

EFFECTS OF INDUSTRIAL TRAINING PROGRAMMES ON COMPETENCIES OF ENGINEERING GRADUATES: A PRELIMINARY STUDY

Aini Najwa Azmi^{a*}, Yusri Kamin^a, Muhammad Khair Noordin^a and Ahmad Nabil Md. Nasir^a

^a*Department of Technical and Engineering Education, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia*

*Corresponding author aininajwa.azmi@gmail.com

Received: 15 May 2018
Received in revised form: 14 December 2018
Accepted: 25 December 2018
Published : 30 April 2019

Abstract

Based on previous reports, there are complaints from industries that our engineering graduates lack in non-technical skills. The engineers that are freshly entered the industry are not industry-ready due to lack of required non-technical skills. One of the reason is when they are still undergraduates, they receive minimum industry exposure during their industrial training. Furthermore, most of them have less industry experience and non-technical that is expected by today's industry. Unfortunately, some students undergo industrial training to the industry which is not relevance to what they are studied before. This problem contributes to unemployment issue among engineering fresh graduates. This paper presents a study on sixteen engineering graduates from various public universities in Malaysia on effects of industrial training programme to them. A semi-structured interview was used to gain data from the respondents. The results reveal that 90% of respondents which underwent only 2.5 to 3 months of industrial training did not satisfy with the short duration of training. In addition, 43.75% of them claimed that the industries that they had been placed are not related to their courses.

Keywords: non-technical skills, Industry Revolution 4.0 (IR 4.0), Education 4.0, higher education, industrial training

© 2019 Penerbit UTM Press. All rights reserved

1.0 INTRODUCTION

In the era of IR 4.0, employers demand fresh engineers with highly creative and critical thinking. It will become to university responsible to fully switched from Education 3.0 to Education 4.0 (Benešová & Tupa, 2017). Graduates must be innovative and able to possess at least basic entrepreneurial skills and have cognitive flexibility to deal with complexity. Graduates must be able to work not only with human but also with robots. The need for better communication and collaborative skills are still important regardless of revolutions and will be far more important than ever. In addition, graduates must acquire self-learning skills to remain relevant in the era of rapid changes (Harkins, 2008). IR 4.0 require human capital with adequate digital and data literacy. In order to achieve these, a collaboration between university and industry is a must to come up with new interdisciplinary program.

Employers always expect a new employee with multi-skills include hard skills and soft skills. Hard skills include technical skills while soft skills include problem solving, communication skill especially in English, able to work in team, high self-esteem and more. There are a lot of criteria of employability skills will be discussed in this research. Many previous researchers reported that fresh graduates are always lack of these three criteria (Husain et al., 2013; Muhammad Khair & et al, 2016.; Rasul, Amnah, Rauf, Sulong, & Mansor, 2012). This will be a very huge challenge to public universities in Malaysia in preparing a standard curriculum to produce graduates with specialized skills to undergo employment in the industries. Collaboration between university and industry will be one of the solutions in this research. Although it is not new in Malaysia, but a very specific new framework will be built to create a flow that can be referred by many parties to increase the employability skills among fresh graduates, yet the unemployment issue can be slowly vanished. This framework will be a platform for students in understanding their potential, the working field experiences and able to increase their specific skills.

Malaysia Education Blueprint-Higher Education (2013-2025) (Malaysia Education Blueprint, 2013) showed the increasing of 70% of student enrolment in universities over ten years to 1.1 million students and 30% of enrolments at higher institution by Ministry of Higher Education such as higher institution, community colleges and polytechnics. These data reflect an increase six-time enrolment for bachelor's degree programs in the period of 1990 to 2010 by the year 2020. However, the amount of highly educated workforce in the job market is only 25% where there is still shortage of 4% based on the average 27.4% which is already set to achieve a high-income country. Compared with countries such as Singapore, Korea, Finland, United States, Australia and the United Kingdom have exceeded the average of having highly educated workforce (Mahmud, Ahmad, Marzuki, & Ahmad, 2016). Malaysia and Hong Kong still showing a gap between 4 to 5% which have not yet reached the stage of workforces which are knowledgeable and highly skilled. This situation can be explained on how these shortages need to be solved even universities and other institutions have produced many graduates every year. Based on these trends, the job market is still requiring a highly educated workforce.

To develop students' skills, industrial training program is an academic curriculum in higher education institutions that are compulsory for engineering students to undergo. This training is an opportunity for undergraduate students to incorporate work-related

experience and knowledge into their formal education in a university by taking part in supervised and planned work in real-world professional environments (Renganathan, Ambri, Abdul, & Li, 2013). Industrial training program can develop students' technical and non-technical skills, good work ethics. Industrial training is a platform for students to gain confidence and face challenges at work such as teamwork, working under pressure and dealing with people from all levels of the organization (Pillai, Khan, Syahirah, & Raphael, 2012). Through industrial training, students can expose themselves to be as potential future employers, develop real workplace skills and gain a lot of work experience.

Students can get exposed to an actual work life through industrial training and it aims to connect the gap between theory and practice. Generally, all industries in Malaysia, regardless local or international, they give continuous support in providing both technical and financial supports in term of machines and monthly pay to all trainees who undergoing industrial training in their company. Based on review done by the research across universities in Malaysia regarding to their industrial training management, students have their own opportunity to choose the industries that are related to the student's program. Sometimes, students like to choose companies that near to their residents. While training, students need to show good ethics, willing and passionate to learn new knowledge and skills and also independent. Industrial training usually has durations between 10 weeks to eight months, students are able to learn all knowledge and skills such as communication skills, management, working with different levels of people in organization such as supervisor, colleagues and clients (Rodzalan & Saat, 2012). All these skills or competencies can enhance students' employability (Mason, Williams, & Cranmer, 2009). Industrial training can provide effectively in developing technical and non-technical skills that demanded by the industry (Renganathan et al., 2013). This happens when they are still pursuing their study. Thus, they are career readied once they are graduated. In addition, (Bhurtun, Jahmeerbacus, Oolun, & Feliachi, 1999) stated that who were study about industrial training for Electrical and Electronics students, not all engineering practice can be learned in classroom, but they must undergo to real industry to learn the actual engineering practices.

Almost all of universities and higher learning institution offer industrial training for their students, the aims and objectives are difference based on institution itself. Yet, the main objective of industrial training is to give the opportunity for undergraduates to experience practical knowledge through hands-on in real industry environments before their study ends (Pillai et al., 2012; Renganathan et al., 2013). In general, industrial training is the platform for student to bridge between knowledge in the lecture and real-work environment (Pillai et al., 2012). In addition, classroom inputs are usually uniform for all students whereas during industrial training, the learning environment differs for each student (Agarwal and Gupta, 2008).

■ 2.0 LITERATURE REVIEW

Fresh graduates step out from universities to the industries with hopes of getting employed with their dream job. With degree scroll in hand, most expect to get a job as soon as they graduate. However, an analysis of the recent past studies (Ismail, 2012; Malhi, 2008; Rasul et al., 2012; Rauf, Mansor, Yasin, & Mahamod, 2013; Zaharim, Yusoff, Omar, & Basri, 2010) on job market and graduate employment trend has clearly indicated that graduate unemployment appears to be an impending problem. Malaysia Labour Force Survey defines the unemployed is a person who are free for work but did not work during a reference period. He or she could actively search for a job or even not. However, graduates who are pursuing their study are not included in this situation (Rahim & Mohd Lajin, 2015; Malaysia Labor Force, 2011).

Furthermore, unemployment issue in Malaysia is always reflected to the system of high education in order to produce graduates that meet the industries expectation. Although there is improvement done in the education system, there is still received a lots of complaint from the employers (Ismail, 2012). According to National Economy Action Board (MTEN), there are five factors that employers search for a new employees which are lack of skills and work experiences, mismatch between student qualification and industrial needs, lack of communication skills especially in English, negative thinking of some graduates towards job vacancies and lack of awareness to the existence of various job vacancies (Ismail, 2012). Factors that influence graduates' successful transition into industries is needed to be critically understood. This is important to decrease the percentage of graduated who are overqualified for their jobs and to make sure the industry's demands of an employee is fully fulfilled in the 21st century knowledge-based economy (Finch, Hamilton, Baldwin, & Zehner, 2013). It is also clarified that there is a loophole in the university's curriculum which unable to produce future employees with technical and non-technical skills that demanded by industries (Finch et al., 2013). Industrial training is an important part of university's curriculum that must be undergone by students upon graduation.

A university should have a well-organized structure of industrial training. This is very important to make sure students can gain the maximum workplace skills and experience which are essential in their future career. As mentioned by Shariff and Muhammad, (2010), many related stakeholders such as students, universities and industries can get benefits from industrial training. Singh, (2005) stated that these stakeholders are the important roles in order to create holistic graduated to be employed in the competitive industries. As students, the objectives of industrial training must be fully understood. This opportunity should be used by student to gain the most experience, skills and knowledge from industries. In addition, the theory learn in the lecture can be related to the practices in the industry. During industrial training, students should give full commitment, actively interact with colleagues and observation to gain the most knowledge and experience (Phang, Yusof, Saat, & Yusof, 2014). As discussed before, today's industries are demanding for an employee with all required skills. Thus, industrial training can be the platform. The goals and objectives can be achieved by establishing a standard structure of industrial training. To avoid mismatching, industries are expected to afford appropriate task with the field of students' courses. As conclusion, the training scopes and structure should be clearly defined by universities and must be synchronized in the industries.

A preliminary study is done to investigate the electrical engineering students' perception of industrial training program that is one of academic curriculum in higher institutions in Malaysia. There are a lot of proofs show that lack of non-technical skill among engineering graduates that lead to unemployment issue. To be an engineer in 21st century era, he or she should be able to apply engineering knowledge, possess strong analytical skills, practical ingenuity, practical ingenuity, creativity, good communication skills, leadership, ethical and life-long learning (Samsuri, Mohd Yusof, & Abdul Aziz, 2017).

3.0 METHODOLOGY

A preliminary study is done to find the opinion of sixteen engineers that have underwent industrial training during their undergraduate period. A semi-structured interview was done followed by thematic analysis. The participants chosen are graduated from various public universities in Malaysia in Electrical Engineering based on purposive sampling. These include Universiti Teknologi Malaysia (UTM), Universiti Teknologi Mara (UiTM), Universiti Malaysia Perlis (UNIMAP), Universiti Malaysia Sarawak (UNIMAS) and Universiti Islam Antarabangsa Malaysia (UIAM). Table 1 is describing the demography characteristics of the respondents. The structure of industrial training program is different based on universities.

Table 1 Demography Characteristics of the Participants

<i>Respondent</i>	<i>Gender</i>	<i>University</i>	<i>Training Duration</i>	<i>Current Position</i>
<i>Respondent 1</i>	Female	UTM	2.5 months	Engineer
<i>Respondent 2</i>	Female	UTM	2.5 months	Engineer
<i>Respondent 3</i>	Female	UNIMAP	6 months	Engineer
<i>Respondent 4</i>	Female	UiTM	3 months	Engineer
<i>Respondent 5</i>	Female	UIAM	3 months	Engineer
<i>Respondent 6</i>	Male	UNIMAP	6 months	Engineer
<i>Respondent 7</i>	Female	UNIMAS	3 months	Engineer
<i>Respondent 8</i>	Male	UNIMAP	6 months	Engineer
<i>Respondent 9</i>	Female	UIAM	3 months	Engineer
<i>Respondent 10</i>	Female	UNIMAP	6 months	Engineer
<i>Respondent 11</i>	Female	UNIMAP	6 months	Engineer
<i>Respondent 12</i>	Female	UTM	2.5 months	Engineer
<i>Respondent 13</i>	Male	UTM	2.5 months	Engineer
<i>Respondent 14</i>	Female	UTM	2.5 months	Engineer
<i>Respondent 15</i>	Male	UTM	2.5 months	Engineer
<i>Respondent 16</i>	Male	UTEM	6 months	Engineer

4.0 FINDINGS

Based on Table 1, it can be seen that UNIMAP and UTEM are public universities that provide six months industrial training program to their engineering students. The rest of public universities are providing in between 2.5 to 3 months of industrial training program to their engineering students. The difference of duration gave difference perspectives among them. All five respondents from UNIMAP and one from UTEM were satisfied with the industrial training duration given to them. Based on them, six months or one semester industrial training program duration is an optimum duration that is suitable for a student to learn technical, non-technical and to gain the most working experience. On the other hands, 90% of respondents which underwent only 2.5 to 3 months of industrial training did not satisfy with the short duration. Most of the respondents claimed that they need more time to learn in each department since there are quite a number of departments in an industry. Based on one respondent graduated from UTM, she said that the industrial training program shall targeting students to expose to real working environment to gain real industry experiences. This is important to prepare their mental and physical to real industry pressure that they would face once they walk in to the industries.

While doing industrial training, 100% students expect to be exposed to real workplace especially in the industries. This will be the start point of working life for every engineering students. In terms of objectives achievement, the result revealed is very close related to duration of industrial training itself. For respondents who underwent 6 months industrial training program, they were fully claimed that they were achieved the objectives that they had been expected. On the other hand, two respondents who underwent 2.5 to 3 months duration of industrial training program said that they had achieved the objectives that they had expected. The rest claimed the objectives is not fully achieved due to time constraint. Based on N. A. Yusof, Mohd Fauzi, Zainul Abidin, & Awang, (2013), their study on employers regarding to graduates' employability through industrial training suggested that the duration of industrial training was too short and should be extended to 6 months for the training to be beneficial to the students. The shorter duration was not viable for practitioners to let the trainee handle a project more comprehensively; a longer duration would give the student more time to explore and experience working on the construction site. The extended time would help the students use and extend their knowledge and help them to gain maturity in decision making processes. In addition, in a study done by (Phang et al., 2014) supports this statement where they revealed in their correlational analysis that the longer duration of industrial training, the higher readiness and future career development among the engineering graduates. This may indicate that duration of industrial training should be lengthen since most of public universities in Malaysia only offers 10-12 weeks of industrial training program to their students.

Mismatching skill while doing industrial training occurs when there is no relevance between industries and courses of the students are taken. This can lead to considerable frustration among students who are likely to feel that they are not learning the required job-specific and general job skills during their industrial training (Pillai et al., 2012). Based on preliminary study to 16 respondents that came from various public universities in Malaysia, 43.75% of them claimed that the industries that they had been placed are not related to their courses. This number quite huge in a small sample. A statement from a respondent who underwent 2.5 months of industrial training said that most of knowledge gain in the university was not useful in the industry that shows a huge gap between theory and practice. However, it did beneficial in gaining non-technical skills such as communication skills which is very essential for any industry. Another respondent claimed that the objectives that he hoped for his industrial training did not achieved due to mismatching skill. For him, industrial training should prepare student to the workplace of student's interest. Therefore, universities should not impose limitation on preferred company to the students. As a result, he was not fully prepared and need to learn a lot of crucial skills in the workplace which should easily covered while industrial training with related industries

5.0 DISCUSSION AND CONCLUSION

Most of respondents thought that industrial training program is a platform for them to develop all skills such as technical skills and non-technical skills and definitely to gain as much as work experience as they could. Besides, one of respondent said that a student could have a chance to be shone in the industry and eventually get employed after graduated. With limited time given to the students, the objectives cannot be fully achieved as some employers did not treat students seriously as some task or project may need more than three months to be completed. As a result, they opt out students to get involve with critical project but only assign with simple or a very basic task that would not able to build engineering skills in the students. One of respondent said that industrial training shall not only viewed as part as curriculum needs, as it is a very useful tools to prepare students with knowledge, skills and experiences thus producing more competence engineers to the industries.

Based on this preliminary result, there are some hiccups in the structure on industrial training program that can be looked closer and deeper to correct it. Besides duration, mismatching skills and unsatisfied objectives achievement among respondents, there is one more hiccup that can be seen. It is students' placement in the industries. Most students faced this problem in finding industries that related to their course. Based on Mat et al., (2011), Method of Industrial Training Placement (SMPLAI) is being used in Universiti Kebangsaan Malaysia (UKM) to help student to find the industrial training placement. However, this method only covers 51% of students and the rest get their placement by their own initiatives. This system can be improved and can be used in all public universities in Malaysia. Thus, students will not face this problem anymore.

In a university's curriculum structure, it integrates knowledge, work experience, human skill, and technical skill is needed to ensure that universities produce graduates with excellent qualification (Osman et al., 2016). In order to meet this requirement, industrial training program has become an important component in preparing students at the university level. As stated by Jainudin, Francis, Tawie, & Matarul, (2015), industry exposure that related to professional practices and industries culture should be given to the engineering students as supplements the disciplinary knowledge in their future career. Thus, it is important for the universities to have a new improved framework to assure the objectives of industrial training are achieved in developing skills in students. It was critical in a study done by (Phang et al., 2014) when engineering students had thoughts that industrial training failed in giving them confidence that they should obtain while training

References

- Benešová, A., & Tupa, J. (2017). Requirements for Education and Qualification of People in Industry 4.0. *Procedia Manufacturing*, 11(June), 2195–2202.
- Bhurlun, C., Jahmeerbacus, I., Oolun, K., & Feliachi, A. (1999). Short-term practical training for electrical engineering undergraduates. *IEEE Transactions on Education*, 42(2), 109–113.
- Finch, D., Hamilton, L., Baldwin, R., & Zehner, M. (2013). An Exploratory Study of Factors Affecting Undergraduate Employability. *Education + Training*, 55(7), 681–704.
- Harkins, A. M. (2008). Leapfrog Principles and Practices: Core Components of Education 3.0 and 4.0. *Future Research Quality*, 24(1), 19–31.
- Husain, M. Y., Rasul, M. S., Mustapha, R., Malik, S. A., Amnah, R., & Rauf, A. (2013). *Jurnal Teknologi Full paper Tahap Kemahiran Employability Pelajar Kejuruteraan dari Perspektif*, 1, 31–39.
- Ismail, M. H. (2012). Kajian Mengenai Kebolehpasaran Siswazah di Malaysia : Tinjauan dari Perspektif Majikan Study on Employability of Graduates in Malaysia : A Survey of Employer Perspectives. *Prosiding PERKEM VII*, 2(2012), 906–913.
- Jainudin, N. A., Francis, L., Tawie, R., & Matarul, J. (2015). Competency of Civil Engineering Students Undergone Industrial Training: Supervisors' Perspectives. *Procedia - Social and Behavioral Sciences*, 167, 245–249.
- Mahmud, M. I., Ahmad, J., Marzuki, W., & Ahmad, W. (2016). Modul Kesiapan Kerjaya Berdasarkan Teori Cognitive Processing (CIP), (3), 59–75.
- Malaysia Education Blueprint, M. (2013). *Malaysia Education Blueprint 2013 - 2025*. *Education*, 27(1), 1–268.
- Malhi, R. S. (2008). The Hard Truth about Graduate Employability and Soft Skills. *The Hard Truth about Graduate Employability and Soft Skills*, 448(December 2008), 1–20.
- Mason, G., Williams, G., & Cranmer, S. (2009). Employability skills initiatives in higher education: What effects do they have on graduate labour market outcomes? *Education Economics*, 17(1), 1–30.
- Mat, K., Omar, M. Z., Osman, S. A., Kofli, N. T., Mohd, M. N., Jamil, M., & Jamaluddin, N. (2011). The effectiveness of industrial training on UKM engineering students. In *Procedia - Social and Behavioral Sciences* (Vol. 18, pp. 656–665).
- Muhammad Khair, N., & et al. (n.d.). Framework for Project-Based Learning (PjBL) in Providing Real World Experience for Electrical Engineering Students.
- Osman, S. A., Khoiry, M. A., Rahman, N. A., Rahni, A. A. A., Mansor, M. R. A., Nordin, D., & Johar, S. (2016). The effectiveness of industrial training from the perspective of students of the civil and structure engineering department. *Journal of Engineering Science and Technology*, 11(Special Issue onpendidikankejuruteraanandalambina), 1–12.
- Phang, F. A., Yusof, K. M., Saat, M. M., & Yusof, N. M. (2014). Perceptions of engineering students on industrial training in Malaysia, (JULY), 1–6.
- Pillai, S., Khan, M. H., Syahirah, I., & Raphael, S. (2012). Enhancing employability through industrial training in the Malaysian context, 187–204.
- Rahim, H. L., & Mohd Lajin, N. F. (2015). Social Entrepreneurship and Graduate Employability. *International Academic Research Journal of Social Science*, 1(1), 33–40.
- Rasul, M. S., Amnah, R., Rauf, A., Sulong, B., & Mansor, A. N. (2012). Kepentingan Kemahiran Kebolehdapatan Kerja Kepada Bidang Teknikal. *Jurnal Teknologi*, 59(1963), 93–101.
- Rauf, R. A. A., Mansor, A. N., Yasin, R. M., & Mahamod, Z. (2013). Graduate Employability For Manufacturing Industry. *Procedia - Social and Behavioral Sciences*, 102(Ifee 2012), 242–250.
- Renganathan, S., Ambri, Z., Abdul, B., & Li, C. S. (2013). Students' perception of industrial internship programme.
- Rodzalan, S. A., & Saat, M. M. (2012). The Effects of Industrial Training on Students' Generic Skills Development. *Procedia - Social and Behavioral Sciences*, 56(Ictthe), 357–368.
- Samsuri, N. S., Mohd Yusof, K., & Abdul Aziz, A. (2017). Preparing First Year Engineering Students to Become Engineers: The Impact Of an "Introduction to Engineering" Course. *Journal of Technical Education and Training (JTET)*, 9(1), 45–60.
- Shariff, S. M. & Muhammad, M. (2010). Learning in the Industrial Practicum Training Program: A Case Study in a Public University in Malaysia. *World Applied Sciences Journal*, 11(11), 1361-1368
- Singh (2005). Enhancing the marketability of Malaysia Graduates: An Employer's Perspective. Paper presented at the Proceeding of National Conference of Tertiary Education 2005, Universiti Teknologi MARA, Malaysia.

- Suhairom, N., Musta'amal, A. H., Amin, N. F. M., & Johari, N. K. A. (2014). The Development of Competency Model and Instrument for Competency Measurement: The Research Methods. *Procedia - Social and Behavioral Sciences*, 152, 1300–1308.
- Yusof, N. A., Mohd Fauzi, S. N. F., Zainul Abidin, N., & Awang, H. (2013). Improving graduates' employability skills through industrial training : Suggestions from employers. *Journal of Education and Practice*, 4(4), 23–29.
- Zaharim, A., Yusoff, Y. M., Omar, M. Z., & Basri, H. (2010). Employability Skills Framework for Engineering Graduate in Malaysia. 8th WSEAS International Conference on Education and Educational Technology, 264–272.

***Dedication:**

We would like to thank School of Graduate Studies (SPS), UTM for assisting this study financially through Zamalah Scholarship.