Employers Perception towards Engineering Employability Skills In Asia

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Abstract: - Employers nowadays place main concern on and give emphasis to employability skills in potential engineers which caused a significant increase in unemployment among engineering graduates in Malaysia. There are several discussions and studies on "What types of skills and abilities are needed in the workplace?" How the government and higher education overcomes this rising phenomenon? This study attempts to look into engineering employability skills that have been required for their new engineers by other countries in Asia such as Malaysia, Japan, Singapore and Hong Kong. This paper will put forward a list comprised of the essential skills needed by these four countries, and compare the existing similarities and differences of these enlisted skills. Information was gathered from articles, journals, papers and reports. The findings indicate that these countries have published reports on the necessary frameworks of employability skills to prepare engineering graduates for the employment today and in the future. Overall, the studies suggest that the engineering graduates should acquire a set of generic skills such as communication skills, problem solving and interpersonal skills.

Keywords: Engineering, graduates, employers, employability and generic skills.

1 Introduction

Bianca K.& Peter F. [3] defined engineering as:

> 'Engineering is a profession directed towards the skilled application of a distinctive body of knowledge based on mathematics, science and technology, integrated with business and management, which is acquired through education and professional formation in a particular engineering discipline. Engineering is directed to developing, providing and maintaining infrastructure, goods and services for industry and the community.'

Therefore, engineering graduates obviously need to have a certain skills to help them applying and practicing the knowledge effectively in workplace. The skills are generic skills and lately known as employability skills. Robinson [25] defined employability skills as "those basic skills necessary for getting, keeping, and doing well on a job." Others described employability skills as the skills that can be teachable [19] and transferable [29].

The concept of employability skills in any disciplines have a common purpose which is to be practised effectively in the workplace [6]. Most of the countries developed the national

frameworks on employability skills as a guide for employers and employee as well for graduates. However, rapid changes occurring in the world require the frameworks to be up-to-date as needed in a workplace. The institutions of higher learning around the world also are very much concerned on their graduate employment. They play significant roles in developing and enhancing the employability skills to their students by providing certain courses, seminars, workshops, industrial trainings, practical trainings and etcetera.

Employability upon graduation is a major priority for most of engineering students. According to Mohammad [21], new and fresh engineering graduates these days confront with more "challenges and competitions" in getting employed compared to previous graduates. He points out that the excellent academic degrees alone are inadequate as employers are definitely required potential engineers for "competencies and capabilities" in generic skill since globalisation demands the companies to be more competitive in their management system. Engineering graduates are required to possess the employability skills to help them practising their knowledge and technical skills effectively. This study was part of the ongoing initiative to assess employers' expectations on the importance of the employability skills and competencies acquired by engineering graduates in Malaysia, Japan, Singapore and Hong Kong.

The objectives of this paper are; firstly, to examine the various engineering employability skills that have been identified by several countries in Asia such as Malaysia, Japan, Singapore, and Hong Kong. Secondly, is to compare the existing similarities and differences of engineering employability skills needed by employers in these four different countries.

2 Engineering Employability Skills Required By Employers

Engineering employability skills, also known as generic skills are highly related to non-technical skills. Employability skills have becoming popular since 1980. This term has been given and replaced with other expressions which differ across continentals. It is sometimes referring to generic capabilities, transferable skills, basic skill, essential skills, work skills, soft skill, core skills, core competencies and enabling skills or even key skills [7; 13; 17; 29].These non-technical skills have been played an important role for a graduate in getting employed and doing well in the workplace [6].

The focus of the study is to investigate the set of engineering employability skills required for engineer entry-level in several countries as mentioned above. The set of employability skills identified in those four countries shows a number of similarities and differences on the employability skills required in entry-level engineering graduates. Employers' expectation and perception play an important role in determining the essential skills needed.

2.1 Malaysia

Engineering graduates in Malaysia have good basic engineering knowledge [22] and they do not lack of technical competency [16]. However, employers in Malaysia complaint on the graduate-level job applicants are lacking generic skills [16]. Employers and leading engineers agreed that local engineering graduates are lack of oral and written communication skills [11; 1 ;2]. The study done by Hassan [11] also shows that there is an urgent need for engineering programmes to improve in all areas, especially in non-technical aspects of engineering education. In other words, the education programmes are recommended to enhance employability skills by emphasizing on improvements in the non-technical skills aspects amongst undergraduates.

The Employability Skills Framework developed by Hassan had listed thirteen (13) most important generic skills acquired by the engineering graduates [11; 2]. The skills are based on criteria emphasized for professional

skills from the Accreditation of Engineering Programmes (EAC) Manual. The finding indicates that most of Malaysian employers agreed to the outcomes of EAC manual. Table 10 shows ten (10) out of thirteen (13) most important skills expected by employers.

Table 1: Engineering Employability Skills developed by Ministry of Higher Education

No.	Skills	Description
1	Communication effectively	the ability to present ideas with confident and effective through aural, oral and written modes, not only with engineers but also with the community at large
2	Competent in application and practice	the ability to use the techniques, skills, and modern engineering tools
3	Interpersonal or team working skills	the ability to function effectively as an individual and in a group with the capacity to be a leader or manager as well as an effective team member
4	Engineering problem solving and decision making skills	the ability to undertake problem identification, apply problem solving , formulation and solutions.
5	Apply knowledge of science and engineering principles	the ability to acquire and apply knowledge of engineering fundamentals.
6	Competent in specific engineering discipline	the ability to acquire in-depth technical competence in a specific engineering discipline.
7	Understand professional , social and ethical responsibilities	the ability to understand the social , cultural, global and environmental responsibilities of a professional engineer, and commitment to professional and ethical responsibilities.
8	Lifelong learning	the ability to recognize the need to undertake life long learning, and possessing / acquiring the capacity to do so.
9	Engineering system approach	the ability to utilize a systems approach to design and evaluate operational performance.
10	Knowledge of contemporary issues	the ability to continue learning independently in the acquisition of new knowledge, skills and technologies. Nowadays, the use of information, communication and computing technologies are very essential in the knowledge-based era.

Sources: [11; 5]

2.2 Japan

In Japan, the Malaysia's Look East Policy model, defines employability as "skills that enable worker mobility" and "skills that are demonstrated in a company and that enable a worker to be employed on a continuous basis."[13]. The term "employability skills" replacing "work skills" was initiated by the Education Special Committee of the Japan Federation of Employers' Association. Japanese

employers did not expect job readiness from fresh graduates but did put on value on the possibility of future development. They considered "…the new graduates as raw material and believe that this new graduates could become a powerful components to organization through continuously in-house training programs."[12].

Since 2000, a practical industrialized curriculum in engineering had engaged to the Japan Accreditation Board for Engineering Education (JABEE) guideline to integrate employable personal qualities and requirements into the academic curriculum in order to generate skilled engineers." According to Kasahara (2001) and Owa (2001) as reported in Nguyen [23], they both agreed that Japanese graduates lack the initiative and problem-solving skills that are most needed by industrial employers. They also pointed out that new engineers are required taking more responsibility on social and respecting the environmental concerns of the wider community. According to Hideo, the "engineering ethics and enhancement of communication capability" [12] is an additional new skills required in Japan. Nguyen [23] reviewed a study by Chino which reported a list of 20 required "employable attributes" of graduates [4]. On the other hand, Nguyen [23] studied on industry employers, found out that these Japanese employers' requirements are grouped into two (2). First, the requirement on scientific knowledge obtained graduates. Second, the requirement on employable personal qualities possess by graduates. The second requirement had enlisted the "employable personal qualities" according to the importance of each "personal qualities" as shown in Table 2. It indicates that communication skills, responsibility and initiative were among the employers' most required personal qualities in potential employees. In addition, Nguyen also revealed the engineering student's perception of the important employable personal qualities, as shown in Table 3. The survey by Nguyen [23] on engineering student's perception of the importance of employable personal qualities indicates a small number of differences perceptions compared to employers' requirement. However, they both agreed that "communication skills, responsibility and initiative" are important personal qualities to Japanese graduates.

Table 2: Employable personal qualities required by Japanese employers

No.	Personal skills	Attitudes	Traits
1	Communication skills	Responsibility	Initiative
2	Personal presentation skills	Optimism	Sensitivity
3	IT and computer skills	Curiosity	Flexibility
4	Problem-solving skills	Ambition	Individuality
5	Leadership skills	Desire for challenge	Sincerity
6	Visioning skills	Cooperation	Creativity
7	Goal-setting skills	Vitality	A balanced personality
8	Self-assessment skills		An entrepreneurial mind

Sources: Nguyen [21]

Table 3: The engineering student's perceptions of the importance of employable personal qualities

No.	Personal skills	Attitudes	Traits

No.	Personal skills	Attitudes	Traits
1	Communication skills	Responsibility	A balanced personality
2	Problem-solving skills	Cooperation (Work in team)	Initiative
3	Goal-setting skills	Desire for challenge	Flexibility
4	Personal presentation skills	Vitality	Sincerity
5	Visioning skills	Curiosity	Creativity
6	IT and computer skills	Ambition	Individuality
7	Leadership skills	Optimism	Sensitivity
8	Self-assessment skills		Entrepreneurial mind.

Sources: Nguyen [21]

Nguyen study indicated that Japanese students rated themselves poorly in communication and presentation skills and they also dissatisfied with their personal traits in taking initiative and having flexibility, however those skills were being rated as significant fundamentals by employers [23].

2.3 Singapore

Republic of Singapore is the nearest neighbour to Malaysia. Various reports stated Singapore is lacking of labour productivity, and flexible and adaptable workers, since Singaporean often inflexible and fussy [28]. Graduates in Singapore nowadays also need to have "basic multi-disciplinary knowledge skills and a mindset…" on top of having creative minds [27]. Siu in his study [27], reports there is a need for engineers to communicate using visuals and in his opinion a graduate without visual literacy would be considered as "incompletely educated". Singapore considers the development of manpower and workforce are important element for successful industrial and economic development [27]. In 2004, Singapore Workforce Development Agency (WDA) introduced the Singapore Employability Skills System (ESS). The system is part of the Singapore Workforce Skills Qualification (WSQ) that has indicates a set of generic employability skills that applicable to all industries. The skills have been identified in helping to enhance worker's abilities and to increase a worker's effectiveness. There are ten employability skills are considered as "... workers can transfer and apply these skills across industries and jobs" [26]. Table 4 shows the employability skills identified by WDA.

Table 4: Ten (10) employability skills identified by WDA.

No.	Employability skills
1	Workplace literacy & numeracy ,
2	Information & communications technology,
3	Problem solving & decision making,
4	Initiative & enterprise,
5	Communication & relationship management,
6	Lifelong learning,
7	Global mindset ,
8	Self-management,
9	Workplace-related life skills
10	Health & workplace safety

Employability skills system developed by WDA is recognised by industries and employers, and it becomes guidance to workers, potential workers, graduates, industries and employers in Singapore [26]. The system (ESS) was designed to equip workforce with updated generic and portable skills that help employees to adapt to new workplace.

As stated earlier, one of the most important literacy skills needed for a graduate to work

effectively in the workplace and in society is visual communication. Normally, Singapore engineering undergraduate curricula consist of "basic literacy skills like language, mathematics and computer literacy in addition to a set of skills in their core subjects in engineering…" to develop the skill in graduate [27]. As a result, literacy and communication become first two essential skills in Singapore Employability Skills System (ESS).

2.4 Hong Kong

In Hong Kong, Centre for Enhanced Learning and Teaching at the Hong Kong University of Science and Technology funded and introduced an online personal-development-planning and portfolio-showcasing tool, called the Portfolio of Essential Attributes, Knowledge and Skills (PEAKS) [14]. This system allows students to display their key attribute, knowledge and skills to potential employers. The development of this electronic portfolio was based on several sources including the feedback from Hong Kong employers on their assessment to the fresh graduates who entered their workforce [24]. In 1989, the Hong Kong Government's tertiary education increased the first degree intake, resulting overflow of graduates into the labour market … [18]. This also led to the employers to look for other knowledge and skills that important in the workplace as an additional to academic qualifications [18]. Table 5 shows the abilities of fresh graduates including engineering graduates according to finding of the survey taken on Employers' Satisfaction with First Degree Graduates Performance [9; 24].

Table 5: Abilities of fresh graduates needed by employers in Hong Kong

No.	Employability skills
1	Work attitude,
2	Interpersonal Skills,
3	Analytical & problem-solving skills,
4	English language proficiency,
5	Numerical competency,
6	Information technology literacy,
7	Management Skills
8	Chinese language proficiency.

According to Lau and Pang study, they suggested Hong Kong graduates to build up confidence through better communication and negotiation skills in order to make known the talents and achievements own by graduates [18].

3 Conclusion

There is ample evidence all around us of the many employability skills have much impact on capabilities of new entry-level job applicants to get a job. Labour market conditions for engineering graduates today are particularly tough due to globalization and competition as the numbers of graduates are continuously increasing. Competitions among themselves become more competitive. Engineering graduates worldwide should have acquired certain employability skills to be aggressive and competent. They need to embrace themselves with suitable softskills more than ever to stay competitive. The students that serious on their employability skills can obtain and strengthen their work-readiness by going through industrial trainings or practical trainings or by getting help from place of study to gain the ability to apply knowledge effectively in their future workplace. Engineers at present or in future must be able to do more. Not only performing technical tasks, but also having mission, vision, dedication, committed, determination and understand professional, social and ethical responsibilities, and loyal to organisation.

This study identified engineering employability skills required by employers in four countries nearby including Malaysia. The graduates who want to stay competitive should fulfilled employers requirements. Table 6 shows a set of employability skills required for new

entry engineer to be employed, and for engineers to be successful in their profession. The table also provides a similarity and differences on skills needed by those four countries. The four most agreed necessary skills are communication skills, problem solving skills, information technology literacy and interpersonal or team working skills. Employers from these four countries agree that good communication skills to be very important followed by soft skills such as problem solving and interpersonal/teamwork skills. These skills are vital and even more important than most hard skills are lifelong learning and self management skills are considered essential too.

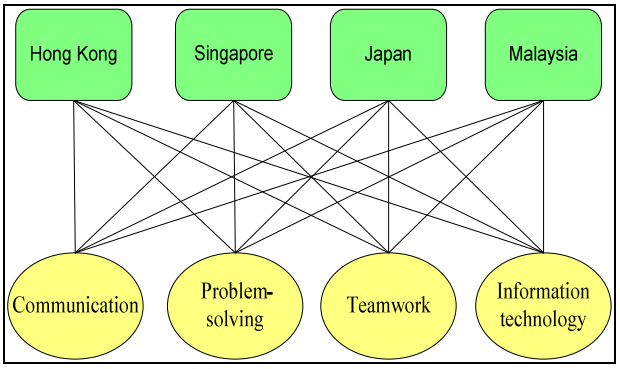

Fig.1 Most four engineering employability skills required.

Table 6: Engineering Employability Skills Required by Employers

No.	Malaysia	Japan	Singapore	Hong Kong
1	Communication effectively	Communication skills;	Workplace literacy & numeracy	Work attitude
2	Competent in application and practice	Problem-solving skills;	Information & communications technology	Interpersonal skills
3	Interpersonal or team working skills	Goal-setting skills;	Problem solving & decision making	Analytical & problem-solving skills
4	Engineering problem solving and decision making skills	Personal presentation skills;	Initiative & enterprise	English language proficiency
5	Apply knowledge of science and engineering principles	Visioning skills;	Communication & relationship management	Numerical competency
6	Competent in specific engineering discipline	IT and computer skills	Lifelong learning	Information technology literacy
7	Understand professional , social and ethical responsibilities	Leadership skills	Global mindset	Management skills
8	Lifelong learning	Self-assessment skills	Self-management	Chinese language proficiency.
9	Engineering system approach		Workplace-related life skills	

No.	Malaysia	Japan	Singapore	Hong Kong
10	Knowledge of contemporary issues		Health & workplace safety	

Sources: [2; 11; 23; 24; 26]

Employability skills such as "teamwork, communication, knowledge retention and the ability to synthesize and make connections between courses and disciplines" [2] are still not been highlighted in engineering program in higher education. Therefore, to prepare the graduates for the world of tomorrow, higher education must develop and utilise appropriate learning tools to the latest learning science and technology [8; 10; 16; 18; 23]. Preparing necessary programme to develop those employability skills into students' profile certainly requires proper planning and preparation [16]. Another opinion, by Juan A, he discovered that teamwork-based methodology should be offered to university students. This will "enable the students to experiment and acquire the skills…" [15], in a way teamwork-based methodology indirectly implement some other skills such as interpersonal communication, teamwork, group problem-solving, leadership, negotiation and time management [15]. Other study by Marin, have shown positive outcomes on the students' academic performance, motivation and attitudes towards learning [20].

It is clear that engineering students should prepare themselves for competitive and global work environment. This study not only provides the career literature, but it is also beneficial to fresh graduates, employees and employers as their references. Engineering graduates must develop the essential skills and attitudes to be ready to work globally after graduation. It is also hoped that job seekers are aware of the expectations of the potential employers.

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