DOI: https://doi.org/10.4038/engineer.v57i1.7644

ENGINEER - Vol. LVII, No. 01, pp. [143-152], 2024

The Attributes and Areas for Improvement of Early Career Engineers in Sri Lanka

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Abstract: Over two thousand engineering graduates enter the job market in Sri Lanka annually from state and private sector universities. There is a growing concern in the industry whether those graduates have attained the required expectations of the employers. Academic literature also lacks sufficient evidence to demonstrate Sri Lankan early career engineers' strengths and areas for improvement. This study explores the strengths and areas for improvement of early career engineers from the perspectives of senior employer engineers in Sri Lanka. This study was conducted qualitatively by holding semi-structured face-to-face interviews with a purposively selected sample of twenty-two employer engineers. Voice-recorded interviews were transcribed verbatim and analysed employing the inductive thematic analysis method. Analysis has revealed that enhanced technical knowledge, analytical skills and computer literacy are the strengths of early career engineers, while money-mindedness, negative attitudes, sticking only to the job role and lack of hard-working skills, interpersonal skills and practical knowledge as the areas for improvement of present-day early career engineers in Sri Lanka. Further, few employer engineers have suggested modifying the university education system and educating academics & training engineers to guide engineering undergraduates on the proper path to achieve the career success.

Keywords: Attributes, Early Career Engineers, Improvements, Sri Lanka

1. Introduction

Engineering has been a leading and promising profession in the world for decades. Hence, there is a higher competition among the students to become professionally qualified engineers. Over two thousand engineering graduates enter the job market in Sri Lanka annually from state and private sector universities. Therefore, competition can be seen among the engineering graduates in the country for getting selected for engineering positions in leading and reputed engineering firms. Young engineers employed in various engineering firms perform in multiple capacities. Hence, employers have diverse perspectives about newly joined engineering graduates. There is a growing concern in the industry to check whether those graduates have attained the required expectations of the employers. This study aims to explore the strengths and areas for improvement (weaknesses) of present-day young engineers from the perspectives of employer engineers in Sri Lanka. The outcome of this study is beneficial for numerous stakeholders in the engineering fraternity to address the areas of improvement while reinforcing the strengths of present-day young engineers in the country.

2. Literature Review

The transition from education to practice can be troublesome for many early career engineers because expectations, habitual work practices and values tend to conflict with realities of engineering workplaces [1]. Lack of knowledge on the employability skills required of fresh engineering graduates negatively affect the individual performance of themselves and the workplace. With the years of experiences, employers know the employability skills required by the employees. Further, they have an idea about the strengths and areas for improvement of the current employees as per their requirements. This is valid for the field of engineering, too. Employers who employ early career engineers in their firms can understand their strengths and areas for improvement in the professional practice.

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Studying the strengths and areas for improvement of various groups of professionals and young graduates in various territories is not a novel domain of study. Various scholars have done many studies in the world during the past few decades to benefit all stakeholders of those professions [2].

Since previous decades, frustration and dissatisfaction in young graduates' early careers have been widespread because of several factors: their job expectations; they find it difficult to change from school's short-range perspectives to work's long-range view; many employers assign them boring tasks that don't challenge them; and they may begin under an incompetent first supervisor [3].

Engineering is a dominant profession in the world. Young engineers are offered job roles in various industrial sectors of private and state sector organisations. They experience different work environments, which are totally different from the university environments. Therefore, sometimes, some early career engineers might not have the relevant employability skills as expected by their employers. Although they learn many theories and technical matters during the undergraduate period, lack of practical experience in engineering practices can be the major reason for numerous weak points within them [1].

Identifying the strengths and weaknesses of any person or a program emerges with the concept of the SWOT Analysis. Strengths, weaknesses, opportunities, and threats (SWOT) analysis has become a fundamental tool for organisations to evaluate their position in the market and is widely used to analyse the internal and external environments of organisations during times of indecision. Normally, SWOT analysis is widely used in the field of strategic planning. However, studies have highlighted that the SWOT model can also be used to evaluate third-party persons [4]. Hence, employers can perform a SWOT analysis on their employees to better understand them when planning the work. Therefore, a study focusing on exploring the strengths and weaknesses of young engineers in the country in the perspectives of employers can be identified as an essential requirement in the contemporary job market.

Many studies in the literature have focused on the strengths and weaknesses of early career engineers or young engineers in many contexts [5]–[7]. There were many observations which are common in many contexts. A study conducted in Canada has identified that early career engineers lack the necessary communication skills in the written and spoken aspects [8]. Hence, they have proposed writing across the curriculum (WAC) and communication across the curriculum (CAC) movements that suggest constructing a progressive pathway to the skill development of engineering undergraduates within the university. A specific way to achieve this progression is by designing tools to help faculty to spread this skills development process throughout the existing curriculum rather than in a particular course.

Another study conducted in the United States of America (USA) to identify the strengths and areas for improvement of early career Mechanical Engineers from supervisory engineers' perspectives has identified the following [6]. They lacked an understanding of how devices are made and work, inadequate communication skills within diverse engineering teams and with non-engineers elsewhere in the organisation, insufficient knowledge of engineering codes and standards, and lack of systems perspective. However, young engineers have judged that their greatest weaknesses are practical experience, project management, business process knowledge, and engineering codes and standards. The two groups, that is, supervisory engineers and young engineers, agreed that young engineers are experts in computer modelling and technical knowledge. They further recommend the following strategies to minimise the weaknesses observed in the early career mechanical engineers in the USA [9]. Those recommendations are as follows.

- creating curricula that inspire innovation and creativity,
- increasing curricular flexibility,
- offering more authentic practice-based engineering experiences,
- developing students' professional skills to a higher standard,
- attracting a more diverse student body,
- increased faculty expertise in professional practice,
- adapting post-graduate education to support specialisation for practicing engineers

The transition from engineering education to engineering practice was identified as an understudied component in engineering

education worldwide [1]. Studies have recognised that the lack of financial knowledge and communication skills required for the workplace is a barrier for early career engineers to transition smoothly from university to the workplace [1].

Nowadays, engineering firms recruit engineers with sufficient technical knowledge who can bridge it with the employees and social needs. According to [10], early career engineers confront the first challenge when proving the ability to fit the company's culture and deliver performance according to the demands. Lack of necessary soft skills to fit the new organisational setting can be considered a weakness of early career engineers. A review study conducted by [11] has identified that the most important soft skills for the employability of engineers can be grouped into six main groups: Problem-Solving and Critical Thinking, Communication, Teamwork, Ethical Perspective, Emotional Intelligence and Creative Thinking. Moreover, both the university or training and the work environment should provide a positive learning environment for engineers to accomplish those requirements for self-development and self-knowledge using the necessary tools. According to [11], it is up to the professionals to use these tools to take ownership of their career, working to be updated on technical knowledge and, eradicating weaknesses and improving strengths.

Even though research literature contains ample evidence of studies on strengths and areas for improvement of early career engineers in different geographical contexts [1], [7], [9], Sri Lanka such studies, at least to compare and benchmark with such findings. Having a knowledge gap in that area is not favourable to create world class graduates from the Sri Lankan universities. It is a timely requirement to explore this grey area to commence an ongoing conversation among the stakeholders of engineering education on the professional development of young engineers. It is more important to investigate it from the perspectives of the leading employers in the country first.

3. Methodology

A qualitative study was designed to accomplish the objective of this study from fresh perspectives. Data was collected from the leading employer engineers in the country for early career engineers. In this case, the purposive sampling strategy was adopted as the most suitable sampling strategy for this qualitative study [12]. According to the purposive sampling strategy [13], professional engineers working as leading employers in the country (serving in the positions of Managing Director (MD) and Chief Executive Officer (CEO)) who recruit young engineers to their firms in the country were selected. The authors believe that employer engineers have a better idea about the strengths and areas for improvement of early career engineers in the country than any other employers. Face-to-face interviews were conducted via Zoom or by physically visiting their offices based on their preferences. Interviews were voice recorded with the consent of the participants (employer engineers) and transcribed verbatim into MS Word files to commence the analysis process [14].

The first author of this study got familiarised with the data (interview transcriptions) by listening to the voice-recorded interviews and reading the transcriptions several times before the data analysis [14]. Inductive Thematic Analysis (ITA), a flexible analysis method available in the qualitative domain, was selected to achieve the objective of this study. In that method, steps like generating initial codes, searching for themes, reviewing the themes and defining the themes should be followed without considering the existing literature relevant to the research topic to dive deep into the findings in fresh perspectives [14]. Unlike in quantitative studies, qualitative studies rely on small sample sizes [13], [15]. Hence, interviews were conducted with 22 employer engineers in the country. When analyzing the last few interviews of participants, first author realized that no new themes were emerging from the data with respect to the objective. According to the qualitative study guidelines, it is the point where theoretical saturation occurred [14]. Hence, the interviewing process was terminated after 22 participants. To preserve the confidentiality of the participants, pseudonyms from the English Alphabet were used instead of their real credentials [14]. NVivo qualitative data analysis software was used to facilitate the data analysis process. All transcribed interviews were uploaded to the NVivo software and coding was done manually by givin lables to the data. NVivo software facilitated the author to manually work on the coding process.

4. Results & Discussion

Twenty-two participants who were interviewed for this study have the chartered engineer status. They belong to the engineering disciplines of Civil, Electrical, Mechanical and Chemical Engineering as per their field of specialisation during the undergraduate period. The firms run by them are private-sector engineering firms, and most of them are the owners of those firms which have employees of small to large scale enterprises. Overall, their firms have employed 1 to 50+ engineers based on the size of the firms. Further, all of the employer engineers give opportunities for engineering undergraduates to undertake the industrial training within their firms. All had more than ten years of industrial experience, confirming their suitability for this study.

ITA of results has revealed a vivid set of themes relevant to the strengths and weaknesses of early career engineers in their firms. Employer engineers have highlighted enhanced computer literacy, technical knowledge & analytical skills and fair use of communication skills as strengths. As per the analysis, less hard-working, money-mindedness, negative attitudes, lack of interpersonal skills, and sticking only to the job role can be identified as the major themes related to the weaknesses of early career engineers. Employer engineers also have suggested some recommendations to address those weaknesses.

4.1 Strengths

Based on their years of industrial experience as employer engineers and business owners in the Sri Lankan industrial sector, participants have highlighted three major themes of strengths of current early career engineers. They were, namely, enhanced computer literacy, enhanced technical knowledge and analytical skills, and fair use of communication skills. The percentage of participants who have emphasized about those themes are mentioned below.

4.1.1. Enhanced Computer Literacy (100%)

Early career engineers nowadays demonstrate enhanced computer literacy. Employer engineers have identified it as a strength of early career engineers since that skill positively supports the workplace. An owner of a large-scale construction company, Participant S, emphasised it as "*They are quite strong on Information Technology, which helps them to perform analysis functions faster and prepare reports pleasing to the reader.*" The present generation is quite knowledgeable about information technology, and it also applies to young engineers [16]. This skill facilitates them to perform analysis activities and preparations of reports faster than before. It is also advantageous for employers since employees are not taking more time to analyse activities and report writing.

"*Fresh engineering graduates from universities are knowledgeable in computer applications and IT-related matters. They can find the answers quickly for complex problems using software.*" Participant U also has observed that the present generation of young engineers are knowledgeable in computer-related matters. The young generation could quickly complete the assigned jobs using computers; previous generations took longer. Good computer and IT literacy is a key strength of present engineers in the country [17]. Nowadays, the majority of engineering undergraduates use laptop computers during their study period for various activities confirming that the higher education system has reached a level which is never before where the use of computers has become an essential component in teaching and learning [18].

4.1.2. Enhanced Technical Knowledge and Analytical Skills (45%)

With the globalisation of the world, knowledge can be found at the fingertips [18]. This is valid for engineers as well. Hence, they can learn many things in no time as knowledge is accessible in online mode also. Therefore, employer engineers have identified that present day early career engineers are good at technical knowledge. Participant L has emphasised it as below. "*Most of the engineers passed out from the universities in Sri Lanka, they are powerful subject-wise. They are knowledgeable subject wise.*" Having good technical knowledge is very important for a knowledge worker like an engineer in today's industry [17]. Good engineering knowledge is the first graduate attribute of the engineering graduates of an accredited engineering degree program [19]. Several state-sector universities in Sri Lanka offer accredited engineering degree programs with international recognition [20]. Participant T further strengthens the above claim: "*Current engineering graduates are intelligent and more knowledgeable and fast.*" Good technical knowledge has provided current early career engineers in the country with good analytical skills. Participant C stated, "*Young engineers are very good in analysis, right? They technically know that very well, Very much better*

than us". According to him, the analytical skills of the young generation are better than the senior engineers in the current context. Not like other professions, analytical skills are essential for professional engineers [21].

Furthermore, some employer engineers have identified the difference in the technical knowledge of engineers who graduated from state and private universities in Sri Lanka. According to Participant J, "*Technically, state sector graduates are superior. Compared with the private sector graduates actually, state university graduands' technical skills are very high.*" The reasons behind those perceived differences must be investigated deeply in Sri Lankan context to develop world-class engineers from Sri Lanka from state and private sector universities.

4.1.3. Fair Use of Communication Skills (23%)

There is a mixed perception of the current communication skill requirement of early career engineers. Several employer engineers have mentioned that the communication skills of current early career engineers are at a good level while some others are not at a good level. This section discusses narrative evidence in favour of the above theme.

Participant H stated, "*Best thing is that they have better communication skills than earlier.*" Participant H has experienced continuing progress in improving the communication skills of the early career engineers who joined his firm during the past years. Participant T also added the following observations to this study. "*I would say their communication skills are significantly good. Certainly, the presentations are very good. Oral presentations are also significantly improved, but written presentation requires a lot of improvements.*" According to Participant T, written communication skills are not at a good level compared to oral communication skills. These pieces of evidence show that employer engineers have identified improved communication skills as a strength of young engineers. Usually, many studies have identified that improved communication skills are essential for any successful professionals, including engineers worldwide [8], [11].

The above three major themes have been identified as the strengths of early career engineers in Sri Lanka, according to the leading employer engineers in the country.

4.2 Areas for Improvement

Identifying the areas for improvement is very important for any professional to succeed in their professional life [6]. This study has revealed 5 major themes as the areas for improvement of early career engineers as observed by leading employer engineers in the country. Everybody has a responsibility to work on their own improvements and convert the weaknesses into the strengths of them. The percentage of participants who have emphasized about those themes are displayed in front of each theme.

4.2.1 Less Hard-working (86%)

Engineering is not a profession that can be easily performed within the comfort zones of any individual [17]. Every engineer needs to be involved with hard work during their job. Professional engineers must often leave their comfort zones and engage with crucial duties in their work environment [12]. Normally, most engineering graduates are unwilling to do a hard job to learn and get the experience of such complex work. Some expect easy ways of doing things. However, employers are looking for hard-working and dedicated engineering graduates, as they are the ones who can handle complex engineering operations in the engineering industry successfully [13]. Participant supports this notion by his statement:

"*Most young engineers focused on working only 8 hours daily and enjoying leisure. They have fewer commitments at this age and should be prepared to work around the clock, acquire maximum knowledge and strengthen their foundations.*"

According to him, most of the early career engineers he met in his company were unwilling to engage in hard-working job roles to get industrial experience. Most young engineers prefer to engage in an 8-hour a day job role rather than working long hours. But, as a senior engineer and a leading employer engineer in the country, Participant S recommends that fresh engineering graduates engage in their first job without having self-restrictions on the hours they work to learn the practical aspects of engineering. However, most early-career engineers are unwilling to spend much more time in the workplace beyond normal office hours. A similar concern was highlighted by Participant V as follows.

"*They don't want to go to difficult places. They want to be in Colombo or Kandy or near main cities.*

And they don't want to go through kind of difficult assignments".

Normally, everybody expects comfort in life. However, comfortability cannot always be achieved in an engineer's professional life if they want success [17]. According to Participant V, finding a suitable young engineer to send for duty in a remote area has become very difficult due to their lack of enthusiasm to do hard work. Furthermore, early career engineers expect convenient projects rather than giving their contribution to difficult engineering projects. Participant E has stated his experiences as an early career engineer as below.

"*They want the latest version of the computer, a vehicle, and a white-collar job. So that is the mentality of engineers passing out from the universities actually now. They don't like to go to the field and get their hands dirty. People should not focus on the salary during the first five years. They should go to places where they can learn. Then, they can sell what they have learned for the rest of their life at a higher value. But a lot of young engineers do not look at those things*".

This narrative explains the current behaviour of most young engineers he met in his company. Most young engineers have forgotten that engineers have field work to be involved. The engineering profession is not merely a white-collar job. However, the majority of young engineers expect white-collar jobs in industries. By sitting in an office, an engineer cannot get the real insights of engineering as many things are based on practical applications. Hence, proper exposure to the practical applications of engineering is essential for early career engineers [9]. According to Participant E, young engineers can market that experience and knowledge in the latter stage of their career. Unfortunately, the young generation has not identified that requirement and is reluctant to engage in the hard work during their first job as young engineers. These pieces of evidence prove that less hard-working behaviour is a weakness of current early career engineers in Sri Lanka.

4.2.2 Money Mindedness (77%)

Money is indeed an essential component of today's life. However, prioritising financial gains in the first job appointment is unacceptable, as per senior employer engineers in the country. Looking always for financial gains does not assist early career engineers' professional development and success [1]. Many participants have highlighted the money-minded behaviour of young engineers in the country as a weakness. Participant D has highlighted it as follows. "*During our times, we want to go and work in a place where we can get a good experience. Now the majority wants to work where you get a higher salary*".

As participant D highlights in the above, employer engineers compare the behaviour of the young generation with their own behaviours during early career stages. According to them, having good industrial experience is better than having a higher salary in the early stages, as proper industrial experience matters for survival in the industry. If young engineers prioritise salary over good experience, it will affect their profession negatively. Yet, if they can get both a good salary and industrial experience same in their first job, that will be very benefical for the young generation to accomplish the financial stability. However, such opportunities are not common in Sri Lankan industrial settings. Participant S also confirmed the young generation's money-conscious behaviour as follows.

"*They are highly money conscious. More concerned about what they can get more than what they can give in return*".

According to Participant S, selfish behaviour can be observed within the young generation. They always prioritise their gains from the workplace rather than fulfilling their responsibilities towards the workplace. Many employer engineers expect employees to respect and give their maximum support to the workplace. However, that behaviour is rarely observed in the young generation nowadays. The participant W supports this notion by his statement:

"*Their first target is on the salary. Then they look at the facilities they will receive from their employment.*"

According to him, the young generation's priority in their professional life is also concentrated on salary and financial benefits. As beginners, they should focus on getting a better work experience rather than focusing only on the financial benefits [17]. It is more important to get good practical knowledge at the beginning. Issues arise when they receive fairly insufficient training in a workplace even though they get a higher salary there. When

such an engineer goes for their second job, they will not be able to perform competently due to lack of good work experience. Therefore, money-mindedness has been considered a weakness of the current engineers.

4.2.3 Negative Attitudes (68%)

Employer engineers have highlighted that having negative attitudes is also not good for the young generation of engineers in the country. Participant M highlighted such behaviour as follows. "*When they come out from the university, they think that they are the kings in the society. They think that they know everything*". Engineering is indeed a reputed profession in the country and the world. However, it does not imply that the engineers are the wisest group in the society. Unfortunately, the young generation believes they are the wisest people in society and know everything. According to senior employer engineers, it is a wrong attitude and unsuitable for knowledgeable professionals like engineers [22]. Engineers should be open-minded to accept new knowledge and others' opinions. Participant U has highlighted another negative attitude of early career engineers that is unsuitable for the professional engineering world, as follows. "*They earn bread and butter from this place. Therefore, the priority should be given to the job. But, many do not have that attitude.*" As per participant U, every employee should fully commit to the job they are doing as it is their primary source of income. Unfortunately, some employees are involved with part-time jobs during the official work hours of the full-time job. It is observed by the employer engineers from the early career engineers in their firms. In that case, the attitudes of early career engineers towards their full-time employment are not acceptable.

"*Some people are lazy, and some are good. The only thing I think is from the university level, students' attitude should be changed.*" Participant F has stated the above suggestion as a remedy to change the negative attitudes of young engineers towards the engineering profession. There are lazy and lethargic employee engineers as well, in the workplace. The major reason behind the sedentary behaviour is the negative attitudes. To become competent engineers, young engineers should demonstrate energetic behaviour in the workplace, giving up negative and lazy attitudes. With negative attitudes, no one can accomplish success in their professional life.

4.2.4 Lack of Interpersonal Skills (59%)

Another major area of improvements observed in early career engineers is the lack of interpersonal skills. Interpersonal skills are essential for engineers when dealing with professional matters in engineering [22]. Participant G has narrated his observations as follows. "*Unfortunately, the main thing they lack is communication skills. Sometimes, I have seen many young engineers not involved with other community matters.*" Previously, some employer engineers have highlighted that the current generation's communication skills are better developed and identified as a strength. But, here, there are some comments from several other employer engineers that communication skills are not at a good level for the young generation. This reveals that more attention needs to be paid to improving the communication skills of the younger generation. Further, it was noted that young engineers' voluntary involvement with community-related matters is minimal. Involvement in community activities supports improving the young generation's interpersonal skills [23]. As per Participant G, it is essential for the young generation. Participant J also highlighted the weakness of lack of proper communication skills.

The communication skills of current engineering graduates are at a very low level. Presentation skills are low, especially in the state university graduates. They need to take stern action to improve this gap".

A special fact is uncovered from the above narrative. That is, the communication skills of state university engineering graduates are unacceptable. So, taking action to fill the communication skills requirement gap is very important. Participant N has highlighted another weakness of early career engineers relevant to the lack of interpersonal skills, as below. "*I think because of this smartphone and other things, people are slightly lazy. Therefore, less interaction between the people, that is the problem.*" It is about the lack of interaction with the people. The major reason for the lack of interaction with people is the frequent use of digital devices like smartphones. Less involvement with the people does not help young engineers get the skills in people management [22]. It is disadvantageous as engineers must manage people in the workplace successfully. It should be a skill that engineers should master. With this evidence, it is clear that lack of interpersonal skills is a considerable weakness that substantially impacts the profession's success.

4.2.5 Sticking only to the Job Role (45%)

This is another area for improvement as identified by the employer engineers. In most job appointments, the employer gives the job description to their employees and expects them to adhere to that and fulfil the job-defined responsibilities without fail. However, engineers sometimes have to perform duties not mentioned in the job description for the smooth functioning of the organisation. Employer engineers have observed that early career engineers are unwilling to perform other tasks beyond their job description. According to employer engineers, they have not behaved like that during their early career stages and supported the operations of the firm wholeheartedly. They have identified it as a major reason for their own professional success. Participant J has emphasized this matter as below. "*When somebody gets a job, he or she tries to do only the assigned work. But that is not the way we should follow. He has to do everything.*" Sticking only to their job role does not allow young engineering professionals to learn the other functions in the firm. Knowledge and experience gained in the firm's other activities are very important when the young generation step into the top management positions with time. However, still, early career engineers have not identified the significance of that. Further, participant N added the comment below.

"*I have observed that they are working hours and hours in front of a computer. But they don't know how to clean their work table. They are less sensitive to the environment.*"

According to Participant N, the early career engineers he met in his firm were unaware of their surroundings. Even though young engineers complete their job-related duties, sometimes they do not pay attention to other non-technical aspects of the job. Maintaining the cleanliness of the workstation is not a big thing to do. However, some engineers do not focus on those things and are not sensitive to their role in the workplace beyond the job description. Hence, it can be identified that sticking strictly to the job description is not acceptable for early career engineers, according to the senior employer engineers in Sri Lanka.

Likewise, five major themes have been identified from the analysis as the weaknesses of early career engineers in Sri Lanka according to the perspectives of several senior employer engineers. However, weaknesses like money-mindedness and sticking only to the job role have not been identified as weaknesses in similar previous studies [3], [6].

4.3 Recommendations

Participants were interested in giving recommendations to the academic staff of the faculties of Engineering in Sri Lanka to support future engineers' professional development further. These recommendations have significant importance because employer engineers are the ones who notice the suitability of passing out graduates from Sri Lankan universities for the industrial sector. Participant E is unhappy about the current semester system adopted by the universities. "*Education is what is left within us after our studies. No one remembers everything, but at least we must remember something and the basics. So this semester system doesn't support us to remember the basics for future use*". The semester system was introduced to the university system several years ago to align with the systems used in other countries. A semester consists of 14-15 weeks of studies and then an examination. However, it is too fast, and students get less time to interact with the subject matter. Hence, students have only a shallow knowledge, and it will not last for a longer time. The below narrative highlighted by Participant T carries the same idea.

"*Young engineers' view of the profession and the society is narrower. The reasons attributed for that are twofold. One is that this semester system makes them quick learners and helps them quickly forget them. You are also a University teacher, no? So you know that, at the end of the semester, they would certainly not remember what subjects they have studied after a year or two.*"

Participant T's narrative excerpt highlights several insights into the semester system. According to him, young engineers have a narrower view of the profession and society, which is disadvantageous for their professional performance as engineers. Further, he explains how the semester system causes engineering students to forget what they have learnt in a shorter period. These claims on the semester system need systematic studies to determine whether it is effective for engineering undergraduates. Hence, further studies should be done on the semester system by gathering information from all engineering education stakeholders.

"*University academic staff have a big responsibility to guide engineering undergraduates. They (Lecturers) are not doing that because they are not*

aware. They are not qualified for that; they are not socially sound on these matters."

Participant C stated the above narrative during his interview to raise his voice to make university staff aware of an essential requirement. According to him, the university academic staff's contribution to raising the awareness of engineering students on their social responsibility required to be improved. Participant C further emphasized the major reason for the lower contribution is the lack of competence of academic staff on the sociological background of the engineering profession. Undoubtedly, the academic staff of state universities for engineering undergraduates are highly qualified in the technical fields. However, they also have a lesser understanding of the sociological impact on the engineering profession. It is better if university academic staff can get proper training on these matters to successfully guide the engineering undergraduates to become socially sound competent engineering professionals in the country.

"Young engineers should fit with the current industry requirements. In that case, university academics and senior engineers who supervised engineering undergraduates and young engineers have a higher responsibility to guide them. These things should be continously discussed in the engineering community".

According to participant A, there should be an ongoing conversation in the engineering community regarding the improvements required among the young engineering graduates to fit with the current industry trends. If these things are discussed thoroughly in the engineering community, then only the academics and supervising engineers get more awareness on the matters they should focus when guiding the young engineering generation.

These recommendations need further clarifications and studies to take actions accurately. Still, there are some controversial findings in this study. In the first section of this article, several participants have highlighted that current-day early career engineers have strong technical knowledge and analytical skills. In the recommendation section, several others have emphasized that most young engineers do not remember what they have learned as an engineering undergraduate because of the semester system in the university. Hence, more systematic studies should be carried out to investigate these matters further and reach valid conclusions. Then, further actions can be taken to enhance the professional competency of early career engineers in Sri Lanka, even to compete in the international job market.

5. Conclusions

This study has revealed that enhanced technical knowledge, analytical skills, and computer literacy are the strengths of early career engineers, while money-mindedness, negative attitudes, sticking only to the job role, and lack of hard-working skills, interpersonal skills & practical knowledge are the weaknesses of present-day early career engineers in Sri Lanka. Further, employer engineers have suggested modifying the university education system, educating academics and senior engineers to guide engineering undergraduates on a proper path and developing an ongoing conversation on such matters in the engineering community.

As a qualitative study, the findings cannot be generalised to the whole population of early career engineers in the country. A generalizable result can be obtained through a systematic quantitative study conducted on a randomly selected sample of senior employer engineers and early career engineers. Moreover, study should be extended to the academic staff of faculties of engineering to get their perspectives also. Further, only male engineers have attended this study as research participants, and it can be assumed that choosing senior female engineers for the interview process will diversify the outcomes and enhance the trustworthiness of the findings. Hence, future studies should be developed considering the limitations of this current study.

Acknowledgment

The authors wish to acknowledge the assistance given by senior employer engineers in Sri Lanka by sharing their valuable experiences during interviews.

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