

A study of employers' satisfaction of engineering graduates in Malaysia

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ABSTRACT: The advent of the 21st century has seen the engineering profession face unprecedented challenges. Rapid advancement of technology, environmental preservation and globalization are some of the issues that confront the profession. In order to face such challenges, engineering education has to adapt itself, in particular, in the aspect of preparing able engineering graduates into the work market. In order to create a smoother transition from education to practice, some argue that engineering education need to give more emphasis on teamwork, communication, knowledge retention and the ability to synthesize and make connections between courses and fields. This work investigates the perception of some selected sectors or industries in Malaysia towards their engineering work force. For the purpose of this paper, only the non-technical attributes such as teamwork, communications, ethics, entrepreneurial skills and various others will be discussed. As a pilot study, a total of 30 companies from various industries were selected randomly and purposively using convenience sampling based on firms where engineering students normally undergo industrial placements. In general, the employers' satisfaction of their engineering workforce with respect to the non-technical attributes can be considered as high, achieving about 50% satisfaction level or higher, with the 'team working' attribute scoring the highest value of 63%. However, the employers are most dissatisfied with the entrepreneurial skills of their engineering workforce, scoring only 13% satisfactory level. This is an initial study carried out as a preparation for a more comprehensive survey work currently being conducted on the perception and needs of Malaysian industries towards graduate engineers. The outcomes of the comprehensive survey work will later be considered in an exercise to revise the engineering education curricula of Malaysian Institutions of Higher Learning.

INTRODUCTION

How do industries view the performance of engineering graduates? In the US, industries perceive that engineering students are not adequately prepared to enter the workforce [1]. In order to create a smoother transition from education to practice, some argue that engineering education need to give more emphasis on teamwork, communication, knowledge retention and the ability to synthesize and make connections between courses and fields [2].

To shed light on this question in the context of Malaysia, a comprehensive survey is currently being conducted on the perception and needs of Malaysian industries towards graduate engineers. The main objective of the survey is to investigate the current level of employers' perception as regards to existing engineering graduates towards assessing measurable qualities. As a start, a pilot study has been conducted on 30 companies in Malaysia, and the results obtained are presented in this paper.

Table 1: Distribution of respondents by industry

Industry	No. of Responses	%
Healthcare and Social	3	10.0
Leisure and Entertainment	0	0.0
Education	2	6.7
Commerce, Trade & Finance	0	0.0
Communications and IT	5	16.7
Defence and Security	1	3.3
Agriculture and Food	0	0.0
Engineered Materials	5	16.7
Energy & Natural Resources	3	10.0
Consulting	6	20.0
Built Environment	2	6.7
Transport	3	10.0
Total	30	100

METHODOLOGY

A total of 30 companies from various industries were selected randomly and purposively using convenience sampling based

on firms where engineering students normally undergo industrial placements. The breakdown of selected companies according to industry is shown in Table 1.

Data collection was carried out through face-to-face interviews using a set of questionnaires. The interviewed respondents were mainly high-ranking personnel in the firm. The positions held by these respondents are shown in Figure 1, where 27% are Executive Directors or higher, 30% are Managers and 43% are Engineers.

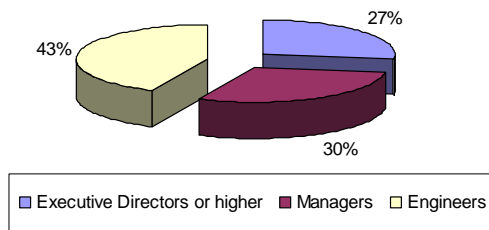


Figure 1: Distribution of respondents by position in the firm

RESULTS AND DISCUSSION

In this pilot study, the level of satisfaction of employers towards a particular attribute as listed in Table 2 possessed by their current engineering workforce required answers on a 5-point Likert's scale. The answers are divided into five categories, i.e. 'most satisfactory', 'satisfactory', 'neutral', 'not satisfactory' and 'not satisfactory at all'. In this instance, in order to simplify the 5-point scale, answers belonging to the first two categories are grouped as 'Satisfactory', while those belonging to the last two categories are grouped as 'Not Satisfactory'. These are shown in Figure 2.

Of the thirteen attributes listed in Table 3, this paper will only discuss those considered as the non-technical attributes. Figure 2 shows the level of satisfaction of employers of such attributes towards their engineering workforce. The employers are most satisfied with the aspect of team working (attribute H) of their workforce (63.3%). They are most dissatisfied with the aspect of entrepreneurial skills of the workforce, scoring only 13.3% satisfactory level. Otherwise, other attributes scored around 50% or higher.

Table 2: List of attributes of workforce

A	Ability to acquire and apply knowledge of engineering fundamentals.
B	Having the competency in theoretical and research engineering.
C	Having competency in application and practical oriented engineering.
D	Ability to communicate effectively, not only with engineers but also with the community at large.
E	Having in-depth technical competence in a specific engineering discipline.
F	Ability to undertake problem identification, formulation and solution.
G	Ability to utilise a systems approach to design and evaluate operational performance.
H	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.
I	Having the understanding of the social, cultural, global and environmental responsibilities and ethics of a professional engineer and the need for sustainable development.
J	Recognising the need to undertake lifelong learning, and possessing/acquiring the capacity to do so.
K	Ability to design and conduct experiments, as well as to analyse and interpret data.
L	Having the knowledge of contemporary issues.
M	Having the basic entrepreneurial skills

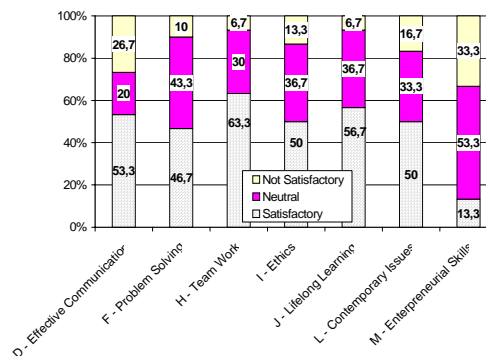


Figure 2: Employers' satisfaction on non-technical attributes of their engineering workforce

Figures 3 (a to g) show the distribution of satisfactory level of nine main industries on the respective non-technical attributes of their

engineering workforce. Figure 3a shows the employers' satisfactory level of the workforce with respect to effective communication (attribute D). Although most sectors scored above 50%, it is irony that the transport sector scored 0 point, which means all three employers in this sector interviewed for this pilot study did not satisfy with the communication level of their engineering staff.

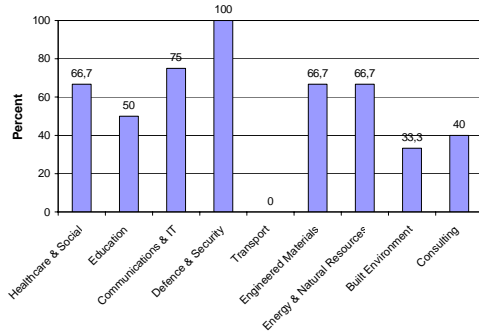


Figure 3a: Employers' satisfaction of their workforce with respect to 'effective communication' (attribute D).

Figure 3b shows the satisfactory level of the workforce with respect to problem solving ability (attribute F). It is striking that education sector seems to rate their staff negatively in terms of problem solving ability whereas Defence & Security has given the highest score of 100%.

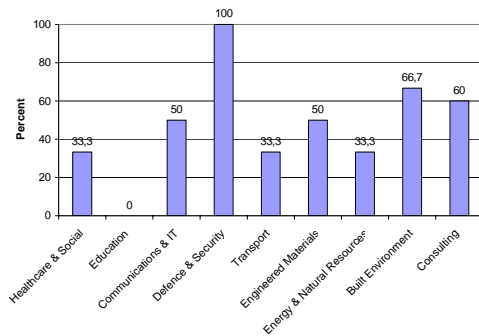


Figure 3b: Employers' satisfaction of their workforce with respect to 'problem solving' (attribute F).

Figure 3c shows the distribution of satisfactory level with respect to attribute H, i.e. team work. All but three sectors have given satisfactory level of 50% or higher. Healthcare & Social and Built Environment sectors give the lowest level of satisfaction, i.e. at 33% each.

Another interesting observation from this pilot study is on the attribute I (ethics). As shown in Figure 3d, Built Environment is most dissatisfied with its engineering workforce in this respect. However, 100% satisfaction is achieved by Education and Defence & Security sectors.

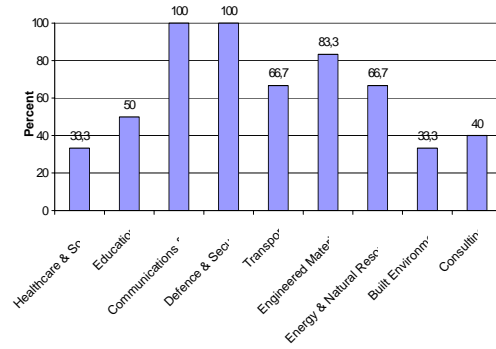


Figure 3c: Employers' satisfaction of their workforce with respect to 'team work' (attribute H).

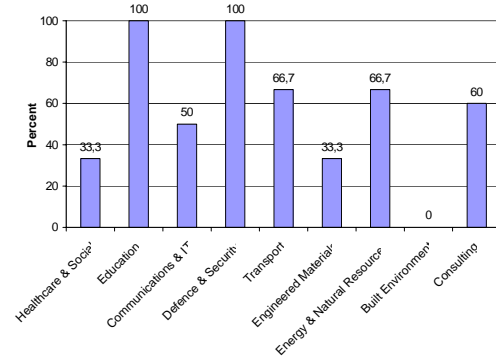


Figure 3d: Employers' satisfaction of their workforce with respect to 'ethics' (attribute I).

The fifth non-technical attribute is lifelong learning, and this is shown in Figure 3e. 100% satisfactory level is given by two sectors, namely Education and Defence & Security. Health and Social sector on the other hand, has given zero score.

Meanwhile Figure 3f represents the satisfaction level for the knowledge of contemporary issues, attribute L. Two of the most strategic sectors, i.e. Communications & IT and Defence & Security, understandably have given high scores to their engineering staff for this attribute, perhaps, particularly since the sectors have to catch up with the related rapid technical advancement associated with the sectors. However, zero score for Education sector needs further investigation,

and more data involving more respondents is necessary.

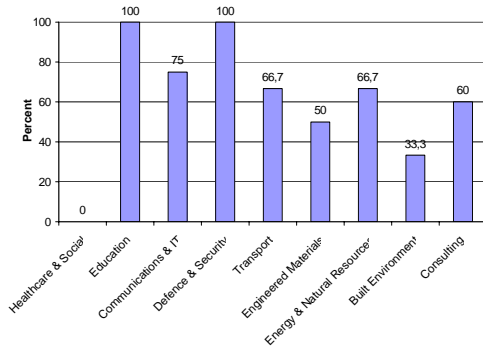


Figure 3e: Employers' satisfaction of their workforce with respect to 'lifelong learning' (attribute J).

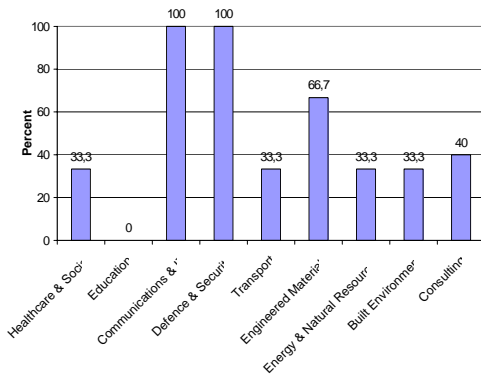


Figure 3f: Employers' satisfaction of their workforce with respect to 'contemporary issues' (attribute L).

Finally, Figure 3g indicates that the employers interviewed are mostly dissatisfied with the entrepreneurial skills of their engineering workforce, with six out of nine sectors have given zero score as shown.

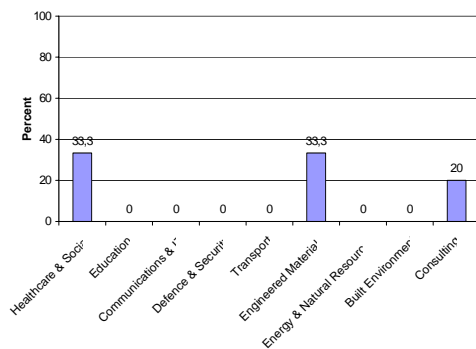


Figure 3g: Employers' satisfaction of their workforce with respect to 'entrepreneurial skills' (attribute M).

The attributes used in this study were based on the necessary criteria on the competency of engineers as identified by Accreditation Board for Engineering and Technology (ABET), the signatory organisation for the United States of America for a multinational agreement established in 1989, i.e. the Washington Accord. Fulfilment of these attributes is a requisite to becoming a member of this accord. Among the countries in the Southeast Asian region, only Malaysia and Singapore have taken steps to work towards full Washington Accord membership (currently, Malaysia and Singapore are provisional members of this accord).

In this respect, this study has given an indication to areas in the Malaysian engineering education system that need improving. For example, the above data obtained to date may indicate that, the engineering education in Malaysia should be able to produce engineering graduates who are not only well versed in engineering and science theory but also in critical thinking for solving engineering problems, as also mentioned by Rugarcia et. al. [3].

CONCLUSIONS

This paper reports some initial data from a pilot study involving 30 companies randomly selected from twelve identified industries or sectors. This initial study was carried out as a preparation for a more comprehensive survey work that is currently being conducted on the perception and needs of Malaysian industries towards graduate engineers. In general, the employers' satisfaction of their engineering workforce with respect to the non-technical attributes can be considered as high, achieving about 50% satisfaction level or higher, with the 'team working' attribute scoring the highest value of 63%. However, the employers are most dissatisfied with the entrepreneurial skills of their engineering workforce, scoring only 13% satisfactory level.

The outcomes of the comprehensive survey work will later be considered in an exercise to revise the engineering education curricula of Malaysian Institutions of Higher Learning. Curricula, those are able to produce engineering graduates who are not only well

versed in engineering and science theory but also in critical thinking for solving engineering problems, may be necessary. Further work towards the gathering of detailed and representative data across the above-mentioned industries is currently being carried out so that comprehensive analysis could be established.

ACKNOWLEDMENT

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