

Determining Factors Influencing the Success of Engineering Doctoral Students: Case Study at University Kebangsaan Malaysia

Azah Mohamed, Abdul Halim Ismail,
Mohd Marzuki Mustaffa and Norhasanah Mohd
Department of Electrical, Electronic and Systems Engineering,
Faculty of Engineering and Built Environment,
University of Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia

Abstract: This study reports on a survey conducted by the faculty on recent PhD engineering graduates of the Faculty of Engineering and Built Environment, University Kebangsaan Malaysia, concerning factors that lead to successful doctoral studies. The survey solicited responses on five aspects of PhD studies: Supervisor, skills, research work, research outcome and research constraints. To analyze and evaluate the factors, the Statistical Package for Social Science, version 16.0.1 was used. Survey results of the first aspect show that 61.3% of respondents chose supervisors who were well known in their research area; 74.2% rated their supervisors as being very helpful while 54.8% held weekly discussions with their supervisors or colleagues. For the second aspect, results depict that 41.9% of respondents stated thinking skills were of utmost importance in becoming successful PhD students while 54.8% opined that working independently was crucial in achieving PhD success. The results of the third aspect reveal two sets of respondents with identical percentages, i.e., 38.7%. Both these groups expressed 30-40 and >40 h per week as time spent doing research during their PhD tenure. In addition, 87.1% of graduates indicated that readings on past and current literature were done every semester. Furthermore, 48.4% of successful candidates disclosed that for the technical writing required in their studies, they learnt from people who wrote clearly and concisely. Looking at the fourth aspect, results show that 58.1% of respondents published >3 journal papers while 64.5% of the respondents attended conferences >4 times during their PhD studies. Finally, for the fifth aspect, results point out that 54.8% of respondents had problems in conducting their research. Results from the survey will be used to upgrade present practices in the faculty to help current engineering PhD candidates achieve success in their studies.

Key words: PhD studies, research effectiveness, survey, skill, social science, Malaysia

INTRODUCTION

Concern over low completion rates by PhD students and the length of time taken by some students to complete their PhD theses, the Ministry of Higher Education in Malaysia recommends that academic institutions implement a number of measures to ensure that the students graduate on time and complete their research investigation within 3 to 3½ years. This issue has to be considered with greater seriousness in line with the Ministry of Higher Education's vision of producing 60,000 PhDs in Malaysia by 2020. Bearing in mind that completing a PhD is a substantial investment in human capital and educational infrastructure, efficient use of resources is highly desirable (Mangematin, 2000). Apart from this, starting a research degree marks a great transition in the lives of students (Philips and Pugh, 2000).

Some of the measures taken at University Kebangsaan Malaysia in ensuring graduate on time include providing students with a research methodology course, evaluating performance of students and supervisors on a regular basis and appointing external examiners on time. From the literature, the identified three categories of influence on the progress of postgraduate research students are institutional and structural issues, individual but non-psychological characteristics such as age, source of funding, etc., and individual factors intrinsic to the student, such as motivation, ego strength, etc (Wright and Cochrane, 2000). There are also many factors that contribute to poor completion rates among PhD students in Malaysia, among which are such as qualities of students, personal issues other than study problems, research problems and supervision. Some studies focused on developing methods for effective

Corresponding Author: Azah Mohamed, Department of Electrical, Electronic and Systems Engineering,
Faculty of Engineering and Built Environment, Universiti of Kebangsaan Malaysia, 43600 Bangi,
Selangor, Malaysia

supervision but these did not identify the factors that affect students' rate of success in PhD studies (Ismail *et al.*, 2011). From the literature, studies focusing on the engineering PhD graduate research experience are scarce. Therefore, there is also a need to conduct a study to understand at greater depth the factors that lead to a student's successful completion of his PhD studies.

The objective of this research study is to identify factors that lead to successful engineering PhD studies in the Faculty of Engineering and Built Environment (FEBE), University Kebangsaan Malaysia (UKM). From the study, the research constraints experienced by the PhD students can also be identified. The purpose of such a study is to gain as much information as possible about respondents' experience of being successful PhD student (Rogers and Goktas, 2010). Such experience could produce useful guidelines leading to successful engineering PhD study (Wright and Cochrane, 2000). By identifying factors that lead to successful engineering PhD studies such information can be relayed down as a guide to the potential PhD candidates.

MATERIALS AND METHODS

In this study, a set of questionnaire has been developed considering five main variables as stated below:

- Supervisor
- Research skills
- Research research
- Research outcome
- Research constraints

This study focuses on a survey carried out on the FEBE PhD graduates of various engineering disciplines, namely, electrical, chemical and mechanical and civil engineering. The objective of the survey is to explore and determine factors influencing the graduates' successful doctoral studies as viewed from their perspective. Total 62 sets of questionnaires have been distributed to local and international PhD graduates during the period from February to July, 2011. The survey returned number is 31 sets in which 50% responded to the survey. The percentage of respondents is as depicted in Fig. 1. Out of the total 31 respondents, 65% were local graduates and 35% were international graduates from Indonesia, Iran, Iraq, Libya and Pakistan. It is noted that there is a difficulty in tracing the international PhD graduates because of the change in their email addresses. The collected data and information was analyzed using the Statistical Package for the Social Science (SPSS) software version 16.0.1.

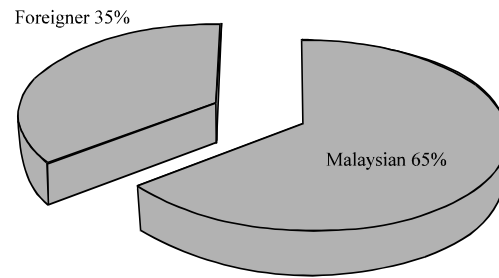


Fig. 1: Percentage of respondents involved in study

RESULTS AND DISCUSSION

In this study, key findings of the survey are discussed accordingly. Table 1 compares the mean ratings of the different variables for successful PhD study, namely; supervisor, skills, research work, research outcome and research constraints. For the supervisor aspect, it is found that the supervisor commitment attribute topped the other attributes with a mean rating of 3.74. Most graduates were of the view that their supervisors' commitment was very important to their PhD success. For the skills variable, results show that the soft skills of a PhD student had the highest mean (2.68). In the research work aspect, the item, time spent on research, garnered the highest rating with a mean of 3.10. A substantial number of successful candidates believed that putting in the hours was fundamental to their favorable outcome. Other than this, the number of conferences attended attribute led the research outcome variable with a rating mean of 3.39. This suggests that many graduates benefitted from attending conferences during their studies. Finally, the research constraints aspect had a high mean of 3.26. This aspect needs more consideration so that the constraints can be truly documented and overcome.

The supervisor factor: Figure 2 shows responses connected to the attributes of choice of supervisor. The analysis indicates that 61.3% of the respondents specified that choosing a well known supervisor in their research area is of paramount importance. On the lower end of the scale, 3.2% responded that they had no idea who their supervisor would be when they filed in their PhD application.

Meanwhile, Fig. 3 depicts the percentage of responses related to the attribute of supervisor commitment. Interestingly, 74.2% of respondents concurred that their supervisors were very helpful while the rest at 25.8%, communicated that the supervisors was helpful. The results imply that the supervisor play a very big role in a candidate's ultimate success.

Table 1: Mean ratings for successful PhD survey

Variables	Successful PhD survey mean
Supervisor	
Choice of supervisor	2.45
Relationship with supervisor	1.26
Supervisor commitment	3.74
Frequency of meeting with supervisor	2.00
Skills	
Research skills	2.32
Soft skills	2.68
Formal course on skills	1.84
Research work	
Time spent on research	3.10
Learning from literature readings	2.84
Effectiveness of research methodology course	2.29
Analyzing research problem	1.90
Communicating in writing	2.97
Log book writing	1.87
Research outcome	
Time spent on thesis writing	1.68
Number of journal studies published	3.29
Number of conferences attended	3.39
Research constraints	
Research constraints	3.26

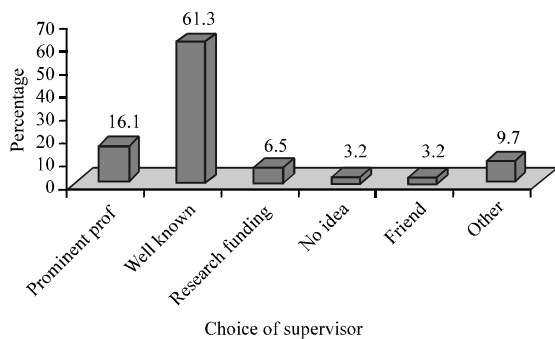


Fig. 2: Percentage for choice of supervisor attributes

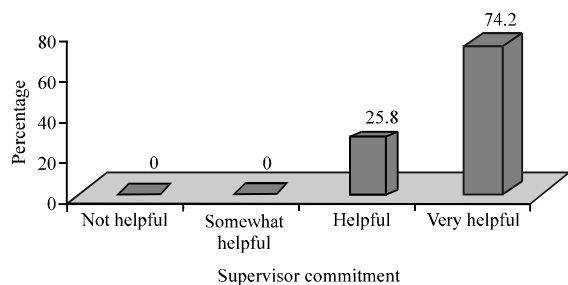


Fig. 3: Percentage for supervisor commitment attributes

Figure 4 shows the responses linked to frequency of meetings between supervisor and student. In this situation, 54.8% of successful candidates held weekly technical discussions with supervisors or other postgraduate colleagues. Conversely, only 6.5% of respondents conducted technical discussions on a frequency of more than once a month. These results seem to imply that frequent meetings with supervisors and colleagues may lead to PhD success.

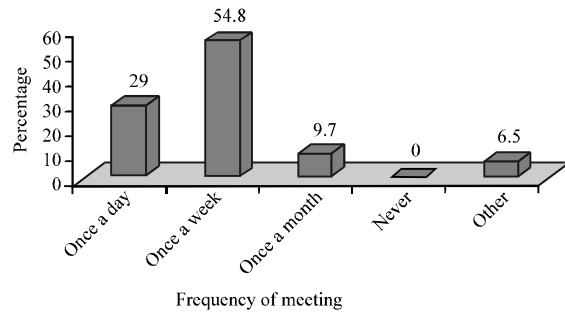


Fig. 4: Percentage for frequency of meetings attributes

The skills factor: Figure 5 displays responses related to the attribute of research skills that is of utmost importance in pursuit of PhD success. About 41.9% of the respondents chose thinking skills as the most important skill to possess. Next, 35.5% of the respondents chose technical writing skills as the second most important skill. Decision-making and perseverance skills both at 3.2% were considered by the respondents as the least important skill.

Figure 6 exhibits the percentage of responses on expected soft skills of a PhD student. A total of 54.8% expressed that working independently is the most important soft skill of a PhD student. In contrast, 6.5% of the respondents chose the ability to multi-task as the least important soft skill.

Research work factor: Figure 7 demonstrates responses connected to the attribute of time spent on research on a weekly basis. For this item, the survey shows that two groups of respondents both at 38.7% equally chose 30-40 and >40 h per week as their strategies for academic success. It seems that the more time is invested in research, the greater the success. For 6.5% of the respondents, their time spent on research were <20 h per week.

Figure 8 represents the percentage of responses related to the attribute of frequency of reading on past and current literature linked to the graduate research. On this issue, 87.1% of the respondents affirmed that readings of past and current literature were done every semester whilst 3.2% conducted readings every other semester. Hence, regular readings on related literature seem to be fundamental to PhD success.

Research outcome factor: Figure 9 shows the percentage of responses related to the attribute of communicating in writing. In this case, 48.4% of the respondents learnt from people who wrote clearly and concisely. Second, 22.6% of the respondents agreed that supervisors were the source of writing assistance. A total of 6.5% of the respondents

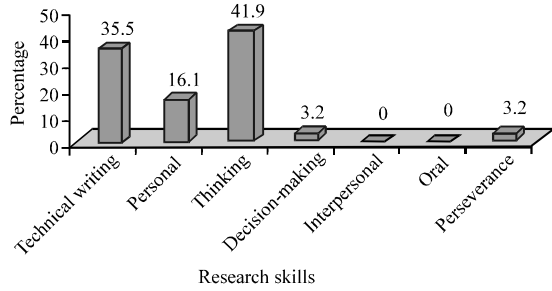


Fig. 5: Percentage for research skills attributes

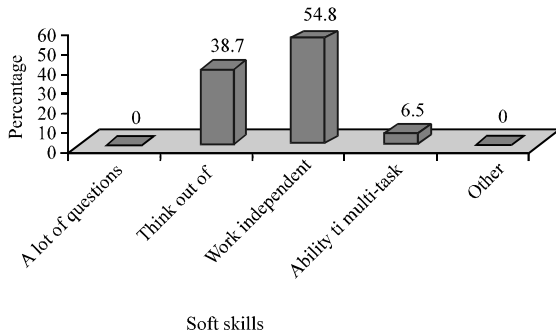


Fig. 6: Percentage for soft skills attributes

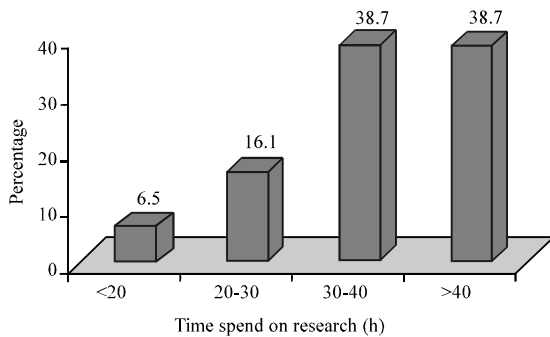


Fig. 7: Percentage for time spent on research attributes

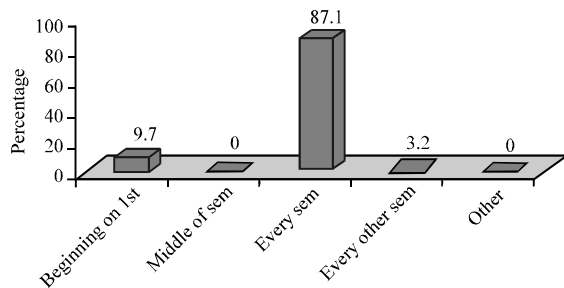


Fig. 8: Percentage for learning from literature reading attributes

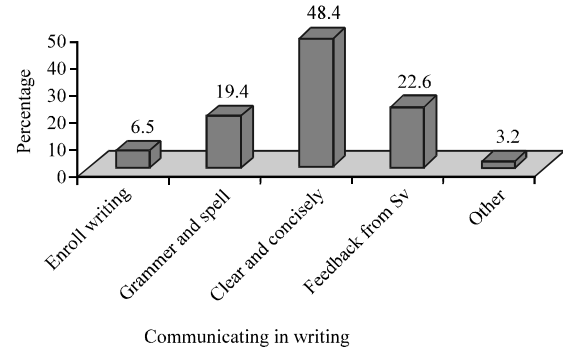


Fig. 9: Percentage for communicating in writing attributes

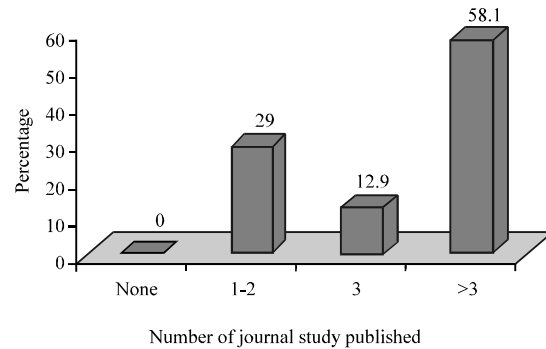


Fig. 10: Percentage for number of journal study published attributes

declared that they enrolled in a writing course. These results imply that good writing role models are favorable to PhD success.

Figure 10 indicates responses allied to the item, number of journal studies published. In this case, 58.1% of the respondents disclosed that they had >3 journal studies published during their PhD studies while 29.0% responded publishing 1-2 journal studies during their PhD studies.

Figure 11 shows the responses connected to the attribute of number of conferences attended. In this case, 64.5% of the respondents declared having attended >4 conferences during their PhD tenure. On the low side, 6.5% reported attending 1-2 conferences during their studies. Frequent attendance to conferences could lead some candidates' success through knowledge, experience in communication and confidence.

Research constraints factor: Finally, Fig. 12 depicts responses linked to research constraints. In this context, results indicate that 54.8% of the respondents had problems in research such as data collection or experiments that did not research. Significantly, 22.6% of

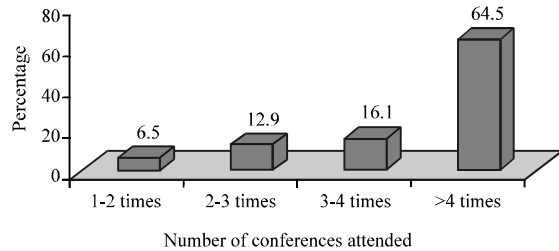


Fig. 11: Percentage for number of conferences attended attributes

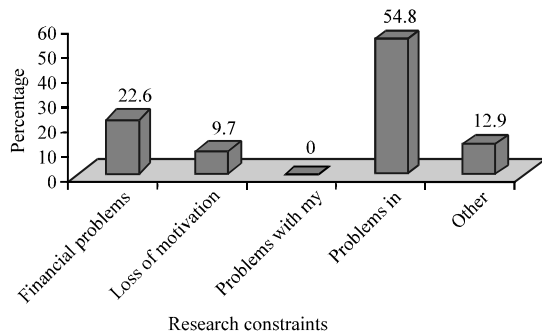


Fig. 12: Percentage for research constraints attributes

the respondents faced financial problems while 9.7% encountered loss of motivation during their PhD studies. These problems cannot be left unattended for they could lead to severe study failures.

CONCLUSION

A survey was conducted on the PhD engineering graduates of the FEBE, UKM to solicit factors that lead to

successful doctoral studies. This study has provided some significant findings regarding the engineering PhD graduate experience. However, the study is far exploratory in nature and more studies need to be done. It is hoped that this research will serve as part of the foundation for an overall understanding of the doctoral engineering student experience and on the flipside, it will also enable solutions to be discovered resulting in improvements in engineering PhD studies in UKM.

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