



THE HUMAN COMPETENCIES (SOFT SKILLS) REQUIRED TO BE AN EFFECTIVE PROJECT MANAGER AND ENSURE PROJECT SUCCESS. A CASE STUDY IN SOUTH AFRICA

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ABSTRACT

Within the civil engineering consulting field, most engineers are expected to perform project management duties at some point. A literature review shows that a project manager's human competencies/soft skills are vital and contribute to project success. However, it appears that more emphasis is placed on technical skills in undergraduate engineering programmes, with soft skills not garnering enough focus. The literature review found that the following soft skills are the main soft skills required by a project manager for project success. Communication, Problem Solving, Leadership, Emotional Intelligence, Decision Making, Conflict Management, Team Building and Negotiation skills.

Surveys were used and the sample population included recent engineering graduates and senior engineering managers. The key conclusions of the study are that both groups agree that more emphasis should be placed on teaching soft skills in higher education institutes (HEI). Graduates believe that some critical soft skills such as team building, communication, decision making, problem solving, motivation, and Conflict Management skills are being taught at HEIs. However, managers believe that this is not the case, and these skills need to be adequately addressed in training, adding that graduates need to realise the importance of these skills in practise. Graduates believe that the top three soft skills required by project managers are communication skills, emotional intelligence, and leadership skills. Managers believe that the three soft skills required by project managers are communication skills, Decision-Making skills, and leadership skills. Suggestions are included on how these skills can be taught.

Keywords: Project Manager, Project Success, Civil Engineering Industry, Soft Skills

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1 INTRODUCTION

Within the field of civil engineering consulting, most engineers are expected to perform project management duties and execute projects from start to finish. As engineers develop in their careers, they are expected to evolve from a technical role to a management role, managing teams, clients, and other stakeholders. The field of civil engineering consulting is mainly operating through the execution of projects from the inception to the closing stages of the project. As a result, engineers need hard and soft skills to execute successful projects. However, according to academics [1], [2], [3], [4], [5], [6], [7], there is little emphasis is placed on the development of project management skills (human competencies) within the various undergraduate civil engineering programmes being offered.

[2], emphasised that educational institution's academic and training programmes should place more importance on the upskilling of "personal characteristics", and it was seen in their study that a project manager's attitude and personal characteristics had a high impact on achieving project success. However, they also mentioned that these personal characteristics must complement technical skills to be a well-rounded project manager.

A project manager who embodies soft skills in project management is vital because human interaction within the field of project management and in the completion of a successful project is crucial [8]. The success of a project is said to be obtained by how well the project team works and interacts (interaction between internal teams, external stakeholders, clients, licencing authorities, and other vital role players) [9]. Factors such as communication, leadership, and emotional intelligence are critical to ensure that a project team works well together to ensure project success. It is becoming more evident that more emphasis is needed on soft (interpersonal) skills to guarantee that a project manager will be effective in his job.

1.1 Problem Statement

There needs to be more emphasis on teaching the soft skills required to be an effective project manager. However, it is becoming more apparent, by the changing face of projects, regarding complexity and how they are executed, that soft skills are required to supplement the traditional project management and hard skills of a project manager [8].

An integral part of project management is the interaction between the project manager, the client, relevant stakeholders & authorities, the professional team, and the internal project team. Unfortunately, many organisations and recruiters appoint project managers purely on the basis of their technical skills without considering their human competencies and people skills [9].

Recent research indicates that soft skills are as critical, if not more important, than hard skills when hiring a potential candidate for a job position [8], [10], [11]. Furthermore, studies indicate that when new hires do not meet the employer's required expectations in their new positions, the absence of soft critical skills is considered the cause.

The set of skills that an effective project manager must embody is still being debated by academics and researchers in the literature on this topic. It is also said that more emphasis should be placed on developing these soft skills within the various undergraduate engineering programmes offered by higher education institutes. This is seen as a stumbling block in the development of young engineers' careers, as managing projects and the need to possess soft skills when working within project teams is a vital key performance area in the development of engineering careers.

1.2 Objective

The objective of the research is first to understand the body of literature available on the related topics of the title and first to establish an understanding of the current research in the field. By understanding the existing body of literature, gaps in the literature are





established, leading to the formulation of research questions. Regarding this study, the identified research perceived gap identified is that more emphasis should be placed on teaching soft skills within the various undergraduate engineering programmes offered by higher education institutes. Therefore, a survey is conducted to identify if this is the case by establishing the perceptions of two groups of research participants, one group being *recent engineering graduates* and the other *senior engineering managers* operating within the consulting engineering field in South Africa. The perceptions between the two groups of participants are then analysed to determine the critical perceptions of these two groups and how they relate to the themes identified in the literature review.

1.3 Research Questions

The following research questions were drawn from the literature review.

Research Question 1: *What are the top human competencies (soft skills) identified to be an effective project manager and ensure project success?*

Research Question 2: *Since engineers are required to execute projects, as this is the nature of business in consulting engineering firms, are these human competencies effectively taught within the various undergraduate engineering programmes at higher education institutes?*

Research Question 3: *Should more emphasis be placed on developing soft skills in undergraduate and postgraduate engineering programmes?*

Research Question 4: *How can these soft skills be further developed in undergraduate and postgraduate engineering programmes?*

2 LITERATURE REVIEW

2.1 Projects

In the last decade, academics have focused a lot on understanding the nature of projects [2]. In addition, consulting companies within fields such as engineering and architecture are project-orientated businesses that focus on implementing projects for various clients as their core business. Therefore, in this modern age, successful implementation of projects plays a vital role in the development of successful companies [1].

One of the most common definitions of a project is defined in the Project Management Body of Knowledge (PMBOK) guide as "a temporary effort undertaken to create a unique product, service, or result" [12].

Since projects are unique and often complex, even though much emphasis has been placed on advancing the implementation of projects, many projects to this day still fail [13], [2]. Therefore, there is an urgent growing need to further develop project management processes and project management competencies to provide excellence in the implementation of projects and ensure successful projects [14], [5].

2.2 Project Management

The field of project management is vital in the implementation of projects and governs the way projects are executed. Various project management organisations oversee the profession of project management, such as the Project Management Institute (PMI) and the International Project Management Association (IPMA).

PMBOK defines *project management* as "the application of knowledge, skills, tools, and technique to project activities to meet project requirements" and characterises "high-quality projects as those that deliver the required product, service, or result, within scope, on time, and within budget" [12].





It is evident from the PMBOK management areas and process groups that the field of project management is diverse and some aspects need to be managed with a more technical approach [8]. Previously, the field of project management was seen to pay more attention to the technical and hard skills of a project manager [10]. It has also been noted that previous editions should have emphasised the person skills of a project manager rather than focused more on the hard and technical skills [15].

As the field of project management is further researched and experience in project implementation develops, it has become more evident that a project manager has not only technical and hard skills, but also soft "people" skills, too [4]. A project is executed by a team that comprises a project manager, team members, and stakeholders, and at each stage of the project, there are people interactions. Therefore, [16] theorise that project management involves people management, which requires a different set of skills of project managers. These skills are known as soft skills and are often referred to as human competencies of a project manager.

2.3 Project Success

Projects are unique and can become complex endeavours, and as the implementation of successful projects becomes increasingly important, there are still many projects that fail [1]. [16] reported that the project success criterion is constantly evolving as more research and experience are gained in project management. Since projects can be complex endeavours, project success criteria can also become complex [2].

It has been stated that the initial literature on project management success focused on this traditional definition of success, as defined in the PMI and referenced as the "classic project triangle" of time, cost, and quality. However, the success criterion has moved away from this and expanded to include other aspects [2]. One of the main reasons for the failure of the projects, as reported by [17] was that the projects were initially assumed to be similar and that a similar set of tools and skills should be used in the implementation of each project. However, only some projects are the same and should be treated as such.

From the literature on project failure, it is evident that the skills and competencies of a project manager play a vital role in achieving project success, with [16] stating that project management frameworks alone cannot achieve project success.

2.4 The Role of the Project Manager in Project Success

The role of the project manager has gained significance over the years in ensuring project success and is a popular topic amongst the project management research community. Moreover, project success has been inexplicably linked to the project manager's competencies and skillset in the project management literature.

[8] links the success of the project with the ability of the project manager and the project team, considering that a project is executed as a set of efforts completed to achieve the goal of the project. Hard and soft skills play a vital role in project success, as these skills assist the project manager to better executing the project better. The skills identified by [10] include communication, team building, and problem-solving skills. [17] identified that the personality and behaviour have an impact on project success and therefore stressed that the personality of a project manager cannot be ignored when it comes to the positive outcome of a project and that honesty is a necessary trait to consider.

[18] states that the appointment to a project determines the success or failure of the project. [19] places great emphasis on the project manager's style, manner of leadership, interpersonal skills, and expertise to achieve project success. The research of [2], [20], [21], [6] and [5] all continues in the same vein by identifying a project manager's competencies and interpersonal skills of a project manager, as influences the success of the project.





[5] and [8] agree that more than technical competencies are needed to ensure project success. Therefore, the balance of hard, technical, and soft skills influences the success of the project.

A study by [2] identified those project management traits that positively influence project success, including optimism, team building ability, motivational ability, trust building ability, emotional intelligence, and improvisation. All identified traits relate to the soft skills of a project manager. [10] indicated that a deficiency of soft skills in a project manager could lead to project failure.

The literature on this subject connects the human competencies of a project manager as one factor contributing to project success.

2.5 Effective Project Manager Skills and Competencies

Since the project manager's competency and skills have recently been linked to project success, a vast body of literature has sought to identify these critical competencies and skill sets.

[8] have alluded to the need for a successful project manager to possess a balance of hard and soft skills, as these skills, hard and soft, interact throughout the life cycle of the project. The authors conclude that "Hard skills reflect what you know, soft skills indicate who you are." They also emphasise the project manager's communication skills as one of the most critical skills to successfully manage each project stage. Communication is essential because the project manager spends a lot of time communicating at every stage of the project. Up to 85% of their time [8].

Although it is evident that a balance between hard and soft skills is required for the success of a project manager, [10] has brought attention to the fact that employers need to pay more attention to the soft skills required by a project manager, as project managers employed in the construction industry have been seen to possess strong technical skills, but they possess insufficient soft skills. The study concluded that soft skills play a vital role in helping the project manager solve project problems and planning and executing the project successfully.

2.6 Identifying key human competencies (soft skills) from the literature

Previous studies have emphasised the identification of the soft critical skills embodied by a project manager to balance technical/hard skills and ensure project success. As a result, various research articles have been identified in this field and each article has been analysed to determine the soft critical skills identified in the article. From the 16 research articles analysed in this study, the top ten soft skills that a project manager needs to achieve successful projects were identified and are recorded according to the ranking in the table below. The top soft skills were identified by the number of times a particular soft skill was mentioned in the total number of articles analysed. They are indicated in the table below.

Table 1: Top ten soft skills identified from the literature review

Rank	Soft Skill	Number of times mentioned in the reviewed research papers.
1	Communication Skills	12
2	Leadership Skills	10
3	Team Building Skills	9
4	Conflict Management Skills	8
5	Problem Solving Skills	7
6	Motivating Skills	7





Rank	Soft Skill	Number of times mentioned in the reviewed research papers.
7	Decision Making Skills	6
8	Negotiation Skills	5
9	Emotional Intelligence	4
10	Influencing Skills	3

2.7 Development of Soft Skills

[1] highlighted a disparity between what higher education institutes were teaching and the skills required by project managers to manage increasingly complex projects in increasingly difficult work settings. They argued that education institutions should offer more to better their students to prepare them for their careers and develop them into outstanding project managers. They established in their study that one way of doing this is that educational institutes give more attention to assisting students in developing "softer" skills to manage projects, especially "...interpersonal skills and leadership as opposed to just technical skills."

Similarly, [2] emphasised that educational institution's academic and training programmes should emphasise the upskilling of "personal characteristics." It was found in their study that attitude and personal characteristics had a high impact on the achievement of project success. However, they also mentioned that these personal characteristics must complement technical skills to be a well-rounded project manager.

Similarly, [3], [4], [5] and [6], also emphasised the need to pay more attention to the education of soft skills among students within the field of project management and engineering fields of study. [6] emphasises the gap between the teaching of soft/interpersonal skills and hard/technical skills.

The literature shows that the need to emphasise soft skills education is still a prevailing theme and relevant according to various researchers' studies, as demonstrated above.

2.8 The South African Context: Soft skills required in the current climate

Implementing a project in South Africa (SA) presents a unique set of challenges that can make a project complex and difficult to implement. SA is still a developing nation post the 1994 democratic elections which saw SA being freed from the previous apartheid government. In South Africa, challenges such as poverty, unemployment, corruption, and inequality are challenges people face daily. It has also been found that the diversity in SA between the various cultures plays a crucial role in the successful implementation of projects when analysing 'Mega Construction Projects' such as the Kusile and Medupi power station projects that are currently being implemented in SA [22]. Mega construction projects are characterised as projects that are large-scale, complex, have a duration of execution that exceeds four (4) years, have a total cost of implementation of more than \$1 billion, and involve numerous stakeholders [23].

Executing projects in the South African context can often be challenging, especially in the public sector. South Africa is still a developing country with a developing economy that is currently grappling with mismanagement of funds, corruption, poor service delivery, incompetent public servants, lack of accountability, poor human resource practises, inadequate procurement practises, and lack of leadership [24].

Noting the unique challenges experienced in the South African industry [3] indicated that graduates must possess a unique set of interpersonal and technical skills to achieve project success within the climate of SA. Interpersonal skills are the most important, considering the unique challenges experienced with project implementation and delivery in SA.





3 RESEARCH METHODOLOGY

3.1 Literature Review Themes

The themes relating to the topic and problem statement field of research are drawn from the literature review.

The main themes identified from the literature review are:

- **Projects** are becoming increasingly complex to execute in the current global environment. Especially evident in the South African context due to the increasing number of challenges experienced locally.
- **Project Management:** As the developing field of project management is further researched and experience in implementing projects develops, it has become more evident that project management requires a project manager who possesses not only technical/hard skills but soft skills too.
- **Project Success:** In recent years, it has become more apparent that the project manager and his competencies are integral to ensuring project success.
- **The role of the Project Manager in Project Success:** It has become more apparent that the project manager's human competencies/soft skills are vitally important and contribute to project success. And not just technical skills.
- **Effective Project Management Skills and Competencies:** Much research has been done to determine the most important soft skills.
- **Identifying Critical Human Competencies (Soft Skills) from the Literature:** From the literature, the most vital soft skills possessed by a project manager were found to be, in order of importance, communication skills, leadership skills, team building skills, conflict management skills, problem solving skills, motivation skills, decision-making skills, negotiation skills, emotional intelligence, and influencing skills.
- **Education of Soft Skills:** There is a vast and ever-growing theme in the literature that more emphasis should be placed on teaching soft skills at higher education institutions.
- **The South African Context - Soft skills required in the current climate:** Taking into account the current challenges experienced in South Africa, project managers must have the soft skills to handle complex projects in SA, each with its unique set of challenges.

3.2 Study Design

Two sample groups were identified and targeted to gather information, address research questions, and determine how current perceptions within the civil engineering consulting field relate to the themes identified in the literature review:

1. Engineering Graduates (EG).
2. Senior Engineering Managers (SEM).

The method of research chosen to gather information from these two groups is the Mixed Research Method.

The chosen data collection instrument is the survey gathering tool and is explained further in the following sections. Two surveys were designed for each sample group on the SurveyMonkey® online survey platform, SurveyMonkey®. The survey questions are both qualitative and quantitative.

Prospective participants for each sample group were identified among colleagues and associates in the field. The link to the online survey and a letter explaining the study being carried out were sent to prospective participants. The raw data from the completed surveys were then analysed using quantitative and qualitative methods. The results of the analysis





were discussed and compared with the themes identified in the literature review. Conclusions were drawn from the identified analysis to answer the research questions. Limitations of the study were highlighted. Finally, recommendations for future studies were identified.

3.3 Research Setting

The study was carried out within the consulting engineering sector, as data was collected from professionals in this field. The geographical location of the population group was limited to the Gauteng Province of South Africa.

3.4 Data Collection Instrument

Two surveys were designed and included questions to confirm whether the participants met the population group criteria required for the study. The remaining survey questions address the identified research questions, as well as to shed light on the themes identified in the literature, and were of a quantitative and qualitative nature.

3.5 Data Collection Process

Prospective participants were identified within the two sample groups. A letter was sent to each prospective participant by email. The letter addressed to each sample group contained the following:

1. An invitation to participate in the survey.
2. The title of the research study, details of the problem statement, and the purpose of the study.
3. Details of the researcher and the reason for the research (Qualification to be fulfilled).
4. The link to the online survey is for Engineering Graduates (EG) or Senior Engineering Managers (SEM).
5. The criteria the participant must meet to complete the survey.
6. The following vital statements about your participation in the survey are:
 - Participation in the research project is voluntary, and participants are not compelled to participate in the survey.
 - The option for the participant to decline to participate in the survey altogether or leave blank any questions that the participant does not wish to answer.
 - Confirmation that there are no known risks to participation in the survey and that participation in the survey will not harm the participant's reputation.
 - Confirmation that the responses will remain confidential and anonymous.
 - Confirmation that the collected data will remain confidential, safe, and reported only as a combined total.
 - Confirmation that no one other than the researcher will know the participant's answers to this questionnaire.
 - An indication that the survey may help participants in their careers to raise their awareness / curiosity about the soft skills required in project management.

3.6 Study Population and Sampling Method

The two identified sample populations are as follows.

1. Engineering Graduates (EG) and
2. Senior Engineering Managers (SEM).

Engineering Graduates (EG).

- Engineering graduates have graduated with an engineering qualification in the last five years and have at least one year of working experience in the engineering industry.





Senior Engineering Managers (SEM).

- Senior managers/directors/professionals within the engineering industry with five years or more experience, who work closely with recent engineering graduates and are involved in recruiting engineering graduates, and
- Engineering professionals who are registered and have five years or more experience.

Surveys were sent to prospective participants in May and June 2022. The participants/target sample was identified within the consulting engineering field (colleagues and members of other consulting firms identified).

3.7 Ethics

The survey questions considered ethical principles of autonomy, beneficence, non-maleficence, and justice when conducting this research study.

The survey questions were designed considering the *University of Johannesburg: Faculty of Engineering and the Built Environment, Faculty of Ethics, and Plagiarism Committee, Standard Operating Procedures for Research Ethics*.

4 RESEARCH RESULTS

4.1 Methods of Analysis

4.1.1 Qualitative Analysis

A Mann-Whitney U test was performed on the qualitative questions of the survey due to the limitation of the small sample size for this study.

4.1.2 Quantitative Analysis

Most of the questions required qualitative analysis, as they were open-ended questions. Additionally, due to the limitation of the small sample size, a summative analysis approach was chosen for the analysis method.

4.2 Findings and Discussions of Analysis

4.2.1 Survey Responses Received

Survey 1 (EG) was sent to 32 prospective participants. Seventeen responses were received, thus a response rate of 53.13%.

Survey 2 (SEM) was sent to 36 prospective participants and 19 were received. Therefore, the survey response rate was 52.78%.

4.2.2 Findings of the Participant Criteria

The first four questions of each survey focused on establishing if the survey participant met the required criteria to participate in the survey.

4.2.2.1 Engineering Graduates - Criteria

Of the seventeen participants, 15 participants graduated with an engineering qualification within the last five years and two did not. The two participants who did not meet this criterion graduated in 2016, this is only a year difference, and the difference proves to be insignificant within the study. Therefore, the responses of these two participants are included in the research analysis. The seventeen participants have work experience in the engineering industry, particularly in consulting, ranging from 1 to 5 years.





4.2.2.2 Senior Engineering Managers - Criteria

The 19 participants hold senior roles within the organisations they work for, with role descriptions including directors, managers, supervisors, and senior engineers. Seventeen of the 19 participants are professionally registered individuals with ECSA, and eight of them are registered mentors. The 19 have more than five years of work experience within the consulting engineering field.

4.2.3 Findings and Discussions of Engineering Graduate Survey Questions

Question 5 (EG & SEM): "Do you believe that the following soft skills are sufficiently developed in higher education institutes in engineering programmes? Decision Making Skills, Team Building Skills, Emotional Intelligence, Leadership Skills, Negotiation Skills, Communication Skills, Conflict Management Skills, Influencing Skills, Motivating Skills, Problem Solving Skills."

Findings: Among EGs, 76.47% agree that team building skills are sufficiently developed in higher education institutions. 64.71% agree that decision-making and communication skills are sufficiently developed, with 54.94% agreeing that problem solving skills and 43.75% agreeing that motivating skills are sufficiently developed. However, it appears that among EGs, there is a low confidence level in developing the following soft skills in higher education institutions, emotional intelligence, leadership skills, negotiation skills, conflict management skills and influence skills.

Among the SEMs, several participants agree that most of the soft skills listed are not taught at higher education institutions. However, there is agreement amongst SEMs that communication skills and problem-solving skills are being taught.

Discussion: From the findings, EG believes that some soft skills are being developed sufficiently. However, this contrasts with the conclusions of the SEM assessment, with SEM's having a much lower confidence level that these soft skills are being developed.

Question 6 (EG & SEM): "Following on from the previous question, do you have any further comments to substantiate your replies or general comments regarding the question?"

Discussion: The graduates identified specific skills that needed to be addressed. These included emotional intelligence, negotiation skills, influence skills, interpersonal skills, and communication skills. **Negotiation skills were** mentioned as a particular skill that is needed in practise. There was considerable support for the notion that technical skills and problem solving are the focus areas of training. Some mentioned that skills were developed through other subjects, such as humanities or participation in other activities, such as student societies.

Managers concurred that these skills are not adequately addressed in training and added that graduates do not realise this importance in practise. As such, they are not sufficiently prepared for the working environment. There was also agreement that the focus in training is mainly on technical skills.

Question 7 (EG & SEM): "Are there any other soft skills not mentioned above (Question 5) that you think are important for engineering graduates working in the engineering industry?"

Discussion: Regarding other soft skills needed, graduates mentioned skills related to interpersonal relationships much more frequently than managers. These included active listening, communication, team management, and delegation. All of these were mentioned only by graduates and not by management. Leadership was only referred to by management. The aspects mentioned by both parties were networking and stakeholder participation. Although both parties identified interpersonal relationships perse, it was much more frequent with graduates. Soft skills related to how one interacts with others were essential for both parties, but more so for graduates, and the focus of the two groups was slightly different.





Interestingly, quite a few (5) graduates mentioned a practical skill such as time management, while it was not noted by managers at all. Time management is, therefore, a skill that graduates feel they lack. Stress management was identified by both groups, while graduates also mentioned planning and creative thinking, while managers identified adaptability as necessary in the workplace.

It was noticeable that the work ethic was mentioned by several managers (3), while this was not identified by graduates. Additionally, the management referred to accountability, responsibility, and willingness to be mentored. These are skills that managers find lacking in the workplace.

Question 8 (EG & SEM): "Which of the following soft skills do you think are most important for engineering graduates working in the engineering industry? Rank the skills from 1 to 10, with one being the most important and ten the least important. Decision Making Skills, Team Building Skills, Emotional Intelligence, Leadership Skills, Negotiation Skills, Communication Skills, Conflict Management Skills, Influencing Skills, Motivating Skills, Problem Solving Skills."

Findings:

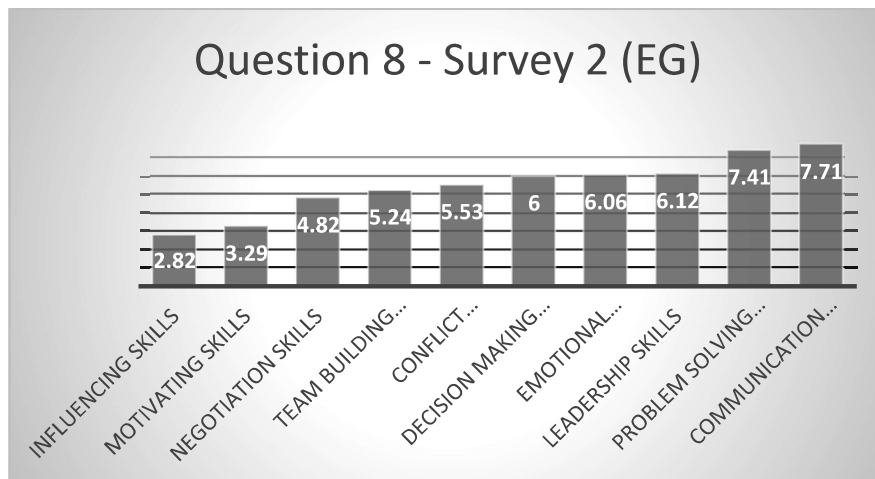


Figure 1: Survey 1 (EG) - Summary of the score Question 8

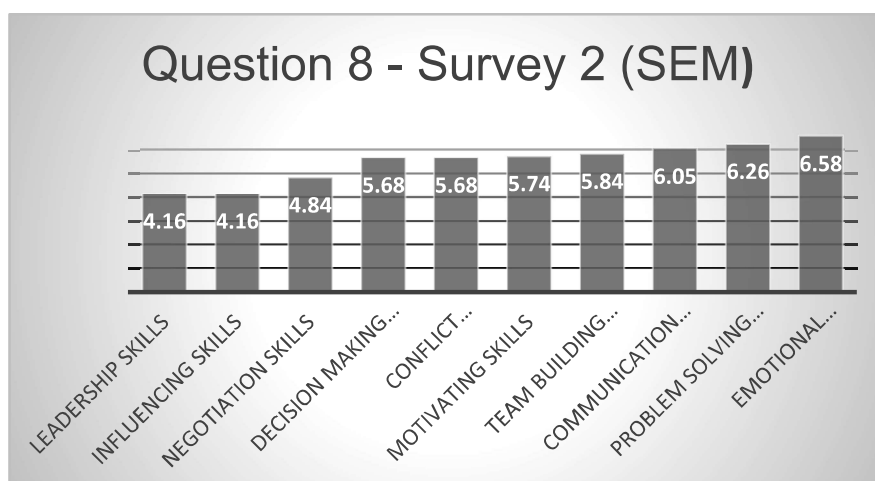


Figure 2: Survey 2 (SEM) - Summary of score Question 8

Discussion: EGs view communication skills as the most important soft skill, while SEMs view *emotional intelligence* as the most important. *Influencing* and *Negotiating skills* both rank low among both groups.





Question 9 (EG & SEM): "Following on from the previous question (**Question 8**), do you have any further comments to substantiate your replies or any further general comments regarding the question?"

Discussion: Although many respondents did not elaborate, graduates and managers mentioned emotional intelligence and communication as essential skills that graduates must possess when entering the workplace. Leadership and interpersonal skills were also highlighted in a similar way. Managers added negotiation skills and conflict management as of particular importance, while time management was once again (*referring to Question 7*) mentioned by graduates. The graduates also emphasised problem-solving skills.

Question 10 (EG & SEM): "Which of the above-mentioned soft skills do you think engineering graduates have the biggest problem with? Please substantiate your answer and provide examples where possible."

Discussion: Communication skills were identified by most of the graduates who commented (11 out of 14). One graduate explained that graduates are often scared to speak up because they are just grateful to have a job.

The fact that engineers need to be adequately prepared in their studies to work with people is clear from the comments. Engineers must be aware when entering the workplace that communication and negotiation are central to their role. Furthermore, engineers tend to be introverted, exacerbating the problem. As seniors sometimes overrule the decisions of junior engineers, they need to develop confidence and, as such, may also need more confidence to influence and motivate others.

Emotional intelligence is again emphasised, followed by decision-making and negotiation skills. Additionally, student life sometimes only promotes accountability, a crucial skill crucial in the workplace.

Regarding engineering managers, communication is also their top priority with regard to skills lacking in the workplace. This is followed by solid support for emotional intelligence. They agree with graduates that decision-making and negotiation skills are needed but add teamwork, leadership/influence, conflict management, and people management to the list, which graduates do not explicitly mention.

Question 11 (EG): "In your opinion, which of the above-mentioned soft skills were developed in the programme in which you graduated? Indicate specific modules/subjects, where possible."

Discussion: From the assessment of the responses, the problem solving skill was indicated to be the skill that graduates thought was the most developed, followed by the communication, conflict management, and team building skills. Other skills such as decision-making, motivation, and leadership were mentioned, but not significantly. Interestingly, emotional intelligence and influence skills were only mentioned once and negotiation skills were not mentioned.

Question 12 (EG) & Question 11 (SEM): "Do you have any suggestions on how these soft skills can be more effectively taught at higher education institute level?"

Discussion: Graduates and managers suggested that more practical projects or case studies could be introduced to better simulate those in the industry. These projects can develop communication, leadership, teamwork, and conflict management, to name a few. This option receives the most support from both groups. Both groups also suggested, but to a lesser extent, that specific modules/short courses/electives/summer schools could be introduced to develop soft skills. In addition, seminars and workshops could be held. More exposure to industry, on the one hand, and involvement of industry professionals, on the other, were also proposed.





Question 13 (EG) & Question 12 (SEM): "Do you feel that more emphasis needs to be placed on the education of soft skills in undergraduate engineering programmes to prepare graduates for working in the industry?"

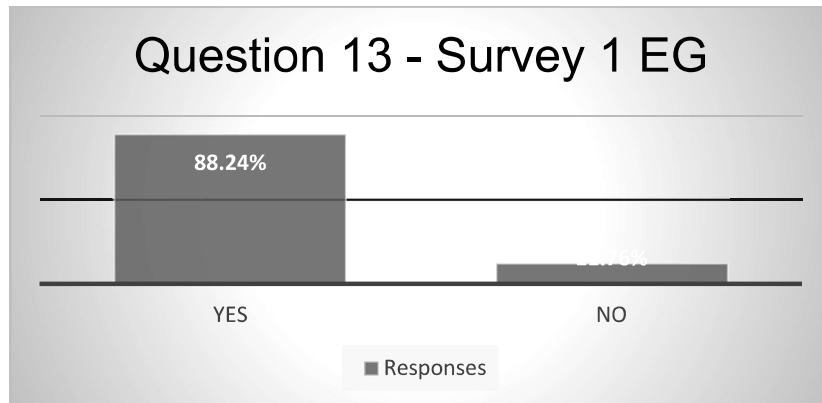


Figure 3: Summary of results - Question 13 - Survey 1 EM

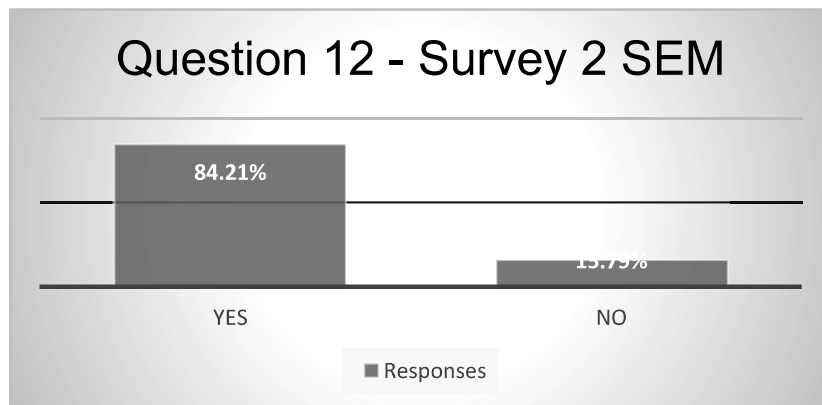


Figure 4: Summary of results - Question 12 - Survey 2 SEM

Findings: 88.24% of engineering graduates agree that more emphasis should be placed on the education of soft skills in undergraduate engineering programmes to prepare graduates for working in the industry.

84.21% of senior engineering managers agree that more emphasis should be placed on the education of soft skills in undergraduate engineering programmes to prepare graduates for working in the industry.

Discussion: The two sample groups strongly agree that teaching soft skills in undergraduate engineering programmes needs more attention. This relates to sentiments noted in the literature review, which commented that more attention should be paid to the education of soft skills among students.

Question 14 (EG) & Question 13 (SEM): "Please substantiate your previous answer."

Findings: Graduates agree that more emphasis should be placed on teaching soft skills in undergraduate engineering programmes, with the overall sentiment being that graduates are primarily unprepared for real engineering work environments. Environments where they are required to work in teams and manage human relations. However, some believe that focussing on soft skills in existing engineering programmes will dilute the learning of hard technical skills. There must be more space to teach soft skills in current engineering programmes.





Furthermore, soft skills can only be developed with experience in the work environment and through post-graduate studies and training.

Managers mostly agree that graduates need to prepare for the real-life engineering workplace and that soft skills development in undergraduate programmes will assist them in dealing with the pressure of the engineering profession. However, there are some views that undergraduate courses should focus on technical skills and that soft skills should be developed during primary and high school or postgraduate programmes.

Question 15 (EG) & Question 14 (SEM): "From the list of soft skills above, what soft skills do you feel are the three most important soft skills required as an engineer and project manager?"

Table 2: Responses to Survey 1 (EG) - Question 15

Soft Skill	Rank
Communication Skills	1
Emotional Intelligence	2
Leadership Skills	3

Table 3: Responses to Survey 2 (SEM) - Question 14

Soft Skill	Rank
Communication Skills	1
Decision Making	2
Leadership Skills	3

Discussion: The two sample groups rank communication and leadership skills amongst the top three soft skills required, including emotional intelligence and decision-making skills.

Question 16 (EG) & Question 15 (SEM): "In your opinion, do you feel that enough emphasis is being placed on the education of soft skills and the importance of possessing soft skills when entering the work environment?"

Findings: Eleven Engineering Graduates (64.7% of the sample population) agree that more emphasis should be placed

Seventeen senior engineering managers (89.5% of the sample population) agree that there is not enough emphasis being placed.

Question 17 (EG) & Question 16 (SEM): "In your opinion, do you feel that more emphasis is being placed on the education of hard skills and the possession of hard skills when entering the work environment?"

Findings: All seventeen Engineering Graduates (100% of the sample population) agree that more emphasis is being placed.

Sixteen Senior Engineering Managers (84.2% of the sample population) agree that more emphasis is being placed.

5 CONCLUSION & RECOMMENDATIONS

Research Question 1: What are the top human competencies (soft skills) identified to be an effective project manager and ensure project success?

The most critical human competencies that a project manager should possess for project success, as identified in the literature, are:

- Communication Skills
- Problem Solving Skills





- Leadership Skills
- Emotional Intelligence
- Decision Making Skills
- Conflict Management Skills
- Team Building Skills
- Negotiation Skills

A few other soft skills have been added to the list as identified in this study, and they are:

- Time management skills
- Stress management skills
- Planning skills
- Creative thinking skills
- Adaptability skills
- Accountability
- Responsibility
- Willingness to learn

Research Question 2: Since engineers are required to execute projects, as this is the nature of business in consulting engineering firms, are these human competencies effectively taught with the various undergraduate engineering programmes at higher education institutes?

The study graduates believe that some soft skills are being taught at HEI. However, managers were not as confident that these soft skills were adequately taught in the HEI. It should be noted that graduates do not realise the importance of having these soft skills when entering the work environment. The graduates also agreed that they did not know that these skills are required when entering the workplace.

Research Question 3: Should more emphasis be placed on developing soft skills in undergraduate and postgraduate engineering programmes?

Both sample groups, graduates, and managers strongly agree that HEIs should emphasise the education of soft/interpersonal skills in undergraduate engineering programmes. This view agrees with the literature and highlights the need to put more emphasis on soft skills, which remains a prevailing theme and concern.

Research Question 4: How can these soft skills be further developed in undergraduate and postgraduate engineering programmes?

The most prevalent suggestion of both groups is that more practical and real-life projects or case studies that simulate those in the industry should be introduced to the programmes studied.

5.1 Recommendations for future research study

Recommendations for future potential research have been identified:

1. Conduct a similar research study using a larger sample group, including managers and graduates, and increasing the sample group to include client bodies and HEI professors and lecturers.
2. Conduct a similar research study in a wider geographic area.
3. Conduct a study to fully explore the suggestions made in this study to teach the required soft skills more effectively.
4. Conduct a study to fully explore why engineering graduates have difficulty adjusting from student life to work life.
5. Some people believe that placing more emphasis on soft skills in existing engineering programmes will dilute the learning of hard technical skills or that there is no space to incorporate the teaching of soft skills in current engineering programmes.





Therefore, soft skills should be learnt and acquired postgraduate by attending training courses aimed at this, gaining experience in the field, and through postgraduate studies. This theme should be explored further to see if it is a viable alternative to emphasising soft skills during undergraduate programmes.

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