

Leadership Competencies Among Engineering Students: Students' Self-Perceptions Analysis

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Abstract Universities in Malaysia are facing challenges producing engineering graduates with the right skills to enter the demanding job market. Most employers have high expectations and emphasis on employability skills among engineering graduates. Limited evidence is available to help understand level and effect of leadership competencies among engineering students. In contrast, the Western and European countries had long measured leadership competencies in the context of engineering students. Quantitative data was collected from 346 engineering students using structured survey. This paper discussed the demographic and data analysis for leadership competencies construct. The results could be helpful in guiding institutions and educators for further researches to extend the instrument presented.

Keywords: engineering student, engineering education, leadership competencies.

1. Introduction

Currently Malaysia has 20 public universities, 47 private universities, 34 private university colleges, 11 foreign university branch campuses, 30 polytechnics and 73 public community colleges. The total number of students were more than a million of which approximately 95,000 were international students from more than 100 countries (StudyMalaysia.com, 2015). Numerous initiatives had been implemented to upgrade education systems in the country where the Ministry of Higher Education had launched four phases

of National Higher Education Plans in the effort of education transformation. The plans include Phase 1: Laying the Foundation (2007-2010), Phase 2: Strengthening and Enhancement (2011-2015), Phase 3: Excellence (2016-2020) and finally Phase 4: Glory and Sustainability (beyond 2020) (KPT, 2007b, 2012). Realizing education is a major contributor to the development of social and economic capital, under the New Economic Model and Economic Transformation Plan, the government must ensure education system continuously progressing. The Education Ministry had launched Malaysian Education Blueprint 2013-2025 for Pre-School to Post-Secondary Education (KPT, 2013) and Malaysia Education Blueprint 2015-2025 (KPT, 2015) for and Higher Education (KPT, 2007a). The effort continues with the Higher Education Institution Entrepreneurship Action Plan 2016-2020 being launched with the hope to shift graduates' mindsets from seeking work to creating jobs (KPT, 2016).

On employability among graduates, it has always be a major concern worldwide (Badariah, Abdul, & Mariana, 2016; Bennett, 2006; Heitmann, 2002). For many decades, researchers, employers and educators expressed concern about how engineering graduates from the tertiary institutions are being prepared for the workforce (Hanapi & Nordin, 2013; Mohamad, Talib, Ambotang, Zain, & Abdullah, 2013; Nasharudin & Harun, 2010; Othman, Hashim, & Wahid, 2012). (Kazilan, Hamzah, & Bakar, 2009) investigated the level of employability skills among the students of technical and vocational in Malaysia. The study discovered that the curriculum lacking employment element skills which are much needed by the employers. In another study, Normala, Abdul Rahman, and Yahya (2016) discovered the communication skills, personalities, teamwork skills, critical thinking and problem solving skills and continuously learning skills were among the identified as job performance predictors.

About 70% of Malaysian employer disappointed with the quality of fresh graduates. In a JobStreet.com website survey of 472 managers in Malaysia, about 24% said the standards of graduates were "bad", while just 6% said they

were “good”. Many employers attributed the poor ratings not to academic qualifications, but rather attitudes and communication skills shown during interviews or at work. The next major feedback from employers is the level of English proficiency, 64% of the employers agreed that fresh graduates have poor command of (Kaira, 2015). A mismatch on student’s expected salary and employer’s expectations where most employers offer a salary range lower than the fresh graduates’ expectations. Another factor contributing to the unemployment issues are graduates being too choosy about the job or company, as pointed out by 60% of employers (Grapragasem, Anbalagan Krishnan, & Mansor, 2014; Kaira, 2015).

Leadership competencies among students has been a research area among researchers but under the pretext of soft skills (Hanapi & Nordin, 2013; Maya Khemlani & Neda, 2018; Sanjeev Kumar & Hsiao, 2007; Shakir, 2009). However, there is a limited number of researchers specifically on leadership competencies especially among engineering students in Malaysia. In an article written by (Farr & Brazil, 2009; Rahmah, Ishak, & Lai, 2011) explored the changing nature of engineering in a globally competitive environment and addresses why leadership has become a key issue in the career progression of engineers.

Apart from engineering theory and practical skills, engineering education should develop the skills, competencies and ethics of an engineer. These are to equip the students for the future employment. Reviews and studies on employability skills done by other researchers (Coakes, 2010; Kaira, 2015) surveyed on engineering employable personal qualities indicate that it is important to enhance employability skills by emphasizing the non-technical skills aspects among graduates. Leadership competencies instruments was designed to help the respondents to identify their current areas of competency and to propose what to focus on the development effort. The purpose of this paper presents the analysis of the data collected.

2. Methodology

2.1 Research Design

The study employed two survey methods: on-line and paper questionnaire distributed among engineering students at public and private universities. The research was explored through quantitative methods. Data analysis was conducted using SPSS 23.0. Descriptive Statistics was used to show the summary of the descriptive measures to compare constructs numerically.

2.2 Instrument

The questionnaire used in this study consists of two sections: Section A and B. **Table 1** shows the structure of the questionnaire prepared for the study. Section A consists of 12 items on demographic profiles including respondent's age, gender, ethnic, place of birth, nationality, university name, level of education, program of study, year of study, education funding, father's working status and mother's working status. Section B comprise of 75 items where 34 items are questions on Leadership Competencies, 19 items on Learning and Innovation Skills, 11 items on Entrepreneurship Traits and 11 items on Entrepreneurial Minded questions. The questionnaire rated on a five-point Likert scale with a score of 5 indicates "Strongly agree" and 1 as "Strongly disagree". Items were adopted from reliable sources and other related instruments. The instrument was refined after tested with a small sample.

Table 1. Structure of Questionnaire

| <u>Section</u> | <u>Content of Questionnaire</u> |
|----------------|--|
| A | 12 questions on demographic profile 34 questions on leadership competencies |
| B | 19 questions on learning and innovation skills 11 questions on entrepreneurship traits 11 questions on entrepreneurial mindset |
| Total | 87 questions |

2.3 Sample of the Study

The questionnaire was distributed both using paper and online. The paper-based questionnaire was distributed to 250 students and online questionnaire was randomly distributed to 1,250 students. A total of 346 responses were collected from both public and private.

3. Data Analysis

The items in the questionnaire were coded and entered accordingly using SPSS 23.0 software. There were 87 items which include 12 items on demographic and 75 items for independent variables and dependent variables. Of the 75 items, 34 were designed to measure leadership competencies, 19 items to measure leadership and innovation skills, 11 items to measure entrepreneurship traits and 11 items to measure entrepreneurial mindset. For the variables to be reliable, the Cronbach's Alpha must be $>.50$ (Kazilan et al., 2009). Coakes (2010) explained that the value for the Cronbach's alpha had to be closer to 1.0, which means higher reliability measures. In this study, Cronbach's Alpha values for all variables are more than 0.8 of which meet the reliability needed as shown in **Table 2**. The highest Cronbach's Alpha value was for leadership competencies (.954) while the lowest was for characters variable (.881). From the table, all the Cronbach's alpha values for all variables were defined as reliable and adequate by the EFA and the overall total for 75 items was .912.

Table 2. Reliability Coefficients of the Variables

| Variables | No of items | Cronbach's Alpha |
|-------------------------|--------------------|-------------------------|
| Leadership competencies | 34 | .954 |

The descriptive statistics were used to analyse the data collected from the respondents. **Table 3** shows the programs of study for student population. The programs are Chemical Engineering, Civil Engineering, Electrical and Electronic Engineering, Mechanical Engineering, Software Engineering and Others. The most respondents were from Electrical and Electronic Engineering (34%).

Table 3. Program of Study and Education Levels

| Program | Education Level % | | Total Respondents |
|---------------------------------------|-------------------|---------|-------------------|
| | Degree | Diploma | |
| Chemical Engineering | 9 | 0 | 9 |
| Civil Engineering | 1 | 0 | 1 |
| Electrical and Electronic Engineering | 29 | 5 | 34 |
| Mechanical Engineering | 18 | 5 | 23 |
| Software Engineering | 14 | 0 | 14 |
| Others | 11 | 8 | 19 |
| Total Respondents | 82 | 18 | 100 |

Table 4 summarizes the demographic of the respondents. The respondent's gender, nationality, ethnic group, year of study and university types were collected for this study. Based on the data collected, the analysis was further looked at the education levels. From the data collected, 71% are male students and 29% are female students, 19% are 1st year students, 32% are 2nd year students, 44% are 3rd year students and 5% are 4th year students. Finally, the students comprise of 81% and 19% are from public and private universities respectively.

Table 4. Demographic of Respondents

| Demographic | Items | Education Level % | | |
|--------------|----------------------|-------------------|---------|-------|
| | | Degree | Diploma | Total |
| Gender | Male | 57 | 14 | 71 |
| | Female | 25 | 4 | 29 |
| Nationality | Malaysian | 79 | 18 | 97 |
| | Non-Malaysian | 3 | 0 | 3 |
| Ethnic Group | Malay | 53 | 17 | 70 |
| | Chinese | 19 | 1 | 20 |
| | Indian | 5 | 0 | 5 |
| | Others | 5 | 0 | 5 |
| Year Study | 1 st Year | 14 | 5 | 19 |
| | 2 nd Year | 25 | 7 | 32 |
| | 3 rd Year | 38 | 6 | 44 |
| | 4 th Year | 4 | 1 | 5 |
| University | Public | 64 | 17 | 81 |
| | Private | 18 | 1 | 19 |

The study also needs to know the distribution of the student's education level. **Figure 1** shows 82% are degree students and 18% are diploma students.

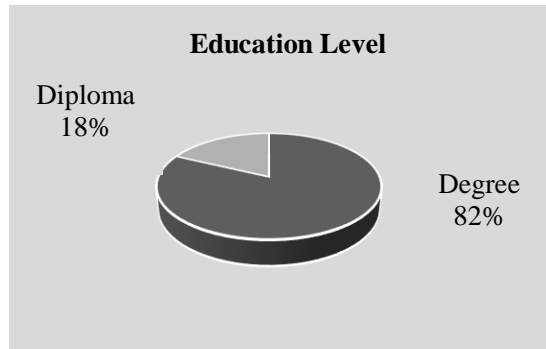


Figure 1. Education Level

Malaysia has population that comprise of many races. The samples collected at random and the distribution is shown in **Figure 2**. Malay has the highest percentage, followed by Chinese and Indian. This is the same trend as the population distribution.

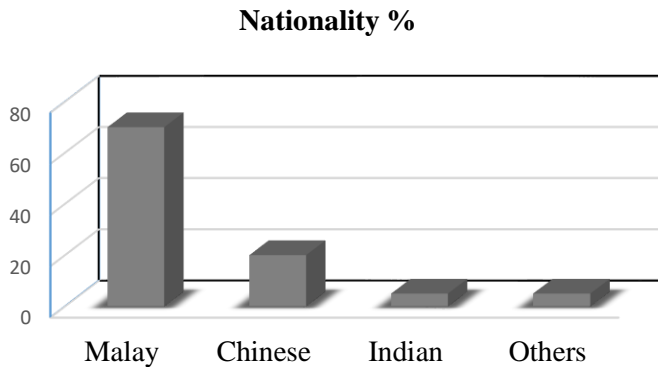


Figure 2. Nationality of Respondents

4. Descriptive Analysis

The questionnaires were distributed both online and paper based. Likert scale of 1 to 5 were used to measure the student’s leadership competencies, learning and innovation skills, entrepreneurship traits and entrepreneurial mindset where 1 indicates “Strongly disagree” and 5 indicates “Strongly agree”. This is to determine the current state of students’ perceptions on leadership competencies. Table 5 shows the descriptive values for leadership construct.

Table 5. Mean and Standard Deviation for Leadership Competencies

| Variables | Mean | Std. Dev. |
|-----------------------------------|-------------|------------------|
| Managing Change | 3.70 | .773 |
| Planning and Organizing | 3.74 | .833 |
| Interpersonal Skills | 3.75 | .837 |
| Results Oriented | 3.66 | .888 |
| Average (Leadership competencies) | 3.71 | |

The results indicated the leadership competencies has an average mean score (3.71). This shows that students under study are still lacking leadership competencies. The results of the study confirmed results of past studies that students lack soft skills namely leadership competencies (Bennett, 2006). The constructs are below 4.00 which means these constructs will be analysed

further to enhance student's skill. The curriculum should be closely look into in order to improve and energize student's leadership competencies.

5. Conclusion

This paper presents the demographic data and descriptive analysis derived from engineering student's responses to the questionnaires distributed with regards to the study. The analysis is only partially reported. From the analysis, it has been proven that engineering students still lacking leadership competencies. This serves as a basis for a serious evaluation and assessment of engineering curriculum to groom leadership competency centric engineers. One of the areas that need to be investigated or evaluated is the sufficiency and availability of opportunity for engineering students to assume the role of leaders whether in group projects, community projects or in class requirements. It is suggested that a platform such as 'Small Business Institute' of which students are exposed to render services to the local community.

References

Badariah, Haji Dina, Abdul, Rahim Anuara, & Mariana, Usman. (2016). *The Entrepreneurship Education Program in Malaysian Public University* Paper presented at the ISSC 2016 : International Soft Science Conference.

Bennett, Tracy Michelle. (2006). *Defining the importance of employability skills in career/technical education*. (3245459 Ed.D.), Auburn University, Ann Arbor.

Retrieved from <https://vpn.utm.my/docview/305361115?accountid=41678>
ProQuest

Central database.

Farr, John V, & Brazil, Donna M. (2009). Leadership skills development for engineers. *Engineering Management Journal*, 21(1), 3-8.

Grapragasem, Selvaraj, Anbalagan Krishnan, & Mansor, Azlin Norhaini. (2014). *Current Trends in Malaysian Higher Education and the Effect on Education*

Policy and Practice: An Overview *International Journal of Higher Education* 3(1).

Hanapi, Zaliza, & Nordin, Mohd Safarin. (2013). Unemployment among Malaysian Graduates: Graduates' Attributes, Lecturers' Competency and Quality of Education.

Heitmann, Werner. (2002). *The action oriented learning and teaching approach: a model that lead to a learner's exemplary job performance and employability.*

Paper presented at the International Vocational Education and Training Association (IVETA).

Kaira, Aditi Sharma. (2015). 70% of Malaysian employers disappointed with the quality of fresh graduates _ Human Resources Online.

Kazilan, F. , Hamzah, R., & Bakar, A.R. (2009). Employability skills among the students of technical and vocational training centers in Malaysia. *European Journal of Social Sciences*, 9(1), 147-160.

KPT. (2007a). National Higher Education Action Plan 2007-2010.

KPT. (2007b). Pelan Strategik Pengajian Tinggi Negara Melagkau Tahun 2020.

KPT. (2012). National Higher Education Strategic Plan Beyond 2020.

KPT. (2013). Malaysian Education Blueprint 2013-2025 PreSchool to Post-Secondary Education.

KPT. (2015). Malaysia Education Blueprint 2015-2025 (Higher Education).

KPT. (2016). Pelan Tindakan Keusahawanan 2016-2020. Putrajaya: Kementerian Pengajian Tinggi.

- Maya Khemlani, David, & Neda, Saeipoor. (2018). Integrating Soft Skills into Courses in Malaysian Public Universities (Undergraduate's Perception). *International Research Journal*.
- Mohamad, Baharom, Talib, Roslee, Ambotang, Abdul Said, Zain, Shukri, & Abdullah, Mohd Yusof. (2013). Cabaran transformasi agenda pendidikan negara. *Utusan Borneo*, B4.
- Nasharudin, Norfadhilah, & Harun, Halimah. (2010). Aspirasi kerjaya keusahawanan dalam kalangan pelajar Institusi Pengajian Tinggi Awam. *Malaysian Journal of Education*, 35(1).
- Normala, Rahmat, Abdul Rahman, Ayub, & Yahya, Buntat. (2016). Employability Skills Constructs as Job Performance Predictors for Malaysian Polytechnic Graduates: A Qualitative Study. *Malaysian Journal and Space*, 12(3), 154-167.
- Othman, N., Hashim, N., & Wahid, H.A. (2012). Readiness towards entrepreneurship education: Students and Malaysian universities *Education and Training*, 54(8), 697-708. doi: 10.1108/00400911211274837
- Rahmah, Ismail, Ishak, Yussof, & Lai, Wei Seang. (2011). Employer Perceptions on Graduates in Malaysian Services Sector. *Medwell Journals*, 5(3):184-193. *Medwell Journals*, 5(3), 184-193.
- Sanjeev Kumar, & Hsiao, J. Kent. (2007). Engineers Learn "Soft Skills the Hard

Way”: Planting a Seed of Leadership in Engineering Classes. 7(1).

doi:[http://dx.doi.org/10.1061/\(ASCE\)1532-6748\(2007\)7:1\(18\)#sthash.IFWRfWAV.dpuf](http://dx.doi.org/10.1061/(ASCE)1532-6748(2007)7:1(18)#sthash.IFWRfWAV.dpuf)

Shakir, Roselina. (2009). Soft skills at the Malaysian institutes of higher learning. *Asia*

Pacific Education Review, 10(3), 309-315.

StudyMalaysia.com. (2015). The Malaysian Higher Education System - An Overview.