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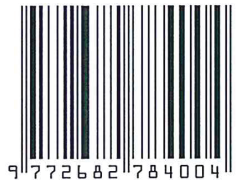

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Employability Skill Among Engineering Graduate In Malaysia

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ABSTRACT

The general perception of an engineer's role is limited to acquiring suitable skills to be employ along with knowledge of science and mathematics. However, the workplace has changed by globalization and most engineers need to work in a multi-disciplinary environment. This paper would like to look forward of engineering employability skills by comparing few countries which are Malaysia, Japan, India, United State and Singapore. There few several employability skills were point out and acquire for an engineer which are communication skills, teamwork skill, problem solving skill and interdependent skills. This study also not only beneficial for graduates and higher education as references to develop academia curriculum but also develop graduate employability skill in their self in obtain job.

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1. Introduction

The role of universities in the emerging of knowledge is very significant and diverse. Universities that collaborate with companies are always seen higher productivity rates compare to universities that not collaborate (Salleh & Omar, 2015). Successful university-industry collaboration needs to support the mission and motivation of each partner. Typically, universities have three overlapping obligations; teaching, research and outreach. The third aspect which involves connecting university activities with society is serious and comprehensively. This requires the need for industrial-university relations aimed at promoting the contribution of university contributions to the socio-economic development.

For universities, collaborate with industry can improve their teaching, access to funding, reputation enhancement and access to empirical data from industry. While for industry, the collaboration with university can access to complementary technical knowledge, tapping into a pool of skilled workers, gain access to equipment and influence the research agenda in universities Guimón, (2013).

Several researchers have discussed university industry collaboration in different perspective on various of types, scopes and category. This paper provides an overview of the few relevant research and contribute to the existing literature on category of university-industry collaboration in Malaysia.

2. Literature Review

University Industry Collaboration Category

Santoro and Gopalakrishnan (2000) suggested there are 3 classifications for university industry collaboration, including: (1) research and development support (2) knowledge transfer such as hiring expertise in personal interaction with institutions in collaboration programs and (3) technology transfer such as product development and commercialization activities through the university's research centre.

Arthur	Category		
	Research and development support	Technology and knowledge transfer	Graduate employability
Lind et al. (2013);	X		
Poyago-Theotokyet al., (2002);	X		
Striukova, L., & Rayna, T, (2015);	X		
Plewa et al., (2013);	X		
Thune, (2011);	X		
Joshua, (2015)	X		
Mansor et al., (2015);	X		
Rast et al., (2012)	X		
Saad & Haron, (2013)	X		
Kondo, M. (2011)		X	
Chandran et al., (2013);		X	
Ahrweiler et al., (2011);		X	
Rossi, F. (2010)		X	
Ramli, F et.al; (2013);		X	
Salleh, M. S., & Omar, M. Z. (2015)		X	
Ishengoma, E., & Vaaland, T. I., (2016)			X
Pellegrin & Hilton, (2012)			X
Tran, (2016)			X
Rosenberg et al., (2012);			X

Research and development (R&D)

From table shows the previous research studied on industry-university collaboration studied in different perspectives and category. Lind et al. (2013) differentiating UIC forms in R&D as the research process leads to creation or product improvement. Industry-university relations can also be classified as industry-pull such as contract research and university-push such as spin-outs distinguish forms of UIC in R&D when research process is towards creating or improving product. (Poyago-Theotokyet al., 2002; Striukova & Rayna 2015)

Other than that, Plewa et al., (2013) discus on the UIC factors on R&D category. The factors are people, communication, trust and understanding. They claim that general drivers in collaboration need to reflect variations in the nature of these factors. Trust was the main among other factors of collaboration between partners (Thune, 2011; Barnes et al., 2002) because of joint research risk, less familiar with universities, industry and environmental culture. Consistent communication for the development of a general knowledge platform and an understanding of

their respective objectives creates the basis for an efficacious UIC (Thune, 2011). For instance, the development phase requires extensive communication in face-to-face and thus a great time investment by the person can slowly generate (Ford, 1982). It is to assure both parties involved in the engagement understanding.

While Mansor et al., (2015) stress out the main activity in R&D through contract research, consultancy and commercialization. One example of a consultation is to hiring a senior or faculty member to negotiate during their leisure time to work outside the university (Rast et al., 2012). R&D contracts undertaken by the research centre followed by contracts made between research centres and firms can obtain funds from time to time. This is because most of the time the university provides the brain in completing the quest for a certain period of time (Lee, 2004). Meanwhile, to commercialize the invention, it should be presented by the industry as a potential licensee (Joshua, 2015).

Several studies investigate factors and drivers for the engaging industry at the university's research center (Plewa et al., 2013; Lawrence 2007), program on both party (Frida, 2013) while other research centres on mechanism (Mansora et al., 2015; Rast, Khabiri, & Amat, 2012). There are also studies that discuss on issue between university and industry of R&D (Jauhari,2013)

Technology and knowledge transfer.

Next category is technology transfer. It can take many forms occurs via several different area of technology. Kondo (2011) point out that UIC can be specific in technology field, such as biotechnology, microelectronics and university science parks (Siegelet al., 2003). Some of area have been studied rather extensively in university patenting of technology and licensing (Thursby and Thursby, 2002; Baldini, 2010). Several studies have been devoted to and academic spin-off activities (Gubeli & Doloreux, 2005; DiGregorio & Shane, 2003;)

The role of the university is more focused in the context of the national innovation system. Where collaborative links between universities and industries are seen as reciprocal in knowledge and technologies for industry and universities (Chandran et al., 2013). However, there are still many areas of product development and advanced technology to be developed countries that Malaysia needs to grow.

Researchers have noted that apart from significant technology and R & D collaboration, intangible contextual factors consist of the implicit knowledge transfer and interacting learning. It can be formal and informal (Ahrweiler et al.,2011). Formal engagement can be a joint publication and joint review. On the other hand, activities for example meetings, mutual attending lectures and joint conferences, email communications can be regarded as informal relationships in the transfer of advanced knowledge.

Previous study has revealed the efficiency knowledge transfer be influenced by five dimensions which are transfer agent, recipient, media, object and environment. Even they are five dimensions but the strongest one was the agents who are involve in the knowledge transfer and the implement in this context are academic researchers, university departments and firms (Bozeman, 2000)

Other than that, the level and features of the process in knowledge transfer can be influenced by the company's ability and the willingness to engage also play the role for a success of knowledge transfer (Rossi, 2010). As well the universities by doing a broader legal and economic environment such as industry. The university can get extra incentive by do knowledge transfer with industry in creating a new and fresh education in future.

For instance, Rossi (2010) show that the involvement of industry to department are a positive function to the international publications, and scientific reputation, while DiGregorio and Shane (2003) suggesting the development of intellectuals play an important role in the university's ability to exploit commercial research. In the study of Italian institution, show that productivity in the consultancy activity has a positive relationship in knowledge transfer (Bonaccorsi & Daraio, (2002)

Graduate employability

The third categories are UIC towards graduate employability. There are researchers who argue about the gap of employability skills on different foot of industry and university stakeholders (Chris, 2015). They said that the university has failed to provide the necessary skills for graduate employment in an increasingly complex and competitive economy. There are claim that industry itself does not come out their own list their skills requirements clearly to the higher education area and the industry has its own responsibility to train graduates for the sector (Rosenberg et al., 2012)

Thus, it attracted attention Pellegrino and Hilton, (2012); Tran, (2016); Ishengoma and Vaaland, (2016) that there was a lack of ties between academic, industry and students in producing employability skills. The biggest challenge that needs solutions related to the different perspective used by each stakeholder group to explain their skills and applications (Pellegrino and Hilton, 2012). Understand on how the skills defined and useful in the industry are an important step in building skills in each stakeholder.

Mbah (2014) emphasizes inadequate student counselling that leads students to choose the wrong academic programs related to market demand. There are also related less programs, courses and subjects required by potential employers to generate skills requests (Ishengoma & Vaaland, 2016). This gap between the characteristics of students offered after years in university learning domains, and work-life requests, can be reduced by UIC. Indirect gaps can be reduced through collaboration with identifying skill requests and gaps to be further reduced to knowingly how collaborative activities and factors are needed to strengthen skills more. Ishengoma and Vaaland, (2016) stated that there is a need for collaborative training and educational, consultative and research activities as well as research activities.

2.1 University and Industry Category Context In Malaysia

In Malaysia, Industry-university collaboration, especially through research and development (R&D) outcomes, have been widely in the national science and technology policy agenda since the mid-1990s (Saad & Haron, 2013). The industrial collaboration is seen as the source of motivation and knowledge for R&D development in universities as mainly commercialization purposes. Companies that collaborate also enjoy greater benefit in terms of research and developments R&D and are able to produce quality products at a competitive cost.

The action plan for Industrial Technology Development was started since 1990, the government launched the Malaysian Technology Development Corporation, the Government High Technology, the Intensification of Research in Priority Areas Grant and a number of other organization to support university industry collaboration among other things (Salleh & Omar, 2015).

Mansor et al., (2015) studied in UTM that specified in research university on R&D show that the most popular modes collaboration was training and industrial training. Follow by consultancy, research and lastly commercialization. While studied in Rast et al., (2012) mentioned the collaboration industry and university in R&D has identify the success criteria of university-industry collaborative research and technological initiative as perceived by academics. Five type of research collaboration mechanisms has been highlight which are; Consultancy and Technical Services Provision, Cooperative R&D Agreement, Licensing, Contract Research, and Spin-off Companies. They also have proposed framework on university and industry in R&D category.

Other than that, Malaysia also enhance the policy and programs in collaboration university and industry for upskilling graduate employability in reduce labor market skill mismatched. The ambitious reforms are already underway to improve collaboration between industry and tertiary educators to align curricula to industry specifications and internationally recognised qualifications, while also increasing opportunities for work placements during and after the completion of studies.

The role of TalentCorp in providing policy oversight for Malaysia's development and sourcing of demand-driven skills is also increasingly important to reduce labour market skills mismatches. Moreover, the 1Malaysia Training Scheme (SL1M) has enhanced graduates' employability through collaboration with government-linked and private sector companies to provide soft skills training and industry placement. These reforms will help address short-term skills mismatches in human capital development but one must not lose sight of longer-term development goals.

In 2012, Malaysian government launched the Graduate Employability Blueprint (GEB) for 2012-2017. The GEB aims to boost the level of graduate employability as well as to fulfil the need to professional and skilled manpower toward national development (Salleh & Omar, 2015). This plan would represent a paradigm shift in confronting the issues of graduate marketability in the country. several programs on graduate employability and marketability have been conducted including the Industry Centre of Excellence (ICoE) in collaboration with universities and industry.

3. Findings

In Malaysia, the category of R&D in university industry collaboration has the most researcher study compare to other category. Out of 20 literatures, 9 of them were research in R&D followed by 6 were in technology and knowledge transfer then others in graduate employability. Most of the R&D research are doing in research university(RU) since RU contribute in discovery new ideas and advancement of knowledge in applied sciences, focusing on high impact and innovation research. RU also strive harder in improve their ranking amongst the leading university in the world.

The research is not having overview from industry part in the result. There also research that propose a conceptual model for university industry collaboration in category R&D. The model contain consultancy, commercialization, contract research and innovation R&D as their characteristic. Even there are many initiative of university industry collaboration in improve the

demand skill among graduate employability but there are none of study in Malaysia in university industry collaboration towards graduate employability.

4. Discussion and Conclusion

Over the last decade, literature has shown that there are different ways for university industry interactions to occur. This study presents the status of university-industry interactions in Malaysia from the perspective of academics. Research and development, graduate employability and knowledge transfer were the three different mechanisms for university industry collaboration has been categorized. Among these, R&D are the most popular category of university industry collaboration. Moreover, there were various type of activity in university industry collaboration including conference, student internship/ staff attachment, appointment of industry advisory panel (IAP), appointment of adjunct from industry. Among them, student internship the most popular activity in Malaysia.

However, discussions on the need to close university industry to upgrade graduates' employability appear as a result of the government and employment-intentions for universities but there are none of study in Malaysia. To understand the growing demands of the industry around the graduate skills, it required in increasingly intensive industrial involvement of knowledge to learn especially in Malaysia. The needed to study in upgrade graduate skill between university industry recently emerged as a result of government pressure and job-seeker interest for university applicants. Other than that, the same research needs to be carried out not only in research universities but other public or private university to see if there are similarities. In addition, it is suggested that future research explore including of industrial part.

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