THE COMPARISON ON PRIORITY ENGINEERING EMPLOYABILITY SKILLS

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ABSTRACT

Recently, significant increase in unemployment of graduates has become quite an important concern for the higher education all over the world. There are debates on what causes this problem and how can the government overcome this rising phenomenon. Thus, to address this issue, this study examines the various engineering employability skills that have been sought after by several countries such as United Kingdom, Australia, United States, Canada, Japan, Europe and Malaysia. This paper will put forward a list comprised of the skills needed by these seven different nations, and compare the existing similarities and differences of these enlisted skills according to its priority. Information was gathered from articles, journals, papers and reports. The finding indicates that these countries have published reports on the necessary frameworks of employability skills to prepare graduates for the employment nowadays and in the future. Overall the frameworks suggest that the engineering graduates worldwide should acquire and demonstrate a set of generic skills such as communication skills, teamwork, lifelong learning, problem solving and professionalism.

Keywords*: Engineering graduates, higher education, comparison, employability and generic skills.*

INTRODUCTION

Employability upon graduation is a major priority for most of engineering students. The higher educations around the world are very much concerned on their graduate employment too. They play significant roles in helping their students to develop the employability skills by providing courses to develop the students' skills and to enhance the students' ability practising the skills. New engineering graduates nowadays are facing more challenges and competitions in getting employed compared to previous graduates. (Mohammad, 2004). The excellent academic degrees alone are inadequate as for the employers today looking in fresh engineering graduates for competencies or capabilities in generic skill. Robinson (2000) defined employability skills as "*those basic skills necessary for getting, keeping, and doing well on a job.*" Employability skills are teachable (Robinson, 2000) and transferable (Bennett et al., 1999; CDELL, 2002) skills. A number of countries such as United Kingdom, Australia, United States, Canada, Japan, Europe and Malaysia had identified the employability skills and developed a national framework with common features (ACER, 2002) to clarify the specific needs of these skills for various posts in different sectors/industries. The differences features are on some basic or foundation skills such as in literacy and numeracy and on values and attitudes. Furthermore, the national frameworks are always keeps on changing, growing and up-to-dated as needed in a workplace. One of the problems in Malaysia is unemployment among engineering graduates. Employers complained on the graduate-level job applicants are lacking in generic skills (Kamsah, 2004). According to Mohd.Sam (2004), Malaysia's new engineering graduates have good basic engineering knowledge, and Kamsah (2004), the graduates are not lacking in technical competency. However, engineering graduates are required to possess the employability skills to help them using their technical skills and their knowledge effectively. Globally, employers agreed that graduates are lacking of generic skill and they want higher education provider emphasis more on developing these skills to students. (Kamsah, 2004; Charner,1988; Gregson,1992; Lankard,1990)

Thus, to address this issue, this study examines the engineering employability skills that have been determined by United Kingdom, Australia, United States, Canada, Japan, Europe and Malaysia. This paper will put forward a list comprised of the skills needed by these seven different nations, and compare the existing similarities of these enlisted skills. Information was gathered from articles, journals, papers and reports.

ENGINEERING EMPLOYABILITY SKILLS FRAMEWORK

Engineering requires creative imagination to discover useful applications and it's always seeking for new invention and improves present methods or invention for better living. This support by Kubler, B.& Forbes, P. (2004) statement:

> '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.'

An engineering firm need an engineer with a solid theoretical background, and require engineers equipped with vital soft skill or employability skills. Engineering employability skills are highly related to non-technical skills or abilities which sometimes called generic skills. This non-technical skills have been played an important role for a graduate to succeed in getting employed and doing well in the workplace (DEST, 2006). The skills are transferable and applicable from one place to another. Employability skills are popular since 1980 and named it differently across continental. Its sometimes refers to *generic skills, generic capabilities, transferable skills, basic skill, soft skill, core skills, core competencies and enabling skills* or even *key skills* (DEST 2002a; Knight, P and Yorke, M, 2002; Yorke, 2006). Table 1 shows the names that been called for employability skills in seven (7) countries.

Table 1**:** Names That Been Called For Employability Skills In Seven (7) Countries

United Kingdom	**Australian**	**United States**	**Canada**	**Japan**	**Europe (EU)**	**Malaysia**
Key Skills (NCVQ, 1999)	Engineers Attributes	ABET Engineering Criteria 2000	Employability Skilss 2000+	Employable Personal Qualities	Generic Employability Skills	Employability Skills

The focus of this study was to investigate the set of engineering employability skills required for engineer entry-level in United Kingdom, Australia, United States, Canada, Japan, Europe and Malaysia. In **United Kingdom** (UK) employability is an important agenda on the national higher education including employability skills of their engineering graduates. According to Gazier (2006), in the 1980s and 1990s, several efforts was done to develop the employability skills. A few models on employability skills been introduced since 1980s which were known as *key skills* in England, Wales, and Northern Ireland, and *core skills* in Scotland. *Basic skills* are later used to replace the term *core skills.* The initial list of core skills was *communication, problem solving, personal skills, numeracy, information technology* and *modern foreign language*, but Scotland excluded the competence in a modern foreign language. The basic skills was mean for entry-level skills for getting a job and not for a life long learning. In 1990's a number of studies been conducted to examine graduate attribute. The Association of Graduate recruiters in the UK indicated that employers are looking for graduates who show qualities in vision, leadership, self-reliance and flexibility, initiative and innovation, communication skills, problem solving, foreign language skills, ability to work in a team, understanding and ability to quantify risk. (Dodrige, 1999). Dodrige in his report "Generic Skill requirements for engineers in the 21st century" found out that employers had expressed their concern on the insufficient of generic skills in engineering graduates. He also believed the reason of the failure to apply knowledge to solve engineering problems is:

"…the theoretical nature of programmes of study, poor level of attainment on entry to higher level programmes in subjects such as mathematics, physics and science and the absence of relevant training by employers." (Dodrige, 1999).

Employers nowadays are looking for the personal quality, communication skills and teamwork skills. The number of skills continuously increased for future need. There was evidence indicating a gap between engineering graduates and the job market. Key skills form an important part of generic skill set required by an engineering graduates. In 1996, the National Council for Vocational Qualifications (NCVQ) introduced key skills comprising six skills which are similar to seven common skills introduced by Business and Technician education Council (BTEC) in 1986. The key skills excluded the "applying design and creativity" skill though it has been identified as a weakness in engineers. Engineering graduates from UK higher education are required to gain the key skills and common skills. Other then those generic skills, the engineering graduates are demanded by engineering industry to accomplish the competencies in OSC Eng Occupational Standards (Dodrige, 1999). Table 2 lists the competencies in OSC Eng Occupational Standards.

Table 2: Engineering graduates fro UK higher education are desired to accomplish the following competencies

No	**OSC Eng Occupational Standards**
1	Develop engineering products
2	Produce Engineering products
3	Install engineering products
4	Maintain engineering products
5	Improve the quality and safety of engineering producs and processes
6	Plan and manage engineering projects
7	Develop own engineering competence

Later in 2004, Enhancing Student Employability Coordination Team of the Higher Education Academy (ESECT) and The Council for Industry and Higher Education (CIHE) released a report on Student Employability Profile -Engineering. The report has list out the employability skills that are expected to be acquired by engineering graduates and the linkage of this skills compare to employability criteria on qualities or attributes needed by employers. Following are the twenty five (25) employability skills listed in the report.

Table 3: Engineering Employability Skills related to Employers' Employability Criteria

Employability Skills	Employers' Employability Criteria Qualities or Attributes
1. Understanding of essential facts, concepts, principles and theories relevant to their chosen specialist engineering discipline(s), and knowledge and understanding of the constraints within which their engineering judgement will have to be exercised.	• Analysis, judgement. • Professional expertise.
2. A sound grasp of science, mathematics and the technological base relevant to their discipline. It is desirable that all students have some knowledge and understanding of business and management techniques; these should be integrated into their engineering studies.	• Working with others, teamwork. • Leadership. • Organisational understanding, commercial awareness, financial awareness. • Professional expertise.
3. Graduating engineering students must also have an understanding of their professional and ethical responsibilities, the broad education necessary to understand the impact of engineering solutions in a global and societal context, and an awareness of relevant contemporary issues.	• Life long Learning, personal development, organisational sensitivity. • Professional expertise, image.
4. Engineers need to be creative and innovative in solving problems, and in designing systems, components and processes. They must be able to apply the appropriate tools from mathematics, science and technology,	• Creativity, initiative. • Technical ability, technical knowledge. • Professional expertise.

coupling these with know-how drawn from professional experience.	
5. Solve engineering problems, often on the basis of limited and possibly contradictory information	• Analysis, judgement, attention to detail. • • Creativity, initiative, achievement orientation, adaptability/flexibility.
6. Analyse and interpret data and, when necessary, design experiments to gain new data; design a system, component or process to meet a need	• Analysis, judgement, attention to detail. • Decisiveness. • Process operation.
7. Evaluate designs, processes and products, and make improvements.	• Process operation
8. Maintain a sound theoretical approach in enabling the introduction of new and advancing technology to enhance current practice.	• Analysis, judgement, attention to detail • Decisiveness • Technical knowledge, technical ability. • Process operation.
9. Take a holistic approach, applying professional judgements, balancing costs, benefits, safety, quality, reliability, appearance and environmental impact.	• Judgement. • Financial awareness, commercial awareness, organisational understanding. • Professional expertise.
10. Assess risks, and take appropriate steps to manage those risks.	• Analysis, judgement, attention to detail. • Decisiveness.
11. Use a wide range of tools, techniques and equipment, including pertinent software; use laboratory and workshop equipment to generate valuable data.	• Technical knowledge, technical ability.
12. Develop, promote and apply safe systems of work.	• Process operation.
13. Communicate effectively with colleagues and others, using both written and oral methods	• Written communication, listening,questioning
14. Use IT effectively	• Technical knowledge, technical ability.
15. Manage resources and time	• Planning and organising. • Financial awareness.
16. Work in a multi-disciplinary team.	• Working with others, teamwork
17. Undertake life long learning, particularly for continuing professional development. To enable students to become effective engineers, they need to develop certain qualities of mind, through the study of engineering.	• Life long learning, personal development, initiative, achievement orientation. • Professional expertise.
18. Develop a good understanding of science in general and, depending on their chosen discipline, they will study specific sciences in greater depth.	• Professional expertise
19. Creative, particularly in the design process.	• Creativity • Process operation
20. Analytical, in the formulation and solution of problems.	• Analysis, judgement, attention to detail. • Decisiveness.
21. Innovative, in the solution of engineering problems and the transfer of technology.	• Creativity • Professional expertise
22. Of an enquiring mind, eager for new knowledge and understanding.	• Initiative, achievement orientation, creativity.
23. Self-disciplined and self-motivated, in the pursuit of their studies and professional practice.	• Life long learning, personal development, achievement orientation.
24. Independent of mind, with intellectual integrity, particularly in respect of ethical issues.	• Organisational understanding. • Professional expertise
25. Enthusistic, in the application of their knowledge and understanding skills in the pursuit of the practice of engineering and the promotion of the engineering disciplines	• Achievement orientation, initiative • Technical knowledge. • Professional expertise.

Adapted from Kubler, B. and Forbes, P. (2004)

In **Australia** education, Key Competencies had been established since 1992 and ten years later Australia education introduced a framework of Employability Skills in *Employability Skills for the Future* (DEST 2002) report which was later endorsed by the National Training Quality Council (NTQC). In 2006 the NTQC was replaced by the National Quality Council (NQC). After a great discussion and consultation between industries and enterprises across Australia, the skills were identified and a framework was recommended. The concepts behind Employability Skills and Key Competencies been discussed in this report. The report also identified eight Employability Skills such as *communication, teamwork, problem solving, initiative and enterprise, planning and organizing, self-management, learning* and *technology* as an important skills regardless any disciplines that are. In 2006, another report produced by Australia education, the "*Employability Skills from Framework to Practice"* (DEST 2006) which unpacked the skills and highlights some further considerations in relation to the eight identified Employability Skills in DEST 2002 report. The Employability Skills are generally common and important in most industry including in engineering and manufacturing. The priority of these employability skills varies depend on job scope, job classification and level of employment. Employers look for leadership skill in their employee and the skills framework become the guidelines to develop leadership skill. On the other hand, the Framework of Employability Skills integrates personal attributes that contribute to overall employability. These personal attributes are *loyalty, commitment, honesty and integrity, enthusiasm, reliability, personal presentation, commonsense, positive self-esteem, sense of humour, ability to deal with pressure, balanced attitude to work and home life, motivation* and *adaptability*. The employers aware of these attributes are new and important component to employability skills (Table 4).

Table 4: The Employability Skills Framework structured in personal attributes:

No	Skills	Description
1	Communication	that contribute to productive and harmonious relationship between employees and customers
2	Team work	that contribute to productive working relationships and outcomes
3	Problem solving	that contribute to productive outcomes
4	Initiative and enterprise	that contribute to innovative outcomes
5	Planning and organising	that contribute to long-term and short-term strategic planning
6	Self-management	that contribute to employee satisfaction and growth
7	Learning	that contributes to ongoing improvemnet and expansion in employee and company operations and outcomes
8	Technology	that contributes to effective execution of tasks

Adapted from DEST 2002.

Engineers Australia (EA) is a professional body and an accrediting body. A review of engineering education shows some significant differences in the development of engineering employability skills for undergraduate students. As a result, EA developed a suite of professional attributes in engineering competencies. However, partly of the engineers' attributes have been covered by the Employability Skills Framework (2002), and these professional attributes are up-to-date to what industry expects from the engineering graduates. The professional attributes included in the Engineers Australia competency standards are listed in Table 5 and Table 6 detailed out the ACCI/BCA Employability Skills Framework.

Table 5: Attributes identified in the Engineers Australia

No	Engineers Australia Attributes
1	Ability to communicate effectively, with the engineering team and with the community at large
2	Ability to manage information and documentation
3	Capacity for creativity and innovation
4	Understanding of professional and ethical responsibilities, and commitment to them
5	Ability to function effectively as an individual and in multidisciplinary and multicultural teams, as a team
6	Capacity for life-long learning and professional development
8	Professional attitudes

Adapted from DEST(2007)

Table 6: The ACCI/BCA Employability Skills Framework in Australia.

Communication	Teamwork	Problem solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
Listening and understanding Speaking clearly and directly Reading and interpreting documentation Using numeracy effectively Sharing information Being assertive Writing to the needs of the audience Empathising Negotiating responsively Persuading effectively Establishing and using networks	Working as an individual and a team member Applying teamwork to a range of situations Working with people of different ages, genders, races, religions or political persuasions Coaching, mentoring and giving feedback. Knowing how to define a role as part of a team Identifying the strengths of team members	Developing practical situations Solving problems in teams Showing initiative and independence in identifying problems and solving them Resolving customer concerns in relation to complex project issues Using mathematics, including budgeting and financial management, to solve problems Testing assumptions, taking the context of data and circumstances into account	Adapting to new situations – including changing work conditions Identifying opportunities not obvious to others Being creative Generating a range of options. Translating ideas into action	Managing time and priorities Collecting, analysing and organising information Identifying contingency situations Implementing contingency plans Being resourceful Allocating people and other resources to tasks Adapting resource allocations to cope with contingencies Participating in continuous improvement and planning processes Planning the use of resources including time management Developing a vision and a proactive plan to accompany it.	Evaluating and monitoring own performance Taking responsibility Having knowledge and confidence in own vision and goals Articulating own ideas and vision	Using a range of mediums to learn Applying learning to technical issues and operations Being open to new ideas and change Contributing to the learning community at the workplace	Having a range of basic IT skills Apply technology Having appropriate physical capacity Operating equipment Using IT to organise data Applying IT as a management tool

Adapted from DEST (2006)

In the **United States** (USA), the Accreditation Board for Engineering and Technology (ABET) identified the attributes of an engineer based on ABET Engineering Criteria 2000 in Criterion 3, Basic Level Accreditation Criteria**.** Program Outcomes in institution of higher educations help the engineering graduates to gain the employability skills. Engineering programs of the higher educations must demonstrate that their engineering graduates have following criteria listed in Table 7.

Table 7: ABET Engineering Criteria 2000

No.	Criteria
1	an ability to apply knowledge of mathematics, science and engineering
2	an ability to design and conduct experiments, as well as to analyse and interpret data
3	an ability to design a system, component, or process to meet desired needs
4	an understanding or professional and ethical responsibility
5	an ability to function on multidisciplinary teams
6	an ability to identify, formulate, and solve engineering problems
7	an ability to communicate effectively
8	the broad education necessary to understand the impact of engineering solutions in a global/societal context
9	a recognition of the need for and an ability to engage in lifelong learning
10	a knowledge of contemporary issues
11	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

In **Canada**, at early 1990s the Conference Board of Canada developed an Employability Skills Profile that identified the generic academic, personal management, and teamwork skills that are required, to varying degrees, in every job (Conference Board of Canada, 1992). Three main domains of employability skills were:

1. *Academic skills*: Those skills which provide the basic foundations to get, keep and progress on a job and to achieve the best results.
2. *Personal management*: The combination of skills, attitudes and behaviours required to get, keep and progress on a job and to achieve the best results.
3. *Teamwork skills*: Those skills needed to work with others on a job and to achieve the best results.

Adapted from http://www.calsca.com/conference_board.htm

Later, the Conference Board has developed another employability skill known as Essential Skills followed by Employability Skills 2000+ (Conference Board of Canada, 2000a). This enhanced framework including communication, problem solving, positive attitudes and behaviours, adaptability, working with others, and science, technology and mathematics skills and a new round of industry and education consultations. Employability Skills 2000+ are the critical skills needed in the workplace. Table 8 list the framework of Employability Skills 2000+ adapted from http://www.conferenceboard.ca/ Libraries/EDUC_PUBLIC/esp2000.sflb

Table 8: The Framework of Employability Skills 2000+

Employability Skills 2000+
The skills you need to enter, stay in, and progress in the world of work—whether you work on your own or as a part of a team.
These skills can also be applied and used beyond the workplace in a range of daily activities.

Fundamental Skills The skills needed as a base for further development	**Personal Management Skills** The personal skills, attitudes and behaviours that drive one's potential for growth	**Teamwork Skills** The skills and attributes needed to contribute productively
You will be better prepared to progress in the world of work when you can: **Communicate** • read and understand information presented in a variety of forms (e.g.,words, graphs, charts, diagrams) • write and speak so others pay attention and understand • listen and ask questions to understand and appreciate the points of view of others • share information using a range of information and communications technologies (e.g., voice, e-mail, computers) • use relevant scientific, technological and mathematical knowledge and skills to explain or clarify ideas **Manage Information** • locate, gather and organize information using appropriate technology and information systems • access, analyze and apply knowledge and skills from various disciplines (e.g., the arts, languages, science, technology, mathematics, social sciences, and the humanities) **Use Numbers** • decide what needs to be measured or calculated • observe and record data using appropriate methods, tools and technology • make estimates and verify calculations **Think & Solve Problems** • assess situations and identify problems • seek different points of view	*You will be able to offer yourself greater possibilities for achievement when you can:* **Demonstrate Positive Attitudes & Behaviours** • feel good about yourself and be confident • deal with people, problems and situations with honesty, integrity and personal ethics • recognize your own and other people's good efforts • take care of your personal health • show interest, initiative and effort **Be Responsible** • set goals and priorities balancing work and personal life • plan and manage time, money and other resources to achieve goals • assess, weigh and manage risk • be accountable for your actions and the actions of your group • be socially responsible and contribute to your community **Be Adaptable** • work independently or as a part of a team • carry out multiple tasks or projects • be innovative and resourceful: identify and suggest alternative ways to achieve goals and get the job done • be open and respond constructively to change • learn from your mistakes and accept feedback • cope with uncertainty **Learn Continuously** • be willing to continuously learn and grow • assess personal strengths and areas for development • set your own learning goals	*You will be better prepared to add value to the outcomes of a task, project or team when you can:* **Work with Others** • understand and work within the dynamics of a group • ensure that a team's purpose and objectives are clear • be flexible: respect, be open to and supportive of the thoughts, opinions and contributions of others in a group • recognize and respect people's diversity, individual differences and perspectives • accept and provide feedback in a constructive and considerate manner • contribute to a team by sharing information and expertise • lead or support when appropriate, motivating a group for high performance • understand the role of conflict in a group to reach solutions • manage and resolve conflict when appropriate **Participate in Projects & Tasks** • plan, design or carry out a project or task from start to finish with well-defined objectives and outcomes • develop a plan, seek feedback, test, revise and implement • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project • adapt to changing requirements and information • continuously monitor the success of a project or task and identify ways to improve

and evaluate them based on facts • recognize the human, interpersonal, technical, scientific and mathematical dimensions of a problem • identify the root cause of a problem • be creative and innovative in exploring possible solutions • readily use science, technology and mathematics as ways to think, gain and share knowledge, solve problems and make decisions • evaluate solutions to make recommendations or decisions • implement solutions • check to see if a solution works, and act on opportunities for improvement	• identify and access learning sources and opportunities • plan for and achieve your learning goals **Work Safely** • be aware of personal and group health and safety practices and procedures, and act in accordance with these	 255 Smyth Road, Ottawa ON K1H 8M7 Canada *Tel.* (613) 526-3280 *Fax* (613) 526-4857 *Internet*: www.conferenceboard.ca/education

Adapted from http://www.conferenceboard.ca/Libraries/EDUC_PUBLIC/esp2000.sflb

In **Europe** countries such as Germany, Austria, France, Sweden, others European Union (EU) and other Europe countries have developed skills models known as key skills, transferable skills and generic skills (DEST. 2002a). Generic employability skills are known as key skills in Germany and Austria or transferable or broad skills in France (ACER. 2002). The European Employment Strategy at the Luxemburg Summit in 1997 had taken seriously on employability skill development (Gazier, 2006). The European Round Table of Industrialists and the Union of Industrial and Employers' Confederations of Europe agreed on the concept of generic employability skills. The concept of generic employability skills replaced the concept of employment means that the emphasis is more on the adaptability and initiatives of individuals and groups rather than looking for security and stability in employment and income (ACER. 2002). Table 9 list generic employability skills proposed by The European Round Table of Industrialists (ERT).

Table 9: Generic employability skills proposed by The European Round Table of Industrialists (ERT)

No	Skills	Description
1	Mastery of one's native language	Including the basics of spelling and sentence structure
2	Understanding of the basics of maths and science	Particularly to cope with new technology
3	Critical thinking	Ability to think through a problem or situation, distinguishing between facts and prejudices
4	Learning techniques	Ability to pick up new skills and adapting to new situations
5	Team spirit	Ability to work in a group
6	Personal discipline	Sense of responsibility
7	Decision making	sense of commitment and willingness to take risks;
8	Initiative	Sense of Curiosity and creativity
9	Professionalism	Sense of achieving excellence ang gaining competitive edge
10	Civic mindedness	Sense of service to the community

Source: ACER. 2002

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."(Hiroyuki, 2004). 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 looking for 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."(Hideo, 2004).

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 (2005), 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 (2004), the "engineering ethics and enhancement of communication capability" is another new skills required in Japan. Nguyen (2005) reviewed a study by Chino (2003) which reported a list of 20 required "employable attributes" of graduates. On the other hand, Nguyen (2005) 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 group had listed (see Table 10) the "employable personal qualities" according to the importance of each "personal qualities". It indicates that *communication skills*, *responsibility* and *initiative* were among the employers' most required personal qualities in potential employees. Table 11 shows a finding on the engineering student's perception of the important employable personal qualities, surveyed by Nguyen (2005).

Table 10: 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 abalanced personality
8	Self-assessment skills		An entrepreneurial mind

Sources: Nguyen (2005)

Table 11: The engineering student's perceptions of the importance of employable personal qualities

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

Sources: Nguyen (2005)

A survey by Nguyen (2005) on engineering student's perception of the importance of employable personal qualities indicates a small number of differences from the employers' requirement. However, they both agreed that "communication skills, responsibility and initiative" are important personal qualities to Japanese graduates.

In **Malaysia**, employers and leading engineers agreed that local Institutes of Higher Education engineering graduates lack of oral and written communication skills (MOHE, 2006). These skills are very important for engineers and new engineers since it will help them in their professional career. The Employability Skills Framework developed through the research listed ten (10) most important generic skills acquired by the engineering graduates. The skills are based on criteria emphasizes for professional skills from the Accreditation of Engineering Programmes (EAC) Manual. The summary of the findings on engineering graduates skills is given as in Table 12 according to it priority.

Table 12: Engineering Employability Skills developed by Malaysian Ministry of Higher Education

No	Skills	Description
1	Engineering system approach	the ability to utilize a systems approach to design and evaluate operational performance.
2	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 .
3	Apply knowledge of science and engineering principles	the ability to acquire and apply knowledge of engineering fundamentals
4	Competent in application and practice	the ability to use the techniques, skills, and modern engineering tools
5	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.
6	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
7	Lifelong learning	the ability to recognize the need to undertake life long learning, and possessing / acquiring the capacity to do so.
8	Competent in specific engineering discipline	the ability to acquire in-depth technical competence in a specific engineering discipline
9	Engineering problem solving and decision making skills	the ability to undertake problem identification, apply problem solving, formulation and solutions.
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.

Adapted MOHE "*The Future of Engineering Education In Malaysia*"(2006)

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 the job. Engineering graduates nowadays have to compete harder for the best position in an industry, as the number of graduates continuously increased. Engineering graduates worldwide are urged to possess certain employability skills. The 5 most similar skills across continental are *communication skills, teamwork, lifelong learning, problem solving* and *professionalism*. The Employability Skills Framework identified by those seven (7) countries shows a number of similarities and differences of the employability skills needed in entry-level engineering graduates. Table 13 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 listed out according to most similar skills that required for new engineers by all seven countries. The list shows these seven countries are agreed that there are five (5) most important employability skills required for engineers: *communication skills, teamwork, lifelong learning, problem solving* and *professionalism*. Surprisingly, professionalism is considered very important for an engineer. The other four (4) skills are well expected to be very important for engineering graduates to have it.

Table 13: Similarity of Employability Skills for Engineers by Country

United Kingdom (Engineering Criteria)	**Engineers Australian Attributes**	**United States (ABET Engineering Criteria 2000)**	**Canada Employability Skill 2000+**	**Japan**	**Europe (EU)**	**Malaysia**
Written communication, listening, questioning.	Communication	Ability to communicate effectively	Communicate	Communication skills	Mastery of one's native language	Communication effectively
Working with others, teamwork.	Teamwork	Ability to function on multidisciplinary teams	Work with Others Participate in Projects & Tasks	Inter-personal skills	Team spirit	Interpersonal or teamworking skills
Life long Learning, personal development ,organisational sensitivity.	Learning	A recognition of the need for and an ability to engage in lifelong learning	Learn Continuously	Self-learning ability	Learning techniques	Lifelong learning
Professional expertise.	Understanding of professional and ethical responsibilities, and commitment to them.	An understanding of professional and ethical responsibility	Demonstrate Positive Attitudes& Behaviours	Mental toughness	Professionalism	Understand professional , social and ethical responsibilities
Analysis, judgement, attention to detail and decisiveness.		Ability to identify, formulate, and solve engineering problems	Think & Solve Problems	Cognitive ability/ concept-making ability	Decision making	Engineering problem solving and decision making skills
Technical ability, technical knowledge.		Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	Be Adaptable	Response to changes	Critical thinking	Competent in application and practice.
Leadership		Ability to design a system, component, or process to meet desired needs	Be Responsible	Self-sufficiency and self enhancement	Personal discipline	Competent in specific engineering discipline
Process operation.	Professional attitudes	The broad education necessary to understand the impact of engineering solutions in a global/societal context	Work Safely		Civic mindedness	Engineering system approach
Planning and organising.	Manage information and documentation	Ability to design and conduct	Manage Information	Organizing and running an		

		experiments, as well as to analyse and interpret data		organization		
Creativity, initiative, achievement orientation, adaptability/ flexibility	Initiative, creativity and innovation				Initiative	Apply knowledge of science and engineering principles
		Ability to apply knowledge of mathematics, science and engineering	Use Numbers		Understanding of the basics of maths and science	
Organisational understanding, commercial awareness, financial awareness.		A knowledge of contemporary issues				Knowledge of contemporary issues

Source : Kubler B. and, P. (2004);DEST (2007); ABET Engineering Criteria 2000 (1998); Nguyen (2005); MOHE (2006)

It is suggested to prepare the graduates for the world of tomorrow, higher education must employ appropriate learning tools to the latest learning science and technology. Preparing programme to develop those employability skills into students profiles' certainly requires proper planning and preparation. Higher educations need to work more than ever to produce the most marketable and employable engineering graduates and have them to stay competitive. Higher education that serious on their students' employability and marketability can help to strengthen their graduates' 'work-readiness' by assisting the students to gain the employability skill and to be able to apply knowledge in practical and theory especially in the workplace.

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