

Technical communication skills among recent electrical and electronics engineering graduates in job industries

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ABSTRACT: A study involving recent graduates of the Department of Electrical, Electronic and Systems Engineering (ESEE) at Universiti Kebangsaan Malaysia has been carried out to evaluate the impact of technical communication skills they acquired. The graduates are currently working in six different job categories with different work experience (between one to three years). The objectives of this study are to evaluate the impact and effectiveness of the technical communication courses offered in the Department towards the graduates in their workplace and engineering experiences. In addition, the study aimed to enhance the current technical courses implementation based on the graduates' suggestions as part of the Department's continuous quality improvement activities. Survey results reveal the need for technical communication skills in order to allow engineering graduates to adjust to their employer's demand and achieve their future career goals. The results from this study suggest that there is a direct relationship between the skills acquired from the technical communication skills courses and their day-to-day communication in the workplace.

Keywords: Communication skills, effective communication, graduate marketability, technical communication

INTRODUCTION

The importance of communication skills for engineering graduates have been stressed in numerous surveys, input from industry and academic advisors [1]. Furthermore, technical communication skills are essential for graduates, as part of the *packages* required by employers to meet the high market demand in job industries [2].

Some poor feedback and unfavourable comments about the capacity of engineering graduates to communicate effectively in the challenging work environment had been received by the Faculty from employers. Recognising the need for technical communication skills, the Engineering Accreditation Council (EAC) now requires engineering programmes to demonstrate students' competency in writing and verbally presenting technical reports [3][4]. In fact, the ability to communicate effectively in complex engineering activities with the engineering community and society has been reflected in one of the programme outcomes of the engineering programmes at Universiti Kebangsaan Malaysia (UKM) [5]. Several efforts have been made at the university and faculty levels to improve the competency of its graduates' communication skills.

One of the efforts has been the implementation of outcome based education, whereby 12 programme outcomes (POs) have been outlined to emphasise the expected achievements of graduates and serve as guidelines for the lecturers and future graduates. One of the programme outcomes, that is PO 9, largely emphasises the ability of engineers to communicate well not only among themselves, but also with society. In addition, the required technical skills of the graduates from the faculty have also been defined [6].

To evaluate the capability of technical communication skills among recent Electrical, Electronic and Systems Engineering (ESEE) graduates from UKM, a survey was carried out on the benefit of the technical communication skills that they acquired during their undergraduate study, and how these technical communication skills help them to adapt in their current workplace environment. In addition, the effectiveness of the current technical communication skills courses offered by the Faculty and University has also been evaluated.

The main objectives of this study can be summarised as follows: a) to evaluate the effectiveness of the current technical communication courses offered at the faculty and university levels; and b) to identify areas and methods for the purpose of improving technical communication skills among graduates.

METHODOLOGY

This study focuses on the graduates of the EESE Department with one to three years of work experience in various engineering industries. Within this three year period, the graduates should be able to provide both industry and engineering education perspectives as they can still remember the technical communication courses that they undertook and relate them to their technical communication skills in the workplace.

To evaluate these technical communication skills, a questionnaire was developed and distributed via email addresses provided by the EESE graduates. A total of 28 respondents participated in the survey. Three main components were evaluated, which can be described as:

- Time allocated (in percentages) for writing, oral presentations and other oral discussions at workplace (e.g. meetings and working in teams).
- Effectiveness of the technical communication courses offered in the EESE Department. The list of courses together with the evaluated components and learning activities are summarised in Table 1.
- Impact of technical communication on graduates' current and future career, such as how technical communication can help graduates to gain confidence, career promotion, work adjustment, salary increment and recognition from peers or supervisors.

Table 1: List of courses related to technical communication skills.

Course name (and code)	Component and learning activities
Engineering Management (KF4133)	Problem-based learning (PBL), leadership and management skills, team work and group presentation
Laboratory Courses	Problem-based learning (PBL) and team work discussion
English for Engineers	Engineering vocabulary, oral presentation, technical writing and forum session
Final year project	<i>Viva voce</i> examination, industrial poster presentation, technical report and thesis dissertation
Engineering Ethics (KF3823)	Case study (technical report writing), group discussion and oral presentation
Co-curriculum courses	Problem-solving via communication, workplace interaction, group discussions, interview process, effective presentation, resume writing

At the end of the survey, the respondents were requested to give suggestions and make recommendations on how to improve the current courses offered at the EESE Department so as to enhance the technical communication skills of future graduates. This helps to increase the chance of securing a job and to meet the high demands of prospective employers.

In this study, five categories of job function were considered; namely: a) research and development (R&D); b) operation and maintenance (O&M); c) production line; d) marketing; e) management; and f) other non-engineering related industry. The number of respondents categorised according to their job functions is summarised in Figure 1.

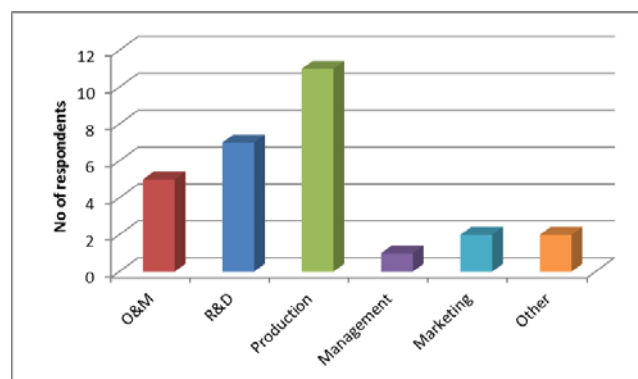


Figure 1: Number of respondents based on job function.

RESULTS AND DISCUSSION

The results from the survey have been presented graphically so as to analyse the trends and relationship between job categories, percentage of time spent on written and oral communication, and to assess the impact of technical communication on the respondents' careers.

Figure 2 shows the feedback given by the respondents in terms of percentage of time spent in communicating and teamwork. The trend as presented in Figure 2 suggests that majority of the engineers spend their work time on written

and other oral communications through meetings, progress/site meetings and on-line multimedia conferencing, However, engineers are less likely to be involved in formal oral presentation. Out of a total of 28 respondents, only two respondents spent more than 50% of their work time on formal oral presentation. Based on the results, technical communication is considered to be an important skill, as highlighted by the respondents. The importance of technical communication for employers arises because engineers need to communicate and discuss with employers by conveying technical ideas and findings concisely, especially, in the field of engineering.

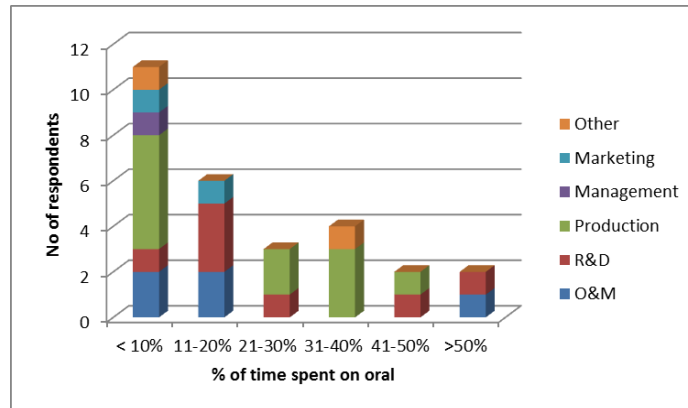


Figure 2: Percentage of work time spent in technical communication.

Figure 3 shows the respondents' perspectives on the importance of technical communication courses offered at the EESE Department during their undergraduate study. Most of the respondents agreed that the course *English for Engineers* was the most important subject, and that it helped them to enhance their technical communication skills. They agreed that the co-curriculum courses offered by the Centre for General Studies (CGS) were of least importance in assisting them in technical communication.

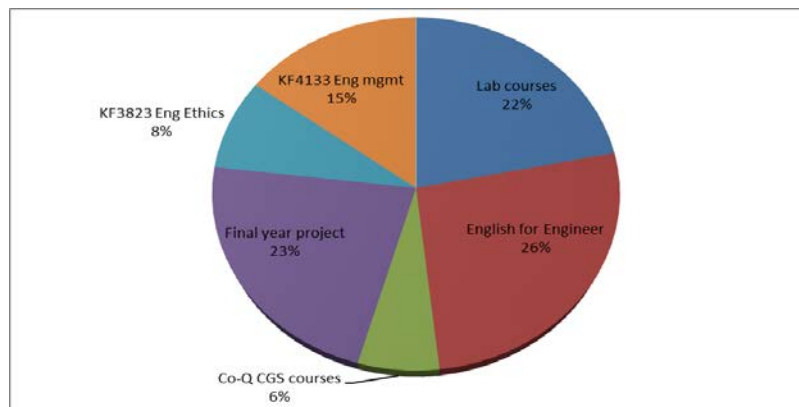


Figure 3: Importance of technical communication subjects received at UKM.

Figure 4 shows the results of the relationship between the time spent on formal oral communication and the respective job functions. Results shown in Figure 4 indicate that the majority (39.29%) of the respondents in all job functions spent less than 10% of their time on formal oral communications.

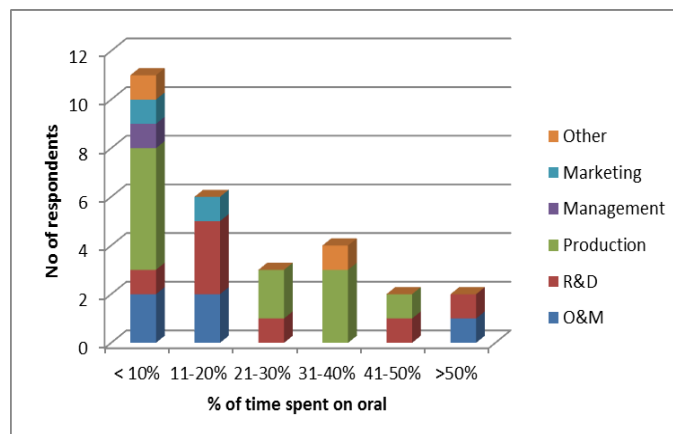


Figure 4: Relationship between job functions and the percent time spent on formal oral communication.

Figure 5 shows the results of the correlation between the time spent on written communication and the respective job functions. Most of the respondents (42.86%) from various job functions spent more than 50% of their work time on written technical communication, in which the majority of them are from the production industry. The results prove that written communication is of importance and that writing skills are required for presenting engineering assignments.

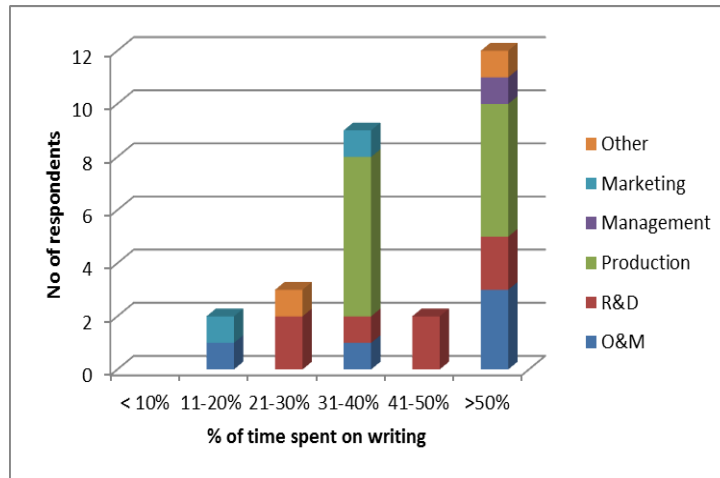


Figure 5: Correlation between percent time spent on writing and job functions.

Table 2 summarises the impact of technical communication skills on the respondents' engineering career based on a five-point Likert scale (from 1 - strongly disagree to 5 - strongly agree). Results shown in Table 2 indicate that all the respondents had a high level of agreement when asked whether technical communication would play an important role in developing their future engineering career. It can be observed that the level of technical communication skills acquired by the respondents correlates directly with the career benefits gained. The most obvious impact of technical communication on an engineering career was attributed to boosting engineers' self-confidence. However, the respondents were less likely to agree that technical communication plays a significant role in increasing their monthly income.

Table 2: Impact of technical communication skills on engineering career based on the correlation between the average response and index.

Impact of technical communication	Average Likert score
Get a job	4.21
Adjust to job	4.18
Advance in job	4.20
Increase salary	3.63
Gain recognition	4.00
Gain confidence	4.37

Comments from the respondents were also taken into account, and these comments can be classified into five different suggestions such as follows:

- English as the main language in teaching and learning (10 comments);
- More presentation and public speaking during undergraduate study (8 comments);
- Improve syllabus related to communication skills (2 comments);
- Introduce a subject primarily focus on public speaking (2 comments);
- Extra period for industrial training (1 comment).

The majority of the respondents suggested that the English language should be the main language used in teaching, while the second most common suggestion was to get students to participate more in presentations, public speaking, discussions and group assignments. Interestingly, despite the lower amount of time spent on formal oral communication (less than 10% in Figure 2), many respondents commented on the importance of incorporating oral presentations and public speaking in the technical communication subjects.

CONCLUSIONS

From this study, it was found that the majority of the respondents spent more than 50% of their time working in teams and spent more time on written communication compared with oral communication. The respondents agreed that technical communication would help to improve their engineering career; however, they were less likely to agree that it

would help to increase their salary. To improve the implementation of technical communication skills in the current teaching and learning activities, the majority of the respondents agreed that EESE students needed to participate more in oral presentations and that English should become the main language during lectures. Based on these findings, it is obvious that the EESE Department needs to improve the current technical communication approach in order to produce graduates not only with high-flying grades, but also able to communicate effectively, thus, ensuring the marketability of future EESE graduates.

ACKNOWLEDGEMENTS

This research is being funded by UKM PTS research grant (Ref: PTS-2011-036).

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BIOGRAPHY



Rosdiadee Nordin received his Bachelor of Engineering (BEng) degree from Universiti Kebangsaan Malaysia in 2001 and his PhD from the University of Bristol, in the United Kingdom in 2011. He is currently a senior lecturer in the Department of Electrical, Electronic and Systems Engineering at Universiti Kebangsaan Malaysia. His main research interest focuses on the wireless physical layer, such as advanced multiple antenna, resource allocation, green radio, intercell interference, and indoor wireless localisation and potential technology for fifth generation (5G) wireless network. He has also developed an interest in action research related to engineering education.