applying math and science in the design of engineering and technical works as very important skills that graduates should possess. In addition, results of t-test indicated that there is no significant difference in the perception of engineering students and industry partners in terms of the importance of hard skills. However, there is a significant difference in the perception of engineering students and industry on the importance of soft skills.

RECOMMENDATION

The result suggests that the university should enhance its curriculum in the areas of engineering knowledge and design and development skills. PSU could integrate in its curriculum learning activities that will nurture teamwork, leadership, communication among students and adopt instructional designs that will facilitate the transfer of engineering knowledge into students' long term memory, and develop the skills of engineering graduates under the deliverance of well-informed academics on the current market needs.

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