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University of the Witwatersrand, School of Construction Economics & Management

Final Research Dissertation Report

An Investigation of Construction Professionals' Perceptions of Construction Managers' Soft Skills in Complex Construction Projects in South Africa

By

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CEM/18/01/MSS

Final Submission: 27th February 2019

University of the Witwatersrand, School of Construction Economics & Management

Final Research Dissertation Report

An Investigation of Construction Professionals' Perceptions of Construction Managers' Soft Skills in Complex Construction Projects in South Africa

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A dissertation report submitted in partial fulfilment of the requirements for the award of the degree of MSc (Building) in the Field of Project Management in Construction to the Faculty of Engineering and Built Environment (School of Construction Economics and Management) of the University of the Witwatersrand

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Final Submission: 27th February 2019

DECLARATION

I, Madimetja Solomon Sekhu Student Number 0301108R, assert that I independently wrote this research with the title Investigation of construction professionals of construction manager's soft skills competencies in complex construction projects in South Africa. I further declare that I did not use or copy any source other than those cited in this work, and in addition this work contains no material that has been submitted previously, in whole or in part, except where otherwise indicated. I am aware that failure to do so could lead to possible disciplinary actions taken against me by the University of the Witwatersrand.

Signed at: Johannesburg (South Africa) on the 27th of February 2019.

Signature: _____

Date: _____

Supervisor

I, as the University of the Witwatersrand Supervisor, confirm that the candidate under my supervision undertook the report in this dissertation.

Signature: _____

Date: _____

DEDICATION

This research is dedicated to:

My late parents, who never went to any formal school my brothers and sisters, who also never went beyond Grade 12; more particularly my elder brother, who took the initiative of paying my school fees up to Grade 12 (Matric): for giving all the love, support and encouragement throughout the duration of my studies.

My beloved wife and children for their sacrifices, support and tolerances given throughout the period of my studies.

ACKNOWLEDGEMENTS

A research project of this size cannot be accomplished without input and advice from the experts. Therefore, I would like to acknowledge and thank the following people for their input into this thesis.

First, I would to send my great thanks to the late Dr Elizabeth Heron for the excellent guidance, immense patience, and support she gave me before she left the institution.

Second, I would like to extend the same to Dr Nthatisi Khatleli, who took over the supervision and guided me throughout the compilation of this thesis. I am hugely grateful for your mentoring, advice, and support throughout my endeavour in compiling this thesis, and feel very privileged to have had the opportunity to work under your supervision. I sincerely appreciate your expeditious reviews and exceptional expertise.

Third, I would like to extend my sincere thanks to Professor Sam Laryea, Professor Sam Azazu, and Dr Rina Vosloo for all the guidance, support, and encouragement during the lecturing sessions on the research methodology and other modules.

Fourth, I would like to extend my gratitude to my former manager, Spencer Leggette, for his contribution to my career to Marcel Theron, for his mentorship in my current working environment; to my friend Dan Monyai, for playing a major part in my career development; and to the organisations that supported me financially and all those who supported me throughout this journey.

Last, very special thanks to my beloved wife and children, who have been my inspiration to fight for my dream and who have stayed with me in bad times and good times. I thank you for your continuous support, motivation, encouragement, patience, and love during the difficult time of my study, which made this possible and worthwhile for me.

ABSTRACT

Purpose: The purpose of this study was to investigate construction professionals' perceptions of construction managers' soft skills in complex construction projects in South Africa.

Design/methodology: The survey and interviews were conducted in Gauteng Province (South Africa), which is the economic hub of the country. The study used a concurrent triangulation (mixed method) approach, where both quantitative and qualitative approaches were applied. The questionnaires were based on a list of 23 soft skills and training strategies extracted from previous research papers. The instruments for data collection were survey questionnaires and interviews.

Findings: Statistical Package for Social Science Software (SPSS) version 25 was used to perform descriptive statistics, mean, standard deviation, and Relative Importance Indices (RII). The findings reveal 15 soft skills that are very important, with mean scores of between 4 and 4.63; and eight important soft skills, with mean scores of between 3 and 95. The overall results indicate that communications skills are considered very important, with a mean score of 4.63.

Research limitation: The sample was drawn from a limited number of respondents from construction professionals based in Gauteng Province (South Africa). It would therefore not be appropriate to generalise the effects of the study to other provinces without considering their unique skills in managing complex projects.

Practical implications: Understanding project complexity and its contributing factors helps construction professionals and construction managers to understand the challenges, dynamics, and complex nature of the construction industry. This highlights the importance of construction managers' proficiency in soft skills.

Originality/Value: This study proposes a list of soft skills and training needs, and their importance for construction managers in complex projects. The study also emphasises the importance of the ability of construction managers' soft skills in complex projects. Therefore, construction organisations would be encouraged to look beyond traditional skills-based training.

Key words: Soft Skills, Construction Manager, Complex Construction Projects

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CHAPTER 1

1.1 Introduction

The construction industry in South Africa plays a major role in contributing to the economic development of the nation in terms of its gross domestic product (GDP) and the physical development of infrastructure projects such as buildings, roads, dams, power stations, and bridges (Tunji-Olayeni, 2016; Alzahrani, 2013). However, the dynamic nature of construction clients, the uniqueness, uncertainties, fragmentation and complexity of construction projects (Okoye, 2015), an unpredictable workplace (Esa, 2014), an aging workforce, and the rapid shift of workplace culture put so much pressure on the industry that it requires construction managers with supplementary soft skills to perform effectively in such a changing economic environment (Bakanauskiėne, 2011). According to Taylor (2016) and Bancino (2007), the focus of education and training has long been on technical topics and technical skills, yet the fast-paced global marketplace of today (including increasingly complex projects) demands construction managers who Excel in both technical and 'soft' skills. Taylor (2016) further states that the skills gap that has employers worried is not the technical skills gap, but the soft skills gap.

Due to the temporary nature and fragmentation of construction projects, project team members and other key stakeholders are often geographically dispersed in different areas, inhibiting communication, collaboration, negotiation, conflict management, and coordination of information (Livesey, 2016). And due to the new economy of rapid technological change and increased project complexity, construction organisations strive to retain and recruit key employees with soft skills (Remedios, 2012) to keep pace with progressively growing demands, varying needs, and construction clients' objectives (Pandya, 2017).

These growing levels of complexity in construction technologies and the increasingly specialised division of labour require a higher level of project team integration, engagement, and collaborative working among the multi-disciplinary project team members. As stated by Taylor (2016), employees who excel in technical skills, but not in other skills such as managing and working with others, will be of much less value to the organisation in the future.

The aim of this study, therefore, is to investigate construction professionals' perceptions on construction managers' soft skills in complex construction projects in South Africa. The study

starts with a literature review, emphasising the importance, and the possible lack, of soft skills in the construction industry, followed by the methodology, data collection and analysis, findings and discussion, conclusion, and recommendations.

1.2 Background of the Study

According to Baiden (2006), the construction industry is organised around specific trades and functions, with project team members being selected based on the technical and financial soundness of the design and the competitiveness of the tender sum. The construction industry is also organised around a temporary structure with the common goal of achieving project success (Guangdong, 2017). It relies on interaction among multiple stakeholders during the planning and execution of the project, who are expected to possess complementary soft skills in addition to technical skills and the acumen to fulfil the client's objectives. According to Hauptfleisch (2009), the construction industry embraces two sectors, the building industry and the civil engineering industry.

- The building industry is the sector that constructs buildings to client requirements using the built environment professionals, contractors, subcontractors, and other diverse resources required for the project
- The civil engineering construction industry is the sector that constructs civil engineering structures using consulting engineers, civil engineers, subcontractors, and other diverse resources required for the completion of the project

The construction industry globally plays a major role in the development and achievement of the goals of society (Bentil, 2016). It is also one of the largest contributors to a country's gross domestic product (GDP) and plays a significant role in a nation's economic growth (Ahn, 2012; Bentil, 2016). According to Madsen (2017), the construction industry is a project-based industry, and is often described as an uncertain and complex environment, with multidisciplinary project team members and stakeholders who are involved throughout the lifecycle of projects. The cconstruction industry contributes annually to the gross domestic product of the nation through the provision of infrastructure such as roads, bridges, railways, dams, harbours, pipelines, energy generation, mineral extraction, telecommunications, and airports, maintaining their infrastructure, and deconstructing them at the end of their life cycle (Shaar, 2016; Manley, 2015; Dada, 2013)**.** The construction industry is considered a more complex undertaking than any other industry; a very significant and vital part of the South African economy (Dada, 2013; Ahn, 2012; Hagan, 2012). Construction professionals and construction managers play a pivotal role through participating in and contributing to the provision of such infrastructure that is necessary for

economic well-being and quality of life in the modern world (Othman, 2014; Carstens, 2016). However, the construction industry's clients still experience recurring problems, such as budget overruns, time overruns, and poor workmanship, which occur endlessly, and require construction managers who are highly qualified in technical skills, but who still need to acquire soft skills to complement their specialised skills (Mohammad, 2017; Dogbegah, 2011).

Understanding the major challenges facing construction projects remains difficult because of the lack of clarity around programme management (Yadollahi, 2014). Thus it is critical to select competent construction managers with the collective ability to integrate and collaborate effectively with other team members to ensure that the challenges encountered during the process of the project are reduced (Yadollahi, 2014, Baiden, 2006). Lawani (2016) declares that the methods of applying soft skills, such as leadership, in construction project management, which is a highly technical environment, are recognised and are constantly debated.

This research thus seeks to address the soft skills gap in the construction industry by investigating construction professionals' perception of construction managers' soft skills acumen in complex projects in South Africa. However, no consensus exists about what these skills actually are, which of them are important, and how to acquire them (Taylor, 2016). Furthermore, the lack of consensus on their definition among construction stakeholders adds to the many challenges faced by the construction industry (Mahasneh, 2015; Mahasneh, 2016).

1.3 Definition of Terms

1.3.1 Soft Skills

To define 'soft skills', studies have used terms such as employability skills, intrapersonal and interpersonal skills, nontechnical skills, human skills, emotional skills, generic skills, transferable skills, soft skills, and competency skills.

Jaser (2015) and Mahasneh (2016) supported Gilman's (1989) definition of skills in stating that skills alone are defined as the ability to use one's knowledge effectively and readily in execution or performance. The author adds that it is a learned ability to do something competently. However, Remedios (2012) defines a skill as a learned ability and capacity to carry out the pre-

detemined steps needed to pursue a career in professional objectives with the minimum of time and effort.

- The Oxford Dictionary (2014a) and Press (1989) define soft skills as personal attributes that enable someone to interact effectively and harmoniously with other project team members (Keevy, 2015; Matteson & Miriam, 2016).
- Hurrell *et al*. (2012:162) describe soft skills as non-technical and not reliant on abstract reasoning, that involve interpersonal and intrapersonal abilities to facilitate a mastered performance in a particular context.
- According to Robles (2012), the Collins English Dictionary defines soft skills as the desirable qualities for certain forms of employment that do not depend on acquired knowledge.
- According to Tang (2014), soft skills are defined as interpersonal and behavioural skills in the workplace.
- Interviewee 8 (#8) defines soft skills as interpersonal skills that enable a leader (a construction manager is a leader) to manage a complex project with a large team, which means that the qualities that leader should have must enable him/her to build trust and loyalty.

However, in reviewing the literature, there seems to be no single definition of the term soft skills.

1.4 Gap in knowledge

As a result of the rapidly increasing complexity of construction projects and the need for improved project performance, multidisciplinary collaboration requires changes in traditional roles, relationships, and collaborative processes between the project team members (Sebastian, 2011). However, at present there are still knowledge gaps in developing and managing the construction team to collaborate effectively in their changing roles (Sebastian, 2011). These changes in roles also require the endorsement of a new integrated procurement method through which all key stakeholders can be involved from the early stages of a project in order to contribute to the design. The aim of this research is thus to investigate contractors' soft skills competencies in complex projects.

1.5 Problem Statement

Challenges in the construction industry concerning the management of complex projects have been extensively scrutinised. Complex construction projects in South Africa are procured through the design-bid-build method, which is regarded as fragmented and creates adversarial relationships among the project team members during the execution phase. The design-bid-build method can lead to aggression between the client and contractor, or between the contractor, the subcontractor, and suppliers ,and lead to conflicts, project abandonment, and the inability to achieve project deliverables (Atuahence, 2017). Accoring to Eriksson (2017), many studies have shown that infrastructure investment in complex projects is often plagued by cost and time overruns. However, the application of design-bid-build procurement in complex projects in South Africa leads to construction managers' lack of soft skills. The construction industry is thus mired in disputes and claims that often result from poor communication and the inability to handle conflict on-site. Furthermore, the seriousness of severed relationships between the parties to the contract has a negative impact on complex projects (Atuahence, 2017). However, the need to manage the contract – and the relationships among consultants, subcontractors, and suppliers – creates many management challenges that require a high level of knowledge of construction managers' acumen, capabilities, and soft skills.

According to Clarke (2016), the lack of soft skills is threatening construction productivity, and could have major financial implications for the country; it is already hindering the employability chances of graduates. Therefore, a failure to address these management problems effectively and efficiently could indicate that there is a perceived soft skills problem in the South African construction industry.

1.6 The Purpose of the Study

The purpose of the study is to investigate construction professionals' perceptions of construction managers' soft skills in complex construction projects in South Africa, and to identify which such skills are important, and how to acquire them in the construction industry.

1.7 Significance of the Study

This study will have significance value for tertiary institutions, the construction industry, professionals, and clients in ensuring that technical students and professional employees are trained, developed, and equipped with essential soft skills so that they are competent to undertake their different duties in a complex environment. The study may further inspire construction professionals to enhance their soft skills in order to cope with the growing complexity of infrastructure and construction projects in South Africa. This study further contributes to the raising of awareness about the importance of soft skills competencies and consequences (Remedios, 2012), or the lack thereof, in complex construction projects in South Africa. Furthermore, the study's findings may contribute to the development of construction managers' soft skill competencies by providing training strategies for enhancing soft skills that are necessary in challenging complex multidiscliplinary projects.The common saying is that "hard skills get one hired, but soft skills keep one employable" (Ibrahim, 2017). Soft skills are the most effective characteristics that play an important role in the ultimate success of complex projects.

1.8 Research Objectives

i. To establish the soft skills needed to make construction managers successful in completing complex projects.
ii. To identify the soft skills that are most lacking in construction managers in complex projects.
iii. To explore construction professionals' perceptions of the importance of construction managers' soft skills in complex projects.
iv. To ascertain the importance of soft skills in complex construction projects.
v. To determine the training needs that will enhance the possession of soft skills by construction managers.

1.9 Research Questions

19.1 Main Research Question

What is the importance of soft skills in complex construction projects?

19.2 Sub-questions

In order to achieve the objectives of this research, this study intends to answer the following research questions:

i. What soft skills are needed to make a construction manager successful in complex projects?
ii. What soft skills are most lacking in construction managers in complex projects?
iii. How important are construction managers' soft skills in complex projects?
iv. What training strategies can be used to address the construction managers' lack of soft skills in complex projects?

1.10 Limitations of the Study

This study focused on construction professionals based in Gauteng Province. However, it was beyond the scope of this research to investigate the relationship between the technical skill competencies and the soft skills competencies of construction managers.

Furthermore, this study was limited by the following:

- Time constraints restricted the study to the South African construction industry
- The questionnaire and interviews were limited to the perceptions of professionals in the construction industry operating in Gauteng Province (South Africa).

1.11 Research Flowchart

This research was conducted according to Figure 1-1 below.

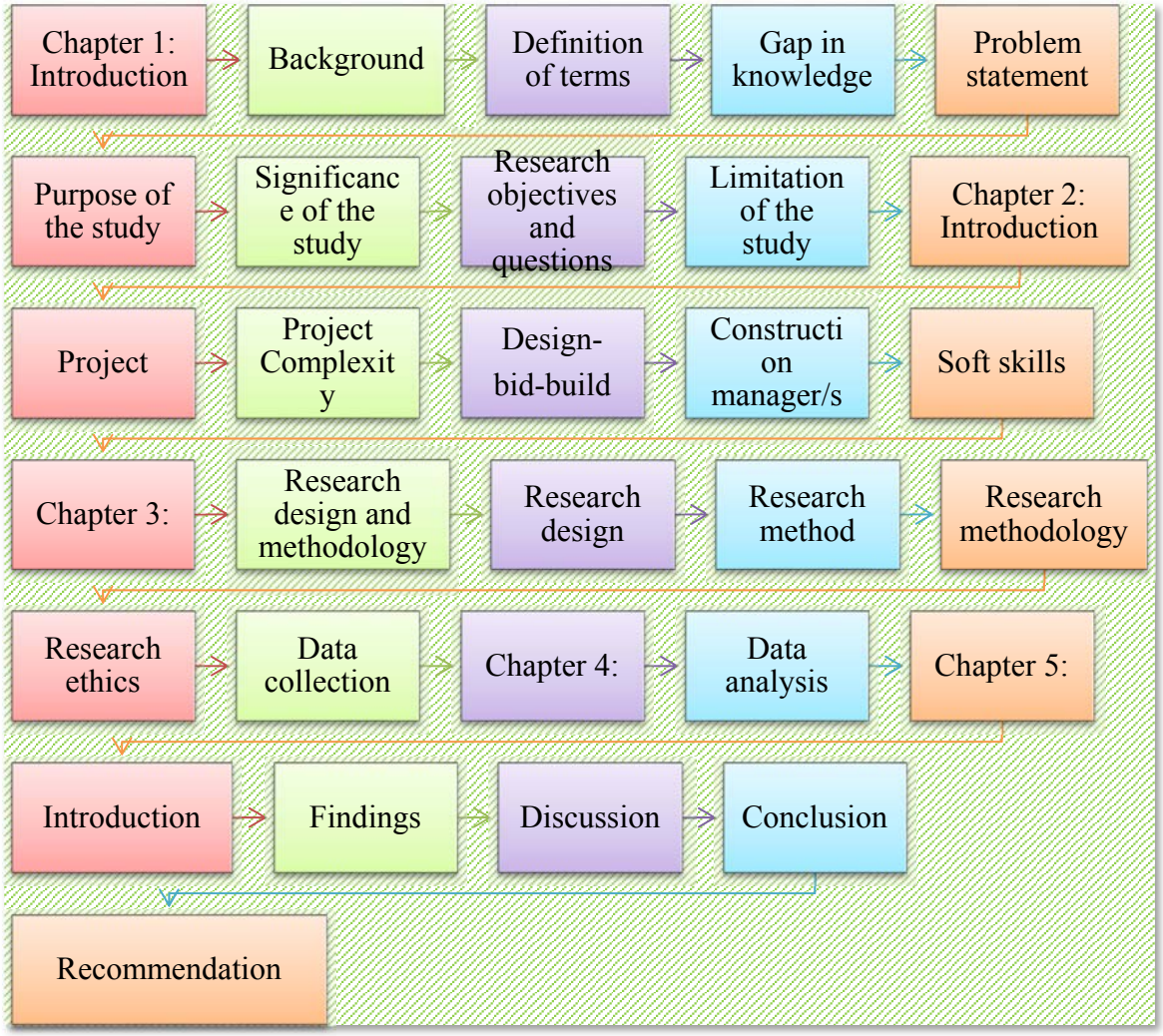


FIGURE 1: RESEARCH FLOWCHART 1

Summary

Previous studies relating to the competencies required in construction projects placed more emphasis on the construction project managers' competencies that are regarded as technical skills, such as planning, organising, leading, executing, and controlling; construction managers' soft skill competencies were largely overlooked (Zhang, 2013).

Due to the increased complexity of construction projects, clients' requirements, and the continuous challenges of project delays, cost overruns, and unacceptable quality, the construction industry needs construction managers with both technical and soft skills in order to continue contributing to the growth of the economy, and to enhance the success of the projects and the wellbeing of the community. According to Mouchi (2011), the traditional and conventional approaches in managing projects are not suitable for complex projects. However, the complexity of today's construction projects, and the involvement of multidisciplinary organisations, which require effective interaction, have changed the traditional competencies expected from construction managers. Furthermore, communication of information among multiple stakeholders becomes critical, as each participant possesses different knowledge, skills, and experience (Sebastian, 2011). Sebastian (2011) further declared that the lack of communication and coordination among the parties in construction projects is among the most important reasons behind the current problems faced by the construction industry.

Construction managers face many challenges throughout the stages of a project that require someone with both technical and soft skills competencies to handle them professionally by making clear decisions. Construction projects involve many stakeholders with different skills and objectives that need to be communicated and coordinated without affecting any other party's performance. Information flowing from different stakeholders needs to be communicated and shared on time to avoid any delay(s) on the project.

Current procurement systems fail to incorporate the importance of soft skills during the request for information, tender adjudication, and selection of the preferred contractor for complex projects, since so much attention is based on the lowest price, Construction Industry Development Board (CIDB) rating, Broad-Base Black Employee Equity (B-BBEE), and tax clearance compliance. There is also much focus on measuring the success of the project based on the 'iron triangle' – that is, on cost, time, and quality – which is no longer adequate to predict the

performance of the project team. Therefore, most projects fail because of the lack of soft skills, such as leadership skills, communication skills, information management skills, collaboration skills, negotiation skills, problem-solving skills, conflict management skills, relationship management skills, and decision-making skills during the planning and execution of the project.

Considering the role played by construction managers and all the challenges they face during the life cycle of a project (including the many stakeholders involved), it is clear that the area in which they have to make big improvements is that of people management skills (Fisher, 2011). According to Obare (2016), most construction organisations seek professionals with better human skills than technical skills.

The consequences of construction managers' lack of soft skills could lead to project failure in relation to time, cost, and quality. This study also attempts to demonstrate that there are some key competencies (other than hard skills) that are seen as important when managing complex projects in both developed and developing countries (Zhang, 2013). Based on this, it can be inferred that soft skills are very important in complex projects, and that there is an awareness that construction managers currently lack these important soft skills.

CHAPTER 2

2. Literature Review

2.1 Introduction

According to Mok et al. (2015), a literature review is regarded as a useful way to gain in-depth understanding of a research topic. Therefore, in order to achieve the objectives of this study, a literature review was undertaken, with Google Scholar being used to conduct a random search on the relevant terminology, such as soft skills, construction managers, complex projects, and other construction-related skills (Mahasneh, 2016). A database was also used to access Scopas and ProQuest, through which journals from publishers by Emeraldinsight, Taylor and Francis online, ASCE/Library, RMIT, and Science Direct (Elsevier) were accessed. The literature search was limited to those that had been published between 2011 and 2018.

Journals or article that were found were synthesised according to the current applicable methods used to source contractors in order to identify the soft skills gap, and particularly those that are related to the research problem (Abdullwahe *et al.*, 2013).

2.2 Project

According to Hai (2012), the construction industry is a project-based activity, and consists of myriads of stakeholders with diverse roles – the financing institution, the developer, the end-users, the designers, the project managers, the main contractor, and the subcontractors. Hai (2012) adds that the complexity of the organisations involved in a complex project and of the expertise of the individuals results in adversarial relationships that inhibit the performance of the project.

A construction project has been defined as a temporary endeavour undertaken to create a unique product, service, or result (PMI, 2013). In contrast to the definition, Goodman (1976, p.494, cited by Livesey, 2017), defined a project as a set of diversely-skilled people working together on a complex task over a limited period. Livesey (2017) also argues that the skills identified in Project Management Body of Knowledge (PMBok) are generally of a technical nature, and are referred to as hard skills, and suggests that the definition of Goodman (1976) is more

appropriate: that a project is a set of diversely-skilled people working together on a complex task over a limited period.

The increasing complexity of construction projects, and fragmented procurement, impede construction managers' technical skills in the effective management of projects (Heerden, 2018). Therefore, the complexity of today's projects requires collaboration and teamwork among multidisciplinary project team members to achieve the objectives of the projects (Bentil, 2016). Furthermore, Zhen (2012) states that the scale and structure of the system itself, differenr goals and cultural environments, and the obstacles of information exchange and inadequate communication, create conflict among the project team members and constitute project complexity.

According to Brady (2014), the complexity of projects plays a critical role in determining the success or failure of construction projects, and the inability to manage such projects has been recognised for many years as a major factor in project failure. The complexity of construction projects leads to difficulties in managing, and is increasing with the passage of time because of project implementation in a dynamic atmosphere (Khattak, 2016).

However, whether the construction projects are complex, fragmented, or in a schedule-driven industry, projects ought to be developed in order to achieve benefits for the country's economy, society, and environment (Rahim, 2016).

2..3 Project Complexity

According to Baccarini (1996), project complexity is defined as consisting of a myriad of interrelated parts, and can be operationalised in terms of differentiation and interdependency. However, Pauget (2013) states that complexity in construction projects results from an increase in the size, number, and degree of interdependence of its elements, and results in an increasing demand for coordination.

According to Han (2011), construction projects are referred to as complex due to the wide separation of project sites, and high pressure on construction time, cost, quality, and technologies. Therefore, temporary complex projects and working constellations are becoming increasingly prevalent (Pauget, 2013). Consequently, complex construction projects bring with them problems from the inception stage as a result of the growing list of client requirements and

multi-stakeholder involvement as the project grows in detail, and hence the construction managers' management skills become more complex (Ramamurthy, 2012).

With infrastructure projects in the construction industry continuously displaying higher levels of complexity (Mills, 2014), essential soft skill competencies are required to achieve the objectives of the client and the project. According to Madsen (2017), competencies needed today differ from those needed before, and these competencies are needed in order to succeed in the management of complex projects.

According to Ahn (2012), to succeed in today's complex and dynamic industry, those who are actively involved in construction projects require not only strong technical skills: they also require soft skills competencies that must be developed and maintained throughout their professional career. However, the soft skills gaps among construction managers is challenging, and affects their work performance, output, and efficiency (Thabet, 2015) in complex construction projects in South Africa. Mills (2014) further states that managing complex infrastructure and construction projects involves a number of interfaces between the various stakeholders hence soft skills play an important role in the ultimate success of the project. These soft skills therefore need to be developed to match the industry's needs, and construction organisations need to take the lead in creating a foundation for these skills in the construction workforce (Thabet, 2015). According to Korpela (2015) and Thomson (2011), construction practitioners have difficulties in dealing with the complexity of clients' requirements, and the need to create and promote a collective understanding during the process of planning and execution of the project. However, Vidal (2008) states that project complexity can be classified into four families, as seen in the figure below.

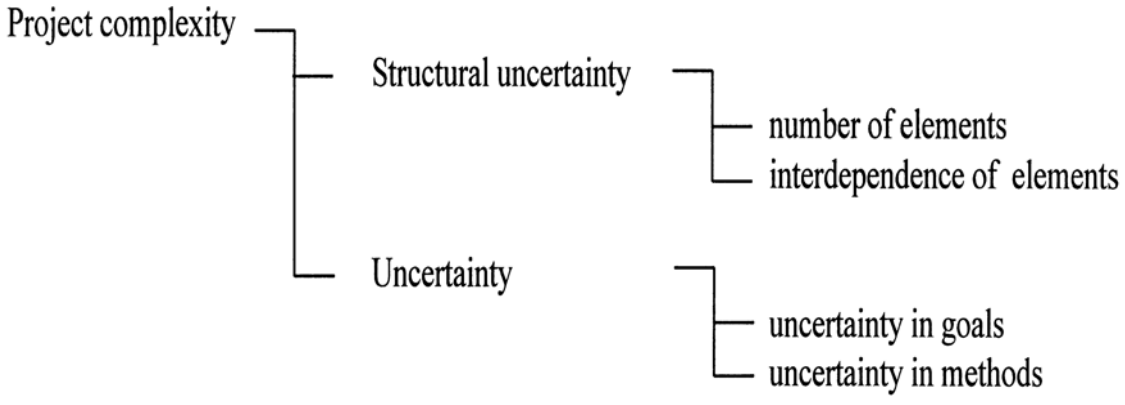


FIGURE 2: PROJECT COMPLEXITY (ADOPTED FROM WILLIAMS, 1999) 1

In sharing the vision of Baccarini (1996), Williams (1999) modified project complexity as in Figure 3 below (Abdou, 2016).

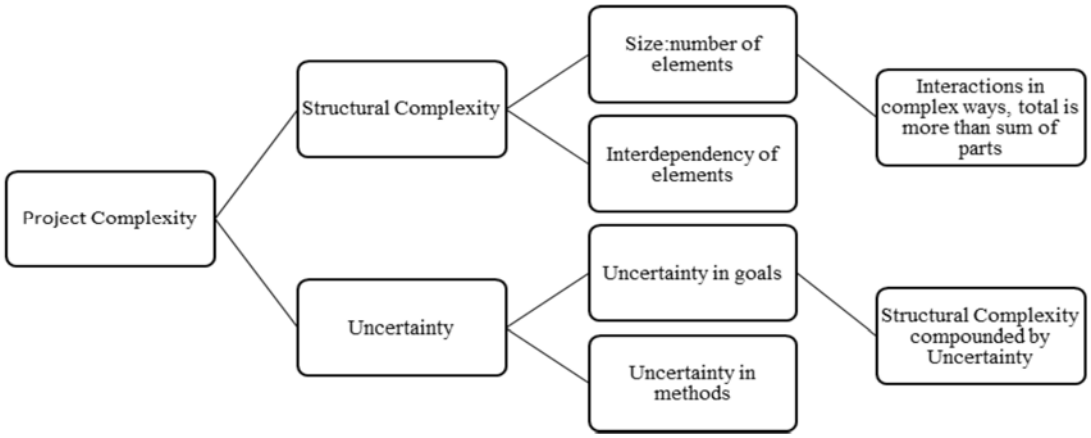


FIGURE 3: DIMENSIONS OF PROJECT COMPLEXITY (SOURCE: MOUCHI, 2011; ABDOU, 2016) 1

While construction managers are challenged to undertake complex construction projects, traditional procurement methods are also a problem when it comes to the management of complex projects (Mills, 2014). Traditional procurement is unable to respond to the constant need for innovation and efficient performance imposed by the complexity of construction projects (Velasco, 2014). However, demands to decrease the dominance of such procurement strategies are being voiced, and the entrance of new strategies implies that the focus will shift more to soft skills (Madsen, 2017). This shift to soft skills may enable diverse project team members to coordinate and collaborate in problem-solving and decision-making processes as the project phases unfold (Eriksson, 2017).

Based on the complexity of the construction industry, and the failure to recognise the value of team integration and collaborative work due to the fragmented strategy, there is a need for construction organisations to encourage and develop their key staff members to acquire the soft skills that can supplement the technical skills, and enable the team to adjust to the client's requirements (Hietajärvi, 2017).

The procurement system for construction projects in South Africa relies heavily on the design-bid-build method, which is regarded as fragmented due to the dispersal of the project team members. 'Fragmentation' is defined as the process or state of breaking, or being broken into

small or separate parts, and usually has a negative connotation (Alashwl, 2015). Fragmentation goes beyond differentiation to include poor coordination, collaboration, integration, and communication, and an increase in construction projects with boundaries between multidisciplinary teams (Alashwl, 2015). However, the level of performance to be expected of a complex project depends on the extent to which the procurement method employed was suitable for the project in question (Molenaar, 1998; Love, 1998; Eriksson, 2011; Braima, 2013).

2.4 Design-bid-build procurement system

The application of design-bid-build procurement in complex projects is problematic, according to Bag (2016), because most of the procurement professionals lack essential soft skills, which are more important than hard skills. This fragmented procurement system is exacerbated by the traditional philosophy of construction project managers, which places a greater emphasis on the ability to plan, organise, execute, and control, which are considered technical skills, while their soft skills are overlooked (Zhang, 2013). The application of this method in complex projects also contributes to poor performance by the project team due to lack of teamwork, professionalism, and work ethic; poor coordination, integrity, and leadership; lack of knowledge and information sharing; and ineffective interaction and communication, all of which result in adversarial relationships that lead to project delays, litigation, and problems in resolving claims (Hasanzadeh, 2014). Furthermore, the importance of collaboration is not well recognised by the traditional procurement system, and this ultimately results in low productivity (Marathe & Anuj 2016). The traditional procurement approach also leads to various problems in construction projects, such as an adversarial culture and poor performance (Xianhai, 2017). The fragmented procurement approach preferred by the South African construction industry does not encourage the integration, coordination, or collaborative working among the project team members that is needed to overcome the challenges brought about by the diverse complexity of the project (Ibrahim, 2015). Poirier (2016) and Joseph (2016) support this statement, stating that coordination between participants is a major challenge in the construction industry.

Moreover, the industry is faced with many challenges, such as a client's tight performance requirements, diverse stakeholders, lack of skills and system integration, environmental issues, and the involvement of multi-disciplinary organisations (Khan, 2016; Gustavsson, 2015; Braimah, 2013; Santos, 2012; Eriksson, 2011; Davies, 2014).

The construction industry's fragmentation has been worsened by the separation of the professionals' designs from the construction process (Masterman, 2003**;** Smith *et al.*, 2004)**.** Furthermore, Smith et al. (2004) state that the issue of fragmentation is experienced not only through the separation of design and construction, but also through the culture, specialisation, and process of the project.

In contrast with many researchers, Lesniak et al. (2012) state that the design-build method has been widely used in many countries from 1968 onwards, reaching its highest level by 1990. However, Chen et al., (2012) also argue that the construction industry's issues of cost overruns, late completion, adversarial relationships, disputes, low productivity, and client dissatisfaction originate from the traditional design-bid-build procurement strategy, and should not be seen as the reason for the industry's poor performance.

According to Wang et al, (2013), once the current fragmented procurement method had been recognised as a problem, studies were undertaken to identify alternative procurement methods that would embrace an integrated project team with the diverse expertise, knowledge, and skills needed to produce innovative solutions for the design that would meet the client's need or objectives.

Nawi et al. (2014) state that other researchers have also revealed that the traditional method has created many problems, such as:

- Isolation of professionals
- Lack of coordination
- Lack of collaboration
- Lack of knowledge integration
- Lack of constructability in design

Kujala (2014) asserts that construction projects continue to be dogged by poor performance and the failure to deliver the promised benefits due to the complexity, uncertainty, and uniqueness of today's projects. According to Okoye (2015), the continuous demand for enhancing project delivery, including the dynamic nature of the client and the resultant complexity, has put the construction industry under pressure, and requires that construction managers acquire management skills. This was later supported by Zhao (2015), when stating that the introduction of construction technology Building Information Model (BIM) in respect of operation and

organisation changes the need to comply with local regulations; and the client's need to have the project completed faster, be less expensive, and be of better quality has an impact on the contractor's collaborative skills. In addition, procurement methods are a challenging issue for stakeholders involved with a construction project (Hosseini, 2016). According to Alashwal (2015)**,** the fragmentation of the traditional procurement method has created the following boundaries among the multidisciplinary team:

- Project social boundary
- Project knowledge boundary
- Project action boundary
- Expertise boundary

Hietajärvi (2017) states that, due to the application of a traditional (fragmented) procurement strategy, integration, communication, and coordination between key stakeholders are undermined. Therefore, the complexity of the construction projects created by the fragmented method requires further effective coordination among the parties in the contract (Alaloul, 2016). However, to enhance complex project performance and provide benefits to all stakeholders, the construction industry will have to move out of its fragmented 'silos' and work as an integrated organisation (Clevenger, 2016).

According to Adnan (2017), increasing globalisation and the changing landscape in political, economic, and technological activities have an impact on the fragmented procurement system, which inhibits the management of the construction projects; hence construction managers are required to possess soft skill competencies in today's complex projects. Bag (2016) and Carstens (2016) declare that construction procurement professionals lack essential soft skills, which are more important than technical skills. Kashyap (2017) declares that the most important person in an organisation is the project manager/construction manager, and the success or the failure of the construction project depends on his/her soft skill competencies.

2.5 Construction manager

The rapid changes in the construction business environment, accompanied by strong global competition, clients' sophisticated requirements, and increased project complexity necessitate the provision of highly competent construction managers with the necessary soft skills for complex

construction projects (Othman, 2012). Okoye (2015) supports this notion, stating that the challenges of complex projects require construction managers to be competent and to be equipped with the soft skills that are essential and critical for the success of complex projects, in addition to technical skills. However, construction managers are continuously challenged to cope with complexity, uncertainty, and various problems during the accomplishment of a project, due to the limited resources and critical time and cost constraints (Ballesteros, 2016). According to Mohammad (2017), construction managers are the key personnel representing the contractor who is appointed to execute the project and to oversee the entire construction process, and hence they are required to equip themselves with both technical and soft skill competencies. Furthermore, the success of the construction project had been based on human factors (Shahhosseini, 2011; Beheshtifar, 2013) and, apart from the technical skills, human skills are essential in construction managers who wish to deliver successful projects (Ballesteros, 2016). According to Anthony (2016) and Robles (2012), soft skills are in demand by employers, but employees lack these essential attributes. Technical professionals (construction managers) in the built environment are of the utmost importance in providing the infrastructure that is essential to support economic well-being and the quality of life in a competitive world (Carstens, 2016). Furthermore, the construction manager is the key figure who holds a central position both in a construction project and within the construction industry, and who is responsible for a construction site that is enclosed by physical boundaries (Madsen, 2017). Bentil (2016) and Jari (2013) state that a construction manager is the key person in a project, and is the communication hub for most reports, requests, and complaints during the lifecycle of a project. According to Punia (2013), the construction manager is the most important person in construction projects, and hence his/her soft skills expertise has become increasingly valuable and instrumental for the success of any complex construction project/s. Conversely, technical skills, the traditional procurement approach, and the iron triangle as the measurement of project success do not suit the complexity of today's projects (Mouchi, 2011). In commenting on the success of an individual in the workplace, Meeks (2017) states that 85% of it depends on soft skills, and only 15% on hard skills. A construction manager's ability actively to create and develop collaborative relationships with other project team members is an essential asset for managing a complex project successfully (Pauget, 2013).

A large and growing body of literature focuses on construction managers' technical skills while ignoring the so-called 'soft construction' management skills (Muneera Esa, 2014). Therefore, construction managers must demonstrate the knowledge, skills, and experience that are appropriate for the size, complexity, and risk of the project (Sadatrasool, 2016). According to Nasir (2011), employees who lack non-technical skills (soft skills) are problems for their employers. Punia (2013) states that construction organisations and their clients in the industry are in need of effective construction managers to be successful in a highly challenging, complex, competitive, and dynamic construction environment.

According to Jabar (2013), a construction manager is a business entity that facilitates the use of the construction management project delivery system on a construction project. Jabar (2013) also defines a construction manager as an employee of a construction company assigned to oversee the construction processes and the construction management of a project. Therefore, a construction manager's work is a dialogue with direct colleagues, subcontractors, suppliers, consultants, clients, and other stakeholders; hence he/she is the hub around which everything revolves (Styhre, 2012).

Baiden (2006) states that complex construction projects integrate multidisciplinary team members who come together to form a temporary organisation aimed at achieving the common goals of delivering a successful project. Baiden (2006) adds that the fragmented approach to complex construction projects leads to adversarial relationships that result in a blame culture, rather than working together in a spirit of trust, effective communication, cooperation, and collaboration throughout the different phases of the project.

As noted by Þórarinsdóttir (2012), the importance of soft skills is growing in the construction industry, but the focus has been on technical skills; hence a balance is now needed, since construction managers have to facilitate team members and other organisations involved in the complex, dynamic, and temporary project environment. Furthermore, construction managers' soft skills may play an important part in integrating different subcontractors and their resources, managing and maintaining the relationship between them, and enhancing collaboration during the construction phase. As Henry Ford once said, **"**Coming together is a beginning, keeping together is progress and working together is success**" (**Mouchi, 2011**).** Mills (2014) agrees with that statement, stating that the success of complex construction processes relies on effective

communication and collaboration between clients, designers, contractors, and other project team members and stakeholders. According to Shafie (2014), acquiring soft skill competencies is increasingly important for those providing services in complex projects, such as construction managers.

In deciding to compete in a tender process for complex construction projects, construction organisations need to ensure that their available key teams are equipped with the necessary soft skills that are so needed to deal with the complexity of the project (Amiruddin, 2016), and with their collective ability to integrate and work together effectively (Baiden, 2006).

According to Jain (2013), soft skills have become an essential quality for construction managers for the effective management of their project teams and their work in the corporate world, irrespective of the sector. Jain (2013) adds that, along with technical knowledge, today's technical professionals need to possess soft skills in order to succeed in complex projects.

Shahhosseini (2011) declares that, if project team members do not possess the required soft skills, project performance can be jeopardised. Alzahrani (2013) asserts that construction projects and their success are highly dependent on contractors' knowledge, experience, and abilities in interacting and coordinating all project activities to the satisfaction of the key stakeholders. According to Liphadzi (2015), construction organisations now search for construction professionals with management and leadership skills.

Therefore, the increasing importance of soft skills (Shafie, 2014) justifies the need for this paper to investigate construction professionals' perceptions of construction managers' proficiency in soft skills in complex construction projects in South Africa.

2.6 Soft skills

The existing context, definition, interpretation, and approach to soft skills is not clear, and that contributes to a soft skills gap among construction professionals and hinders construction managers from acquiring the expected level of soft skills (Mahasneh, 2016). Furthermore, little light has been shed on the soft skills that potentially influence construction managers' acumen and their level of effectiveness in complex construction projects (Zhang, 2013). According to BEE (2017), the need for soft skills has come to the fore due to the complexity of construction projects and the increasing diversity of stakeholders – some of whom have no experience in

construction, but have to be involved or kept informed about the process. However, the construction industry demands construction managers who are equipped with a high level of soft skills to increase the efficiency of work, processes, and technology (Mahasneh, 2016).

To achieve the objectives of the study, 23 elements of soft skills needed by construction managers in complex construction projects in South Africa were extracted from earlier papers, compiled, and used to collect data from construction professionals.

2.6.1 The need for soft skills

According to Taylaor (2016), agreement about what soft skills actually are, which ones are important for managers, and how to acquire them still needs to be determined. This statement confirms comments by Furuoka (2011), Taylor (2005), and Blackmore (1999), in saying that "no completely satisfactory model of human skill yet exists".

Hagan (2012) declares that the increasing demand for contractors to play an integrated role during the planning and design of a project, and the move towards multidisciplinary teams, also increases the pressure to acquire soft skills in order to interact with different stakeholders and to enhance project performance. According to Ahn (2012), to succeed in today's complex, dynamic, and challenging projects, construction managers require soft skills in order to influence and interact with all key stakeholders, including subcontractors and their direct workforce. Taylor (2016) states that technical professionals in disciplines such as engineering are increasingly required to broaden their skill sets to master the so-called soft skills.

Increasing client expectations and project complexity, the dynamic nature of construction projects, and various other factors that change at a pace that was never previously encountered in the construction industry, form part of the requirements of the soft skills expected from today's construction managers (Thabet, 2015, Dogbegah, 2011). However, Mahasneh (2016) asserts that, due to the high increase in the number of projects and client requirements, and the challenges brought by their complexity, construction organisations now demand people who are equipped not only with technical skills but also with essential soft skills, in order to increase the efficiency of work, processes, and technology. Furthermore, Ogunsanmi (2016) and Livesey (2017) declare that, due to the growing size and complexity of construction projects, the size of the project teams needed to manage them also increases, which places a greater emphasis on construction

managers needing to acquire soft skills in addition to technical skills, to interact effectively with diverse organisations involved in projects.

In addition, Dean (2017) states that, due to the increasing complexity of construction projects, contractors who have long been relying on technical skills are now facing major challenges when competing in the global market; thus the possession of technical skills alone is no longer sufficient for employees in the highly competitive marketplace. Dean (2017) adds that the skills and capabilities required to deliver a construction project successfully still present a challenge for both project team members and contractors, due to the increasing complexity in the design of modern construction projects. Livesey (2017) states that the complexity of today's construction projects needs a diverse project team with the necessary knowledge, skills, and experience in order to work together over a limited period of time on a complex project site. Furthermore, Ozbek (2017) confirms that the construction industry's increasing complexity and multidisciplinary workforce requires collaboration skills in order to succeed.

Zhang (2013) declares that the complexity of construction projects places more emphasis on construction managers' need for soft skills, due to the uniqueness and complexity of the stakeholders, project team members, multiplicity of requirements, and difficulty in coordinating all the resources required for the project. Yadollahi (2014) states that finding and selecting knowledgeable and capable construction managers for a complex project is the most important commercial implementation task, and an essential element in achieving success in a construction project.

As noted by Ahn (2012), to succeed in a complex and dynamic construction industry, construction managers require not only technical skills but also additional soft skill competencies such as leadership, collaboration, communication, interpersonal skills, professionalism, coordination skills, and problem-solving skills. In identifying the soft skills that are required of the construction managers working in complex projects that are procured through early contractor involvement, it would be useful to differentiate between the hard and soft skills expected of them (Adnan, 2012). Furthermore, Love *et al.* (2014) say that critical core skills – such as communication, collaboration, coordination and leadership – would improve among the project team members through the application of early contractor involvement.

Han (2011) refers to soft skills such as communication, teamwork, and leadership as human factors that affect the successful accomplishment of project objectives. The research carried out by Yaacoub (2011) identifies that there was an increased demand for soft skills in engineers working in a globalised world, and that the American Board of Engineering and Technology (ABET) will precisely reflect the needs of current work in the construction industry.

The unique structure of the construction industry, and rapid changes in its technological development, coupled with many other challenges have created the need for highly educated and competent construction managers (Affandi, 2012).

As stated by Walters (2011), it is vital that the construction industry appoint project team members with the essential soft skills. Walters (2011) asserts that the critical soft skills could be used when making important decisions in real world conditions. In order to achieve effective performance in the construction industry, construction organisations need to have employees who possess not only the domain knowledge and the technical and analytical skills, but also the skills to work collaboratively with all key stakeholders in dealing with the challenges of complex projects and the environment within which the project takes place (Abbas, 2013). Cukierman (2014) notes that, globally, accreditation boards, engineering school authorities, and industry itself are demanding soft skills.

Litchfield (2016) declares that engineers need to acquire both technical and professional skills in order to face the global challenges in the engineering field. LIorencs et al. (2016) refer to soft skills as 'professional skills' when addressing the challenges faced by students who study information and communication technology, and suggest that universities should develop appropriate methods that will enable students to acquire the soft skills required by the industry. According to Valdes-Vasquez (2015), construction professionals depend on both technical and soft skills to resolve the problems associated with complex projects. However, Zadeh ***et al.*** (2016) affirm that there is a need for soft skills, along with technical skills, to manage projects successfully. Hartmann (2016) confirms the urgent need for soft skills in the construction industry when asserting that engineers need to possess leadership skills – one of the soft skills.

According to Rashidi (2013), in order to perform effectively in the work place, construction companies' construction managers need to have not only domain knowledge, and technical and

analytical skills, but also the skills needed to deal with the external world of clients, and to work in a collaborative manner with team members.

According to Shafie (2014), the technical skills possessed by construction employees will not go any further without the support of soft skills. De los Ríos-Carmenado (2015) went further by stating that technical competences are not sufficient for today's world. Ling (2015) stated that people need soft skills because they have to interact with one another during the construction of complex projects. Ramzani and Jergeas (2015) proposed three main areas that should be considered when conducting skills training;

- Develop critical thinking in order to deal with complexity
- Develop softer parameters of managing projects
- Prepare project team members to be engaged in real projects

According to Mahasneh (2015), to participate in the global market, the construction industry will need people who possess the essential soft skills, and a soft skills gap among entry-level workers challenges the construction industry. Mahasneh (2016) states that the construction industry requires people who are highly equipped with soft skills in order to enhance the efficiency of their work, processes, and application of technology. Emmanuel (2016) adds that construction managers need to be equipped with various skills in order to execute projects and to participate and contribute during the design process of an early contractor involvement system. However, Nusrat (2016) asserts that, without the acquisition of soft skills, the level of potential success in the context of international trade, business transactions, and production cannot be maximised. Nusrat (2016) adds that, when soft skills are developed to supplement technical skills, collaboration, synergy, and productivity are increased and in turn improve business success and increase profitability.

2.6.2 The Lack of Soft Skills

According to Deep (2017), the skills and capabilities required to deliver a successful construction project is still a challenge for both project team members and contractors, due to the increasing complexity in design of modern construction projects.

Direito (2012) states that today's engineering graduates have an abundance of technical knowledge, but most of them lack the interpersonal and social skills required by the modern

setting. The lack of soft skills has been addressed by some of the higher institutions in engineering. For example, the presentation by Knobbs *et al.* (2013) during the 2nd biennial conference in Cape Town was about the development of soft skills in engineering students; but it did not focus on those who had already completed their studies and were now involved in projects. However, despite the importance of soft skills, they are regarded as non-academic abilities (Lavrysh, 2016). Furthermore, the difficulty in evaluating changes in soft skills – or the lack of them – is an issue affecting soft skills development efforts (Amiruddin, 2016; Groh, 2016). The soft skills deficit in the construction industry has been highlighted by Shafie (2014), who stated that the challenges and the diversity of construction managers' appointment opportunities raise the need to be equipped with key soft skill competencies. The dearth of soft skills has also been reported in a country such as Britain and, according to Clarke (2016), it is threating construction productivity, could have major financial implications for that country, and is already hindering the employability chances of graduates.

According to Takim *et al.* (2013), construction managers' service performance is still lacking in design and build. Takim *et al.* (2013) recommend that, in order to succeed through the application of the system, construction managers should be capable of tackling the practical aspects of design and construction, building up in-house management expertise and capability, achieving a high level of cooperation, sharing common project goals, and developing an ability to resolve conflicts among the project team. According to Levasseur (2013), many technical people lack the soft skills that would enable the organisation to achieve optimal performance. However, Sunindijo (2013) states that project management personnel should be flexible, effective communicators in order to build teamwork, and have strong presentation skills in order to ensure that all stakeholders are well-informed throughout the project. Sunindijo (2013) adds that, due to the fast-changing environment of the construction industry and the increasing challenges, construction managers find themselves confronted by new issues, and have to undertake roles that have not traditionally been part of their responsibility. Hence their roles have to be adapted and supplemented with nontechnical skills in order to meet today's professional demands. Punia (2013) concurs, stating that the survival of the organisation and the success of the project hinge on the soft skill competencies of effective construction managers.

Adding to the large amount of research on soft skills carried out in different industries, Davies *et al.* (2014) declare that the construction industry's inefficiency is due to the lack of soft skills and

the poor cultural integration of education and skills. Davies *et al.* (2014) add that, for the project team to succeed in a BIM environment, a focus on soft skills would be a requirement.

According to the Built Environment 2050 report, the construction sector's inefficiency results from a lack of soft skills and a poor cultural integration of education and skills. However, there is still no clear definition of soft skills, whereas technical skills are defined in detail (Davies, 2015). Mahasneh (2015) notes that the soft skills gap in the construction industry is partially a knowledge gap and supply/demand problem.

Current project performance within the construction industry is exacerbated by clients' and professionals' lack of soft skills to help make clear decisions when choosing the most appropriate procurement method and selecting the project team (Braimah and Ghadamsi, 2013). Therefore, for a construction organisation's survival and long-term economic competitiveness, construction managers with effective soft skills who can enhance productivity and profit are essential (Jain, 2013). The lack of non-technical skills while being highly dependent on technical skills is a problem that should be overcome by soft-skilled workers (Nasir, 2011). The construction industry is affected by: the shortage of high design knowledge, complexity in design, political uncertainty, collusion, complexity of stakeholders, cultural diversity, poor communication, an environment with multiple projects, excessive delays, budget overruns, poor quality, and the demand for improved and efficient project delivery (Alzahrani, 2013; Emuze, 2013; Othman, 2013; Othman, 2014; Enshassi, 2011; Khattak, 2016).

According to Mahasneh (2015), various scholars argue that the low level or lack of soft skills in the construction workforce is challenging, even though the US construction industry is also faced with many challenges, such as globalisation, environmental impacts, changes in technical forces, and the rise of client expectations. However, Suprapto (2016) asserts that researchers agree that the current performance problems within the construction industry are strongly related to inadequate interaction, poor collaboration, and lack of attention to its economic dynamics. On the other hand, Poirier (2016) states that the construction sector is organised around, and relies on, a process of interaction among the project team, including the stakeholders possessing complementary skills and experience to fulfil mutual objectives.

2.6.3 The Importance of Soft skills

Freeman (2017) declares that institutions and employers from different industries have realised and eulogized praised the importance of soft skills and their need to complement construction professionals' technical skills.

According to Carstens (2016), soft skills have become increasingly important in the construction industry because it is rapidly moving from a focus on the delivery of technical services to a service industry that competes in the global marketplace. Meanwhile, Mitchell (2016) states that soft skills have become more important to employers due to the growth in the number of jobs that have service responsibilities and types of organisation that require collaboration and communication. Soft skills are considered critical assets in today's workplace (Randolph, 2016; de Ridder, 2014; Deepa, 2013). According to Ling (2014), contractors' soft skill competencies play a more important role than consultants' soft skill competencies in bringing about superior project outcomes. Robles (2012) states that today's workplace shows that technical skills are not enough to keep individuals employed, while soft skills are critical for productive performance in today's workplace. Taylor (2016) states that employees who Excel in the technical skills, but not in other skills such as managing and working with others, will be of much less value to organisations in the future.

As a result of the continuing complexity of construction projects, the integration of the client, designers, contractors, and suppliers becomes a challenge, especially in a single contractual relationship where architectural values and innovative engineering are to be realised through effective collaboration and construction processes (Sebastian, 2011)**.** Both Sebastian (2011) and Lavikka (2015) concur, stating that the lack of communication and coordination between key stakeholders has an impact on the performance of construction projects. Hietajärvi (2017) supports this by stating that cultural and organisational boundaries hinder collaborative work, communication, and joint problem-solving in the construction industry.

According to Zhang (2013), emotional intelligence is a crucial soft skill, and provides many benefits, but it has been ignored when selecting project teams for complex projects, and is unexplored in construction project management. However, a competent construction site manager with the necessary skills and knowledge is vital for the professional and successful

management of a complex project, while ensuring that the project is completed according to the client's defined objectives (Hwang, 2013).

According to Carstens (2016), professionals with both hard and soft skills in the built environment are of the utmost importance in delivering the infrastructure projects that are necessary for the economy of the country. Carstens (2016) adds that soft skills have become increasingly important in the construction industry because of its move towards being a service industry that competes globally. Mahasneh (2016) asserts that the construction industry needs people who are equipped with a high level of soft skills in order effectively to enhance the efficiency of the processes and project outcomes. Nusrat (2016) states that job performance and the career success of an individual largely depend on the effective practice of soft skills. Furthermore, Okoye (2015) states that communication among project team members and the entire network is important to support a shared understanding of the project and its goals. Kazaz (2016) asserts that construction organisations are now looking for experienced professionals with effective leadership and management skills rather than technical experience, although this is also important.

According to Jain (2013), the success and performance of construction managers depends not only on effective job-based training but also on soft skills development. Jain (2013) adds that many organisations continue to underinvest in soft skills training in spite of the great importance of soft skills in the growing complexity of projects. Oeij (2012) declares that soft skills might also be more important than hard skills, since the impact of complex projects is largely produced by people. Þórhildur (2012) supports Oeij (2012), stating that the traditional perspective of project management has been on hard skills, whereas the importance of soft skills is increasing in the work place environment.

According to BEE (2015), if soft skills are to be taught, they should at least be those that are considered important by employers. Therefore, in order to continue contributing to the growth of the construction industry, construction managers need to acquire the necessary soft skills to complement their technical skills (Danial, 2014).

2.6.4 Training Needs

Although universities are addressing the issues of soft skills in preparing students, there appears to be a gap in terms of what is offered and what is needed to deal with complex projects in today's real world. Training programmes are inadequate for the construction industry's requirements and for what is expected in today's work environment (Ramazani and Jergeas, 2014). Sitthisomjin (2014) states that every organisation needs to develop its staff to enhance their skills properly and progressively, in line with global trends.

Given the strategic importance of the assets created by projects (Suprapto, 2016), and their complexity, challenges, changing economic conditions, and increasing client requirements, construction organisations need to understand, inspire, and develop their key personnel to possess essential soft skills to enable them to interact and participate effectively in a multi-organisational project (Dogbegah, 2011).

According to Jain (2013), the acquisition of managerial soft skills through training is essential, and leads to better-performing managers. Therefore, without the acquisition of what have come to be called 'soft skills', the level of potential success of business transactions, production, and international trade cannot be maximised (Hang, 2015). According to Eriksson (2017), complexity in infrastructure projects increases the need for learning to develop new ranges of adaptive solutions when circumstances change. Ngang (2015) goes further, stating that the development of human capital and the enhancement of the knowledge, skills, experience, and intellectual capacity of key construction employees must be a priority if the construction industry is to improve its performance. Zhao (2015) states that collaborative construction skills can be obtained through higher education training in construction. Weedon (2013), cited by Gibb (2014), suggests that specialist programmes do not necessarily work well in developing soft skills.

The construction industry's increasing complexity and multidisciplinary workforce requires the necessary collaboration skills in order to succeed (Ozbek, 2017). However, the study carried out by Beenen1 (2017) confirms that there is agreement among employers and students that interpersonal skills are critical to managerial success.

Many researchers have focused their studies on soft skills as an entry level to the workplace environment in relation to the prospective employers' expectation of university graduates (Adnan, 2012; Nikitina, 2012; Knobbs and Grason, 2012). In contrast to this statement, Junrat (2014) states that soft skills involve the relationship between a person and society, and can be developed through personal experience and reflection. However, Zhao (2015) differs from Junrat, stating that collaborative construction skills, which is one of the soft skills, can be obtained through from higher education and training in construction. Hu (2015) asserts that there has been a lack of academic effort in exploring the need for improved soft skills, and so knowledge advancement is needed to help construction site managers to improve service customisation together with the development of construction projects.

Levasseur (2013) asserts that human development is defined as the process through which the growing person acquires a more extended, differentiated, and valid concept of the ecological environment, and becomes motivated and able to engage in activities that reveal the properties of, sustain, or restructure the environment at levels of similar or greater complexity in form and content.

Thus researchers such as Adnan (2012), Nikitina, (2012), and Knobbs and Grason (2012) are calling for institutions to introduce the learning of soft skills in the current curriculum in order to ensure that graduates are equipped with the necessary employability skills that will able them to secure employment when completing their studies. However, no agreement exists about what these skills actually are, which ones are important, and how to acquire them (Taylor, 2016). Thus a list consisting of 23 soft skills extracted from previous papers was compiled, and a research method was identified and used to collect data from construction professionals.

CHAPTER 3

3. Research Design and Methodology

3.1 Introduction

This study aims to investigate construction professionals' perceptions of construction managers' soft skills in complex projects in South Africa; compile a list of essential soft skills; identify soft skills that construction managers lack; ascertain which ones are important; and identify training needs.

Research is defined as:

- the process that involves obtaining scientific knowledge using various objective methods and procedures (Welman, 2005: 2);
- a systematic process of collecting, analysing, and interpreting information (data) in order to increase our understanding of a phenomenon about which we are interested or concerned (Leedy *et al.*, 2014:2).

According to Leedy *et al.* (2014:19), 'scientific' means the method that searches after knowledge, whereas 'scientific method' is where insight into the unknown is sought by:

1. identifying the problem that defines the goals of one's quest;
2. positing a hypothesis that, if confirmed, resolves the problem;
3. gathering data relevant to the hypothesis; and
4. analysing and interpreting the data to see whether they support the hypothesis and resolve the question that initiated the research.

3.2 Research Design

According to Blanche (2006:37), the aim of a research design is to plan and structure a research project so that the eventual validity of the research findings is maximised. This study was based on a concurrent triangulation mixed methods research design. The design for the study was based on a survey and interview, and the intent was to investigate the contractors' (construction managers') soft skill competencies in complex construction projects in the Gauteng Province in South Africa. The identification of the necessary soft skills for construction managers was

through a literature review. Many researchers have defined a research design differently – for example:

A strategic framework or plan that provides the guideline that will be used in arranging systematically the conditions in which the collection and analysis of data will be carried out including the instruments that will be used to analyse and validate the results (Durrheim *et al.*, 2006).

The research design of this study is structured as in Figure 1 – 2 below:

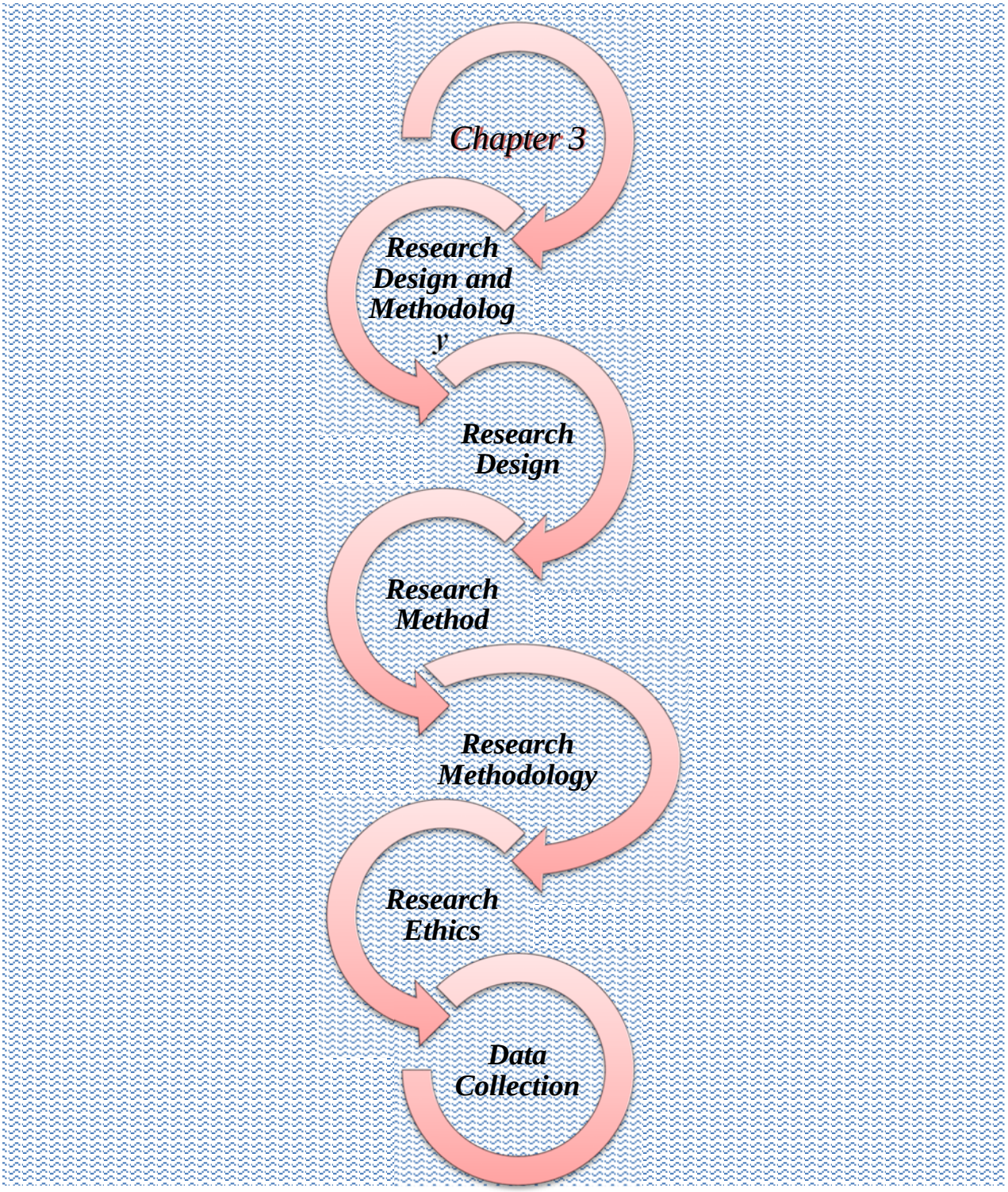


FIGURE 4: RESEARCH DESIGN 1

3.3 Research Method

According to Ruddock (2008), the construction management research community has long adhered to its traditional positivist (quantitative) research method, and due to the concerns and debates raised by the constructivist (qualitative) community on the apparent dominance of positivist (quantitative) research methods, there has been a move towards mixing the research paradigm methods. Ruddock (2008) also states that the aim of integrating the paradigms is not to infer that combining research strategies is better than employing a single strategy, but to present an alternative perspective on how construction management reseachers could design their research projects in the future. According to Goulding (2014), the use of mixed methods research in building and costruction research has been studied in detail. Cameron (2015) confirmed the increased use of the mixed method in other disciplines such as health, sociology, psychology, and education. Although the importance of mixed methods has been pointed out by many researchers, the method remains under-used in management science, particularly in the construction industry (Cameron, 2015) However, Creswell (2013: 4) defines mixed method research as an approach to an inquiry that combines both qualitative and quantitative forms.

In following what other researchers have done in their investigations of the use of mixed methods research in other discplines (Stentz, 2012), and in order to achieve the objectives of this study, the literature was reviewed to identify a suitable research method for the study. Hence this study was based on a concurrent mixed methods research design. The phenomenon measured in this study describes the professionals' perceptions of the construction managers' soft skills competencies in complex projects in the South African construction industry. Construction management is about people who interact with each other (Ruddock, 2008) throughout the life cycle of the project in an attempt to enhance the success of the project and mitigate any possible risks. Therefore, this study is further categorised as a descriptive study. The method comprised a mix of quantitative (positivist) and qualitative (constructivist or interpretivist) research paradigms. The quantitative (positivist) method was based on a survey questionnaire, administered email, and using a five-point Likert scale, whereas the qualitative (interpretivist) method was based on face-to-face semi-structured interviews with a set of questions set up by the researcher. The qualitative research questions were designed so that they were adjustable during the interview in order to match the situation and to search for more information from the interviewee. The figure below represents the concurrent triangulation strategy, indicating how

the quantitative and qualitative data were collected, analysed, and compared in order to reach the conclusion of the findings.

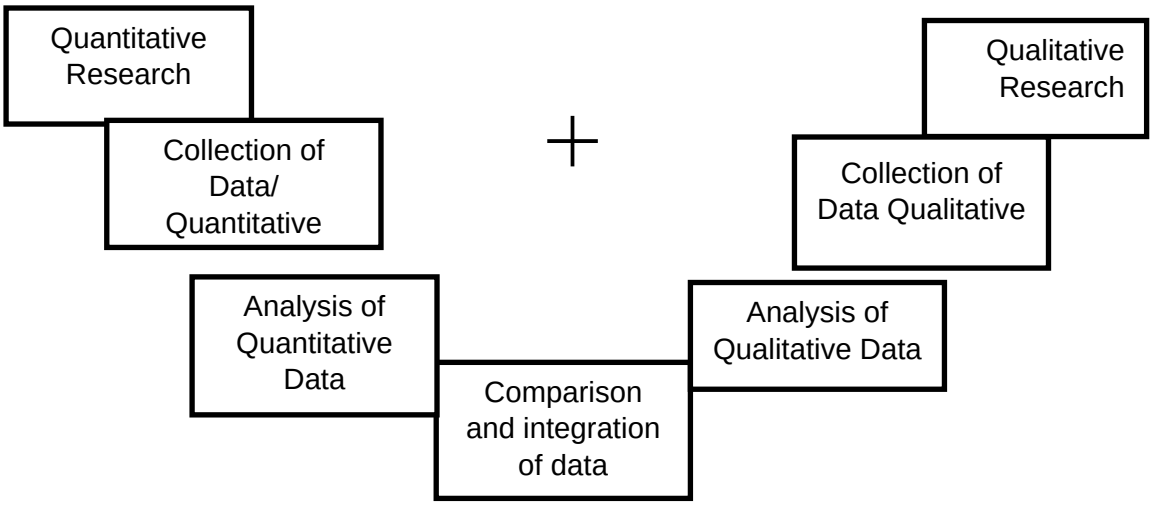


FIGURE 5: CONCURRENT TRIANGULATION 1

3.4 Research Instrument

A questionnaire survey (quantitative) was used, and semi-structured interview questions (qualitative) were compiled and used, to collect data. The research survey questionnaires were distributed to professionals from various professional organisations, such as quantity surveying, architecture, engineering, and project management, all based in South Africa (Emuze and Smallwood, 2014; Scheepbouwer and Humphries, 2011; Lohne, 2014; Rahman and Alhassan, 2012). Copies of the research survey questionnaire were sent to the South African Council for Project and Construction Management Professions (SACPCMP) and the Pretoria Institute for Architects (PIA) for distribution to their members. A letter of invitation, including the consent form, was sent by email to prospective participants, requesting confirmation of whether they would be interested in participating in the survey. Follow-up telephone calls were made, and emails were sent out reminding prospective participants to confirm their participation, sign the consent form if interested, and return to the researcher. The researcher also asked other consultants, through email and telephone calls, whether they would be available and willing to participate in an interview process. Two consultants replied, with one stating that the topic was not in line with their expertise, and the second stated that it was not only the contractors who lack the soft skills, but that some consultants within the construction industry have similar problems.

3.5 Research Population and Sampling Technique

According to Heravi (2015), it is often economically difficult, infeasible, and a lengthy process to collect the data from every member of the population. However, Visesbora (2015) asserts that selecting the sampling techniques is known as one of the essential parts of a research project. This study was carried out with a good mix of construction professionals from different construction disciplines/backgrounds based in Gauteng Province in South Africa. Participants were fully active in the construction industry, involving medium and large construction projects as well as new construction projects and refurbishments, and were selected based on their qualifications and experience in the construction industry.

The participants for this research study were project managers, architects, quantity surveyors, and engineers, and the geographic area of the participants was Gauteng Province, which is one of the nine provinces in South Africa. The questionnaires were distributed via email as the quickest method, and the administration was tracked easily, as the participants were all currently working in the construction industry.

Due to the lack of a specific sampling frame for construction managers with the relevant soft skill competencies necessary for complex construction projects, non-probability sampling techniques of snowball sampling and purposive sampling were used to obtain the study samples (Ghadamsi, 2013; Ruan, 2016). Both sampling methods were used to collect the primary data from the participants, while the secondary data were collected through the literature review. Factors that determined the size of the study sample were also considered and assessed.

The choice of snowball sampling was to obtain assistance from known professionals to nominate other participants, through their social networks, who had the knowledge and experience in construction projects (Liguo, 2014), while purposive sampling was selected because the researcher focused on a specific group (construction professionals) with construction-related qualifications. According to Esa (2014), nonprobability sampling is used when a specific group of people is chosen to participate in the research. Ikediashi (2014) confirms that purposive sampling is the most common technique because it affords the researcher the advantage of selecting the most productive sample to answer the research question. Mtsweni (2016) asserts that purposive sampling allows the researcher to specify the roles or people who participate in the study. Abowits (2009) states that the method has become common in construction research,

thus previously confirming the use of purposive sampling. After a pilot test of the research questionnaire, professionals in the built environment were contacted and a letter was sent through the email requesting their participation in the research. According to Shao (2012), snowball sampling makes it impossible to control questionnare distribution and does not allow for the calculation of the response rate. However, this study opted to apply the following equation in order to estimate the expected population size (Mansour, 2015; Moore, 2003),

$N = (Z/2m)^2$ (equation 1)

where: N is the population size, Z is the value (e.g. 1.96 for 95% confidence level), and M is the confidence interval (e.g. 0.05 = +- 5).

Based on the formula, the expected or targeted population was estimated at between 100 and 150 participants.

3.6 Demographic Profile of Respondents

This section of the study gathered the demographic information of the participants – their personal background, such as qualification/s, years of experience, gender, and age (Ngang, 2015). Four constructs were used to collect the status of the respondents: gender, age, highest qualification/s, and years of experience in construction. The age was estimated to be between 21 and 65 or more, while the expected years of experience were estimated at between 0 and 45 or more.

3.7 Research Survey

The research survey consists of five research questions that were structured as follows:

Research Question 1 aimed at identifying the soft skills that are needed for contractors in complex projects in order to be successful in achieving the clients' stated objectives. To achieve the objective of the study, a list of twenty-three (23) soft skills or variables were extracted from a range of the literature, coded, and compiled in a tabular format (see below).

• Communication Skills
• Leadership Skills
• Collaboration/Teamwork skills
• Negotiation Skills
• Critical Thinking and Problem solving Skills
• Conflict Management Skills
• Decision-making Skills
• Coordination Skills
• Delegation Skills
• Information Management Skills
• Presentation Skills
• Political Skills
• Entrepreneurial Skills
• Stakeholder Management Skills
• Cultural Alignment Skills
• Team Integration Skills
• Self-Management Skills
• Ethics and Professional Moral Skills
• Persuasion Skills
• Influencing Skills
• Team Building Skills

• Motivation Skills
• Interpersonal Skills

TABLE 1: CONSTRUCTION MANAGERS' NEEDED SOFT SKILLS 1

These variables were used to determine the perceptions of construction professionals (consultants) about the soft skills needed for complex projects. A five-point Likert scale was used to rate each of the soft skill competencies that are needed (Gudiene, 2017) in order to make construction managers successful in complex projects in South Africa, where

1 = Not Needed, 2 = Least Needed, 3 = Needed, 4 = Highly Needed, and 5 = Extremely Needed.

The mean and standard deviations were determined through the application of SPSS version 25. However, **Spearman's rank correlation test** was applied to questions 1 – 3 in order to determine the level of relationship between the proposed variables based on the participants' perceptions (Chan, 2010). **Kendall's coefficient** was applied to questions 4 – 5 in order to measure the degree of agreement between the different participating groups (McCord, 2015).

Research question 2 aimed to identify the soft skills that are lacking in the construction industry (SA) and that contribute to project failure. However, to achieve the objective of this research, the list of twenty-three soft skills was sent to construction professionals to determine whether they are lacking in construction managers working in complex projects in South Africa. Participants were requested to score each of them on a five-point Likert scale, where 1 = Not Lacking, 2 = Fairly Lacking, 3 = Lacking, 4 = Mostly Lacking, and 5 = Extremely Lacking.

The focus of this study was to investigate and analyse construction professionals' perceptions of the construction managers' lack of soft skill competencies in complex projects.

Research Question 3 aimed to determine the soft skills that are important for construction managers in complex construction projects. To achieve this objective, and based on the identified soft skills, respondents were asked to rate each soft skill on a five-point Likert scale, where 1 = Extremely Unimportant, 2 = Unimportant, 3 = Important, 4 = Very Important, and 5 = Extremely Important.

Respondents' perceptions about construction managers' soft skill competencies in complex construction projects were subject to descriptive (Chileshe, 2015) and analysed primarily using

statistical methods (Goulding, 2014). The responses received from the participants were used to ascertain the relative importance of the soft skills through the examination of the mean score, the median, and the standard deviation of the identified soft skills (Chileshe, 2015). Pearson's coefficient of correlation was also conducted to measure the strength of the variables according to the perceptions of the construction professionals.

The same list of soft skills presented above was used, when participants were requested to score the importance of the contractors' soft skills in achieving success in complex projects. A five-point Likert scale was used, where 1 = Extremely Unimportant, 2 = Unimportant, 3 = Important, 4 = Very Important, and 5 = Extremely Important.

Research Question 4 aimed at determining the importance of the construction managers' soft skill competencies in complex problems, and fourteen variables were compiled.

A Likert scale was used to rate the importance of construction managers' soft skill competencies in complex projects (Gudiene, 2017) in South Africa. The researcher applied descriptive statistics and mean score in order to evaluate the importance of the construction managers' soft skills competencies in complex projects (Chan, 2010).

The following soft skills were also used to determine the importance of the construction mangers' soft skill competencies in complex projects, and participants were requested to rate them on a five-point Likert scale, where

1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree

• To contribute to the overall performance of the project
• To perform effectively during management of the construction processes
• To maintain efficiency and produce quality outcomes
• To be more flexible and react quickly to changes
• To allow the construction managers to organise the workforce in a way that they better respond to the needs of the projects
• To maintain performance continuity in highly uncertain construction

environments
• To help change the blame culture and instil a spirit of being a responsible team member
• To improve interdisciplinary collaboration and multi-stakeholder partnerships on the construction site
• To interact with all multi-stakeholders and manage construction processes effectively
• To fulfil the expectations of the client
• To reflect the organisation's good image
• To enhance employability with better career prospects
• To optimise the construction organisation's performance in complex projects
• To enhance team selection and allocation of work according to varying project requirements

TABLE 2: IMPORTANCE OF CONSTRUCTION MANAGERS' SOFT SKILLS IN COMPLEX PROJECTS 1

Research question 5 aimed at determining the training strategies to be used in order to equip construction managers with the soft skills that are essential for complex projects in South Africa. Due to the shortage of people holding transferable (soft) skills, and the increase in demand for such people (Costa, 2017), training in such skills is necessary, particularly with the current challenges and the complexity of today's projects. However, Costa (2017) states that people learn not only inside the boundaries of an institution, but also in everyday life situations; hence informal learning cannot be ignored.

In order to achieve the five research objectives, a list of the following training strategies were proposed and, irrespective of their background, experience, or qualifications, the respondents were asked to identify (through a ranking scale) the soft skills training that would enhance construction managers' soft skill competencies in complex projects. The questionnaire was constructed according to a five-poijt Likert scale (Costa, 2017), where 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Agree/Neutral, 4 = Agree, and 5 = Strongly Agree. **Kendall's coefficient**

was also applied to determine the level of agreement between the participant groups (McCord, 2015).

Project-based Learning/On-the-job Training:
• Mentorship Programme
• Coaching
• Internship
Off-the-job Training:
• Conferences/Workshops
• Short Courses in Soft Skills
• Formal Training
• Online Training
• Experiential Training
• Time Space Learning

TABLE 3: SOFT SKILLS' TRAINING STRATEGIES 1

This study used a benchmark score of three and above on all questions to determine the important soft skills for construction managers in complex projects (Ikediashi, 2014). However, constructs that scored less were considered insignificant in importance, or not lacking (Ikediashi, 2014). A similar benchmark was used to determine the training strategies for construction managers to be equipped with such soft skills.

The five-point scale was transformed to relatively importance indices for each of the soft skills in order to determine the ranking of the soft skill competencies as perceived by the respondents (McCord, 2015).

3.8 Qualitative Research Questions

Qualitative research questions were compiled and semi-structured interviews were conducted where the interviewees were selected from the same groups of professionals in order to gather the quantitative data.

In a similar way to the quantitative questions, the qualitative research questions were based on the focus of the study, which is an investigation and analysis of the consultants' (professionals') perceptions of the construction managers' soft skill competencies in complex projects. These questions are outlined in appendix D (Interview Protocol).

Building on the foundation of existing research, the intention of this study was to bridge the knowledge gap and contribute to the debate about the necessary soft skills and the training programmes for contractors to be able to participate more effectively in complex construction projects (Jergeas, 2016).

3.9 Research Ethics

3.9.1 Definition of ethics

- Ethics is the study of what are is good, right, wrong, or virtuous in the conduct of research (Punch, 2013:36; Mouton, 2006:238).
- Research ethics is a field of applied ethics that seeks to ensure that the welfare of research participants is protected (Blanche, 2006:563)

Scientific research is based on human conduct, and therefore such conduct has to conform to generally accepted norms and values (Mouton, 2006).

Although there are no major concerns, privacy will be protected and no names will be used in the final report. Participants will be notified on time about the research and its purpose to ensure informed consent.

3.9.2 Obligation of the researcher

The researcher adhered to the research ethics requirements stipulated by the University of the Witwatersrand, and ensured that integrity, honesty, and respect were maintained throughout the research process. The researcher distributed an Informed and Voluntary Consent Form to all

prospective participants prior to collection of the data. The researcher also ensured that prospective participants had a substantial understanding of the research and its nature.

In order to achieve the goals of the study, the researcher adhered to the research ethics standards and obligations which were:

- Protect and respect human dignity;
- Respect the participants' integrity, freedom, and rights;
- Protect participants from any harm that might be caused by the research;
- Protect children and young people from any harm due to the research;
- Recognise the social and cultural values of the indigenous population;
- Avoid any conflicts of interest;
- Bear special responsibility for protecting the interests of vulnerable groups;
- Avoid becoming dependent on informants;
- Respect and recognise participants' culture;
- Promote standards of scientific integrity;
- Avoid plagiarism of other texts;
- Strive to exercise good reference practice at all times;
- Strive to exercise transparency, impartiality, and honesty;
- Strive to protect the research results from being presented in a misleading manner;
- Protect and secure participants' information;
- Participants' privacy and psychological wellbeing will be respected and protected by not divulging to the public;
- Ensure that the level of confidentiality, anonymity, and protection of the collected data is adhered to;
- Provide prospective participants with full details of what will be asked of them;
- Protect the disclosure of the individual's identities; and
- Discuss the accessibility, presentation, dissemination, and archiving of data with prospective participants.

3.10 Data Collection and Results

The ethics clearance form was completed and submitted to the Ethics Committee for approval. The researcher had to obtain written approval from the Ethics Committee of the University of the Witwatersrand before conducting data collection. The approval was granted in protocol number CEM/18/01/MSS, dated 21st January 2018, and expiring on 21st January 2019.

Once approved, the researcher sent out an invitation letter to prospective participants asking about their willingness to participate in the research. An informed consent form and interview protocol were distributed to those who confirmed their willingness to participate in the research. The interview protocol comprised semi-structured qualitative interview questions. A letter was sent to those who participated in the survey and interview processes, thanking them for their time and contribution to the research study.

The mixed methods adopted for this study involved a mixture of both quantitative and qualitative data collection (Hoxley, 2011), suitable for collecting the most appropriate data to fulfil the objectives of the research (Wood, 2008). Hence the main instruments used to collect the primary data for determining the level of importance of the identified soft skill competencies for this research were the structured questionnaire survey and the face-to-face semi-structured interviews.

Both the survey questionnaire and the semi-structured interviews were used to collect demographic data about the respondents' educational background and years of experience in the construction industry. Both instruments were also used to collect data from construction professionals based in South Africa and working in Gauteng Province. Participants were selected using snowballing and purposive sampling methods according to their work experience, which ranged between 10 and 35 years.

3.10.1 Quantitative Data Collection

According to Visesbora (2015), the process of collecting data is one of the most important parts of research activity. Various procedures are available for collecting research data that can increase the validity and reliability of the data and their interpretation (Zohrabi, 2013).

The questionnaire strategy is the primary source of obtaining data in any research endeavour (Zohrabi, 2013), and is considered the most appropriate for quantitative data (numerical data) collection because of its level of accuracy and because it compares the target population on the same basis (Braimah and Ghadamsi, 2013). The questionnaires were sent via email to those who showed interest and willingness in participating in the research, which comprised a number of questions asking respondents to score the variables on a five-point Likert scale, where 1 denoted extremely unimportant and 5 denoted extremely important. All data collected through the questionnaire were as per the individual's perception about contractors' soft skill competencies. Furthermore, the questionnaire was tested by some professionals, and amendments were made to the questionnaire (Shao, 2012). By using the Likert scale, the researcher was obligated to use Cronbach's alpha coefficient for internal reliability, which means the extent to which variables in an instrument are consistent among themselves and with the overall instrument (Croasmun, 2011).

3.10.2 Research Survey Results

A total of 106 participants submitted their feedback, with the breakdown according to the different disciplines as follows:

- Quantity Surveyors (36)
- Architects (28)
- Project Managers (24)
- Engineers (14)
- Undisclosed Discipline (4)

Graphs or charts were created to indicate the level of rating of the participants' perceptions. Table 1 shows the respondents by their disciplines (Hamid, 2014). The largest number of respondents belonged to the Quantity Surveying group, with 38 responses (34.297%), followed by the Architects group with 28 responses (26.67%) , Project Managers with 23 responses (21.90%), Engineers with 14 responses (13.33%), and lastly the undisclosed group with four responses (3.81%) (those who did not declare to which discipline they belonged, but they had to be included in the data capturing and analysis). The size of this last group is minimal compared with the total percentage of 100%, meaning that their influence on the outcome is also small.

Variables	Classification	Frequency	Percent (%)	Cumulative Percent (%)
Position in Organisation				
	Project Managers	23	21.90	21.90
	Architects	28	26.67	48.57
	Quantity Surveyors	36	34.29	82.86
	Engineers	14	13.33	96.19
	Undisclosed	4	3.81	100.00
Total		105	100	100
Gender	Male	82	78.10	78.10
	Female	16	15.24	93.33
	Undisclosed	7	6.67	100.00
Total		105	100	100
	21 - 25	9	8.57	8.57
	25 - 30	14	13.33	21.90
	30 -35	11	10.48	32.38
	35 - 40	10	9.52	41.90
	40 - 45	15	14.29	56.19
Average Age	45 - 50	13	12.38	68.57
	50 - 55	9	8.57	77.14
	55 - 60	7	6.67	83.81
	60 - 65	9	8.57	92.38
	65 & above	5	4.76	97.14
	Undisclosed	3	2.86	100.00
Total		105	100	100
Education	Student	1	0.95	0.95
	ND	9	8.57	9.52

	NHD	5	4.76	14.29
	B-Tech	3	2.86	17.14
	M-Tech	1	0.95	18.10
	BSc	17	16.19	34.29
	B-Arch	15	14.29	48.57
	B-Engineering	8	7.62	56.19
	BSc (Hons)	26	24.76	80.95
	M- Arch	8	7.62	88.57
	MSc	6	5.71	94.29
	PhD	3	2.86	97.14
	Undisclosed	3	2.86	100.00
Total		105	100	100
Experience	0 - 1	3	2.86	2.86
	1 – 10	28	26.67	29.52
	10 – 20	26	24.76	54.29
	20 – 25	15	14.29	68.57
	25 – 30	7	6.67	75.24
	30 – 35	10	9.52	84.76
	35 – 40	5	4.76	89.52
	40 – 45	8	7.62	97.14
	Undisclosed	3	2.86	100.00
Total		105	100	100

TABLE 4: PARTICIPANTS' DEMOGRAPHIC INFORMATION (ADAPTED FROM KATTAK, 2016) 1

Therefore it can be declared that the reponses from the survey were a true reflection of the coverage of possible participants, and did not discriminate against age, experience, and gender, except that the objective of the researcher was to collect raw data from construction professionals who are currently working in Gauteng Province.

3.10.3 Feedback of Research Survey for Question 1

A total of 105 participants participated in the survey and completed the questionnaire. The results are presented in Table 5; and an Excel spreadsheet was used to develop a graph to

indicate the number of responses for each soft skill and the Likert scale used to rate each of them. Twenty-three soft skills were identified in the literature review of this study, and were sent out to the following group of participants to evaluate: Architects, Quantity Surveyors, Project Managers, and Engineers. The survey respondents rated each competency on a five-point Likert scale for each perceived needed skill, where 1 = Not Needed, 2 = Least Needed, 3 = Needed, 4 = Highly Needed, and 5 = Extremely Needed, according to the following research question: "What soft skills are needed to make a construction manager successful in complex projects?".

Code	**Variables (Soft Skills)**	1= Not Needed	2= Least Needed	3= Needed	4= Highly Needed	5= Extremely Needed
SS1	Communication Skills			2	32	71
SS2	Leadership Skills			5	45	55
SS3	Collaboration/Teamwork skills			9	32	64
SS4	Negotiation Skills		2	24	51	28
SS5	Critical Thinking and Problem-solving Skills			5	33	67
SS6	Conflict Management Skills		1	15	41	48
SS7	Decision-Making Skills		1	8	32	64
SS8	Coordination Skills		3	12	34	56
SS9	Delegation Skills		5	16	42	42
SS10	Information Management Skills		3	21	49	33
SS11	Presentation Skills	3	20	51	23	9
SS12	Political Skills	5	19	44	30	6

SS13	Entrepreneurial Skills	5	25	51	18	6
SS14	Stakeholder Management Skills	1	13	32	45	7
SS15	Cultural Alignment Skills	2	15	37	38	13
SS16	Team Integration Skills		3	14	46	42
SS17	Self-Management Skills		3	9	41	52
SS18	Ethics and Professional Moral Skills		1	13	27	64
SS19	Persuasion Skills		4	38	40	13
SS20	Influencing Skills		5	33	51	16
SS21	Team Building Skills		4	17	43	41
SS22	Motivation Skills		2	14	44	45
SS23	Interpersonal Skills		1	19	46	39

TABLE 5: PERCEIVED NEEDED SOFT SKILLS 1

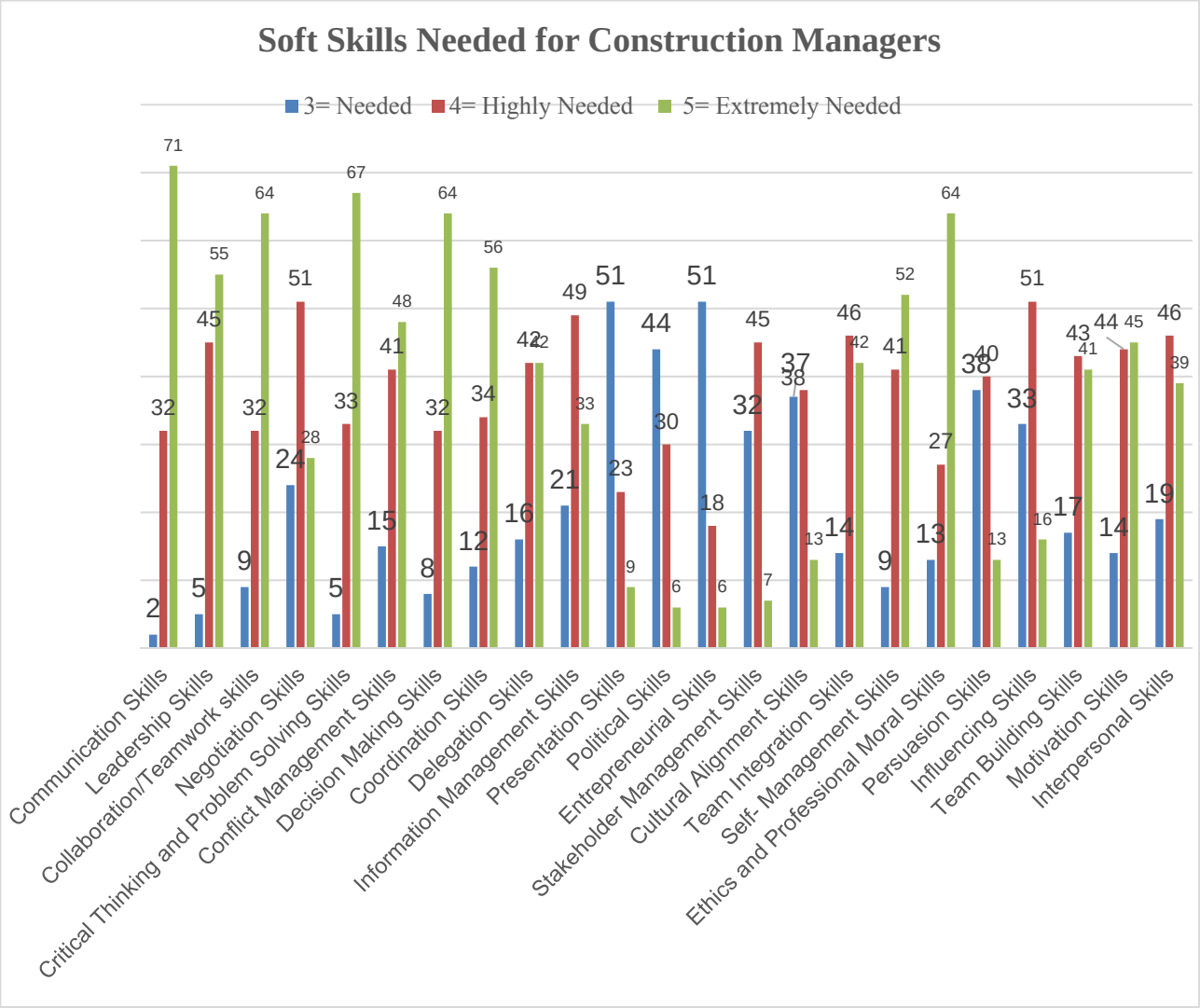


FIGURE 6: PERCEIVED NEEDED SOFT SKILLS 1

The above data were transformed into an Excel format that could be exported to SPSS for analysis.

3.10.4 Feedback of Research Survey for Question 2

The aim of this question was to determine the contractor's lack of soft skills in complex projects as perceived by the participants. The compiled list of soft skills was used, and participants were asked to rate each of the soft skills on a five-point Likert scale, where 1 = Not Lacking, 2 = Fairly Lacking, 3 = Lacking, 4 = Most Lacking, and 5 = Extremely Lacking. Table 6 below shows the results of the 105 participants regarding the perceived lack of soft skills in complex projects.

Code	Variables (Soft Skills)	1= Not Lacking	2= Fairly Lacking	3=Lacking	4= Most Lacking	5= Extremely Lacking
SS1	Communication Skills	12	33	38	15	7
SS2	Leadership Skills	13	40	28	18	6
SS3	Collaboration/Teamwork skills	9	43	26	21	6
SS4	Negotiation Skills	9	41	40	11	4
SS5	Critical Thinking and Problem-solving Skills	13	31	36	17	8
SS6	Conflict Management Skills	9	31	36	18	11
SS7	Decision-Making Skills	13	38	30	17	7
SS8	Coordination Skills	15	32	35	16	7
SS9	Delegation Skills	28	42	24	9	2
SS10	Information Management Skills	9	45	26	18	7
SS11	Presentation Skills	13	28	34	21	9
SS12	Political Skills	8	37	35	17	8
SS13	Entrepreneurial Skills	15	32	36	15	7
SS14	Stakeholder Management Skills	9	40	35	18	3
SS15	Cultural Alignment Skills	7	40	33	16	9
SS16	Team Integration Skills	8	46	29	15	7

SS17	Self-Management Skills	19	37	34	16	3
SS18	Ethics and Professional Moral Skills	13	40	25	21	6
SS19	Persuasion Skills	11	46	35	11	2
SS20	Influencing Skills	10	52	31	11	1
SS21	Team Building Skills	10	35	33	23	3
SS22	Motivation Skills	9	31	43	17	5
SS23	Interpersonal Skills	7	42	33	19	4

TABLE 6: PERCEIVED LACK OF SOFT SKILLS 1

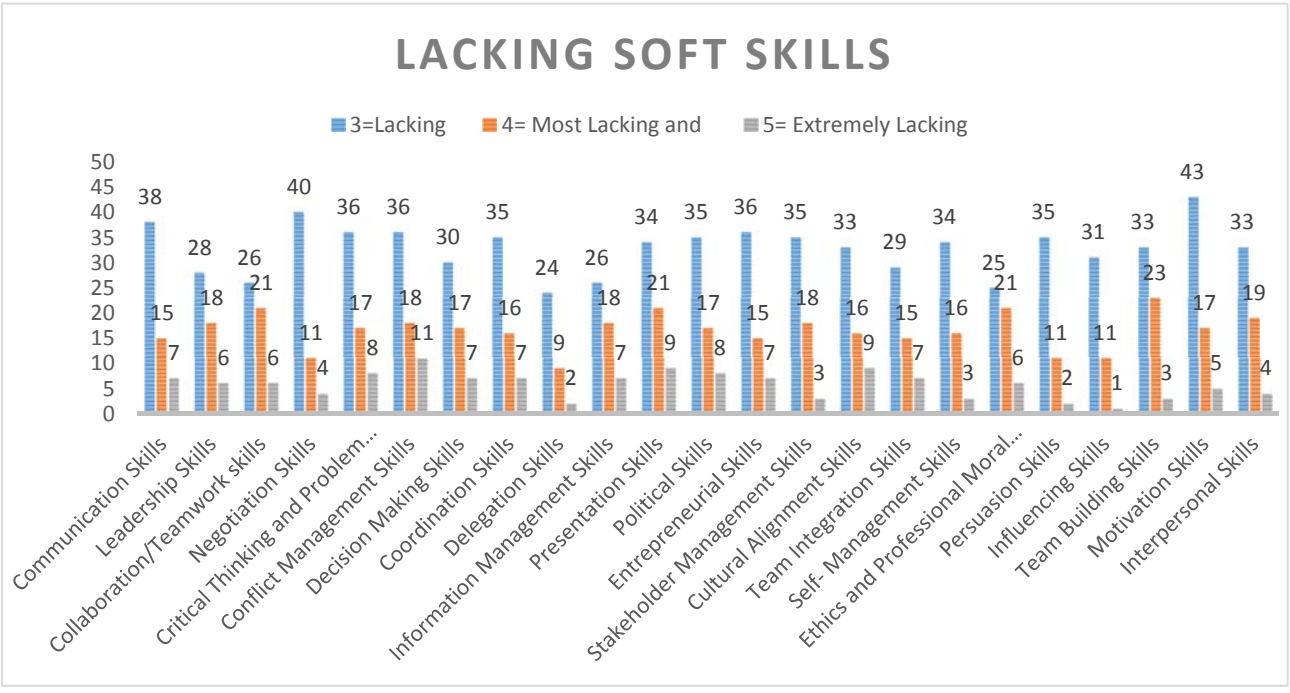


FIGURE 7: PERCEIVED LACKING SOFT SKILLS 1

3.10.5 Results of Research Survey for Question 3

The aim of this question was to determine the perceptions of construction professionals about the importance of soft skills for construction managers in complex projects. The participants were asked to rate each of the identified soft skills on a five-point Likert scale, where 1 = Extremely Unimportant, 2 = Unimportant, 3 = Important, 4 = Very Important, and 5 = Extremely Important. Table 7 below shows the results of the perceived important soft skills.

Code	Variables (Soft Skills)	1 = Extremely Unimportant	2 = Unimportant	3 = Important	4 = Very Important	5 = Extremely Important
SS1	Communication Skills			6	25	74
SS2	Leadership Skills		1	4	42	58
SS3	Collaboration/Teamwork skills			12	33	59
SS4	Negotiation Skills		3	21	54	27
SS5	Critical Thinking and Problem-solving Skills			5	32	68
SS6	Conflict Management Skills			17	35	53
SS7	Decision Making Skills			8	32	65
SS8	Coordination Skills		1	13	43	47
SS9	Delegation Skills		1	22	46	35
SS10	Information Management Skills		4	18	49	33
SS11	Presentation Skills	5	16	47	26	10
SS12	Political Skills	5	17	39	25	18
SS13	Entrepreneurial Skills	8	15	50	23	8

SS14	Stakeholder Management Skills	3	3	22	55	22
SS15	Cultural Alignment Skills	3	16	29	32	24
SS16	Team Integration Skills	2	2	14	44	42
SS17	Self-Management Skills	2		14	40	48
SS18	Ethics and Professional Moral Skills		2	9	29	64
SS19	Persuasion Skills		4	35	53	12
SS20	Influencing Skills		7	28	49	20
SS21	Team Building Skills		4	16	47	37
SS22	Motivation Skills		1	14	53	36
SS23	Interpersonal Skills	1	4	14	47	37

TABLE 7: PERCEIVED IMPORTANT SOFT SKILLS 1

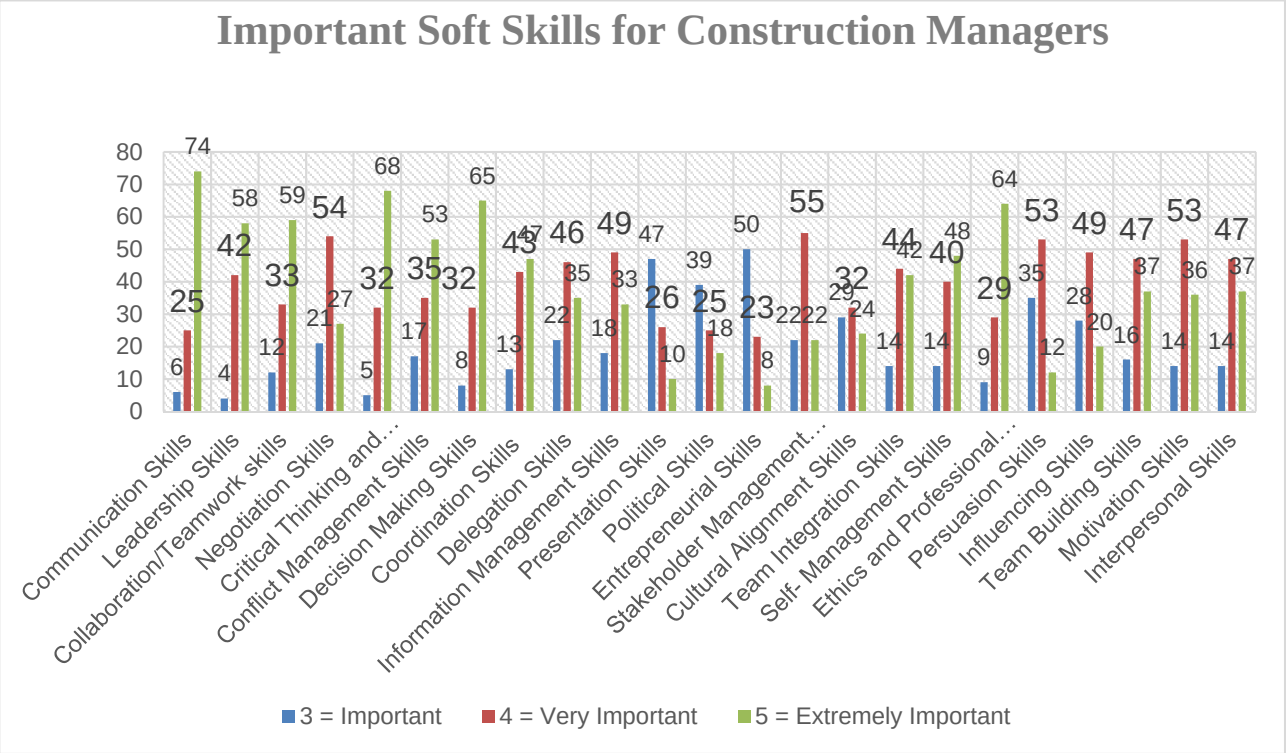


FIGURE 8: PERCEIVED IMPORTANT SOFT SKILL 1

3.10.6 Feedback of Research Survey for Question 4

The aim of this question was to ascertain the importance of soft skills in complex construction projects. Participants were requested to rate each of the variable on a five-point Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Participants were expected to indicate their agreement or disagreement on each of the variables. Each variable was given a code from I1 to I14.

Code	Variables (Soft Skills)	1 = Strongly Disagree	2 = Disagree	3 = Neutral	4 = Agree	5 = Strongly Agree
I 1	To contribute to the overall performance of the project			8	36	61
I 2	To perform effectively during management of the construction processes		1	2	43	59

I 3	To maintain efficiency and produce quality outcomes		3	4	40	58
I 4	To be more flexible and able to react quickly to changes		1	16	34	54
I 5	To allow the construction managers to organise the workforce in a way that better responds to the needs of the projects	1	1	7	44	51
I 6	To maintain performance continuity in highly uncertain construction environments		1	13	39	52
I 7	To help change the blame culture and instil a spirit of being a responsible team member	2	2	9	33	58
I 8	To improve interdisciplinary collaboration and multi-stakeholder partnerships on construction site	2	1	8	51	42
I 9	To interact with all multi-stakeholders and manage construction processes effectively		3	12	40	50
I 10	To fulfil the expectations of the client		2	5	33	65
I 11	To reflect the organisation's good image		5	14	46	40
I 12	To enhance employability with better career prospects	1	8	23	42	30
I 13	To optimise construction organisations' performance in complex projects		1	9	45	50
I 14	To enhance team selection and allocation of work according to varying project requirements		1	15	46	43

TABLE 8: PERCEIVED IMPORTANCE OF CONSTRUCTION MANAGERS' SOFT SKILLS 1

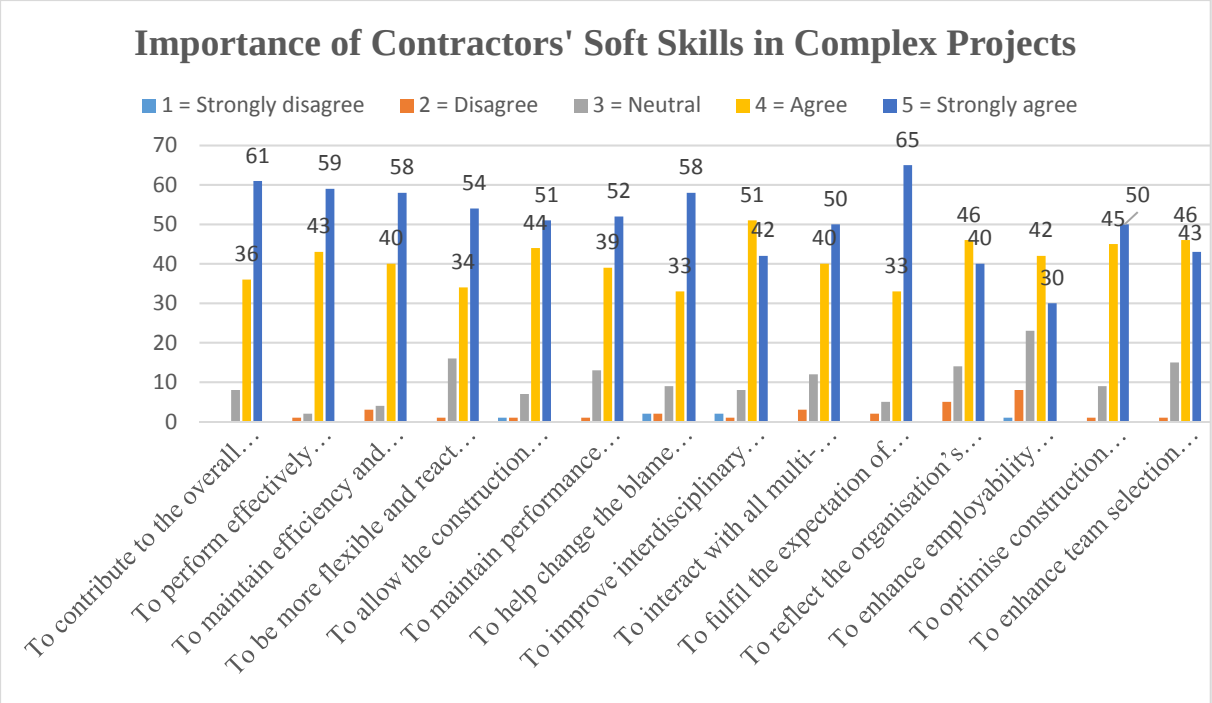


FIGURE 9: IMPORTANCE OF CONSTRUCTION MANAGER'S SOFT SKILLS 1

3.10.7 Results of Research Survey for Question 5

As Warnick (2011) stated, "we live and work in a world that is even more interconnected and interdependent than ever before". In reference to this statement, construction managers not only develop the hard skills necessary to get themselves jobs, but must also develop essential soft skills that will enable them to deal effectively and efficiently with the challenges experienced in complex projects. Construction project initiators in South Africa share a common concern about the problems relating to poor performance of projects, such as delays, cost overruns, and quality defects (Meng, 2011) that result from human error. However, the complexity of construction projects, the multitude of relationships, and the contractual agreements between the organisations and a labour-intensive industry require more interactions among the project teams, leading to a widespread desire for competent construction managers who possess both hard and soft skills (Langford, 2014).

The objective of this question was to identify the training needs that can be applied in developing construction managers' soft skill competencies to perform effectively in complex projects by ensuring the success of such complex projects. A list of possible training needs was extracted from the literature, compiled, and used to obtain the perceptions of the participants. The participants were asked to rate each of the needs on a five-point Likert scale, where 1 =

Strongly Disagree, 2 = Disagree, 3 = Slightly Agree/Neutral, 4 = Agree, and 5 = Strongly Agree. Table 9 shows the number of responses for each need training strategies.

Code	Training Strategies	1 = Strongly Disagree	2 = Disagree	3 = Slightly Agree/Neutral	4 = Agree	5 = Strongly Agree
TS1	Project-Based Learning/On-the-Job Training (OJT)					
TS1a	Mentorship Programme			14	43	48
TS1b	Coaching		1	18	46	40
TS1c	Internship		6	17	39	42
TS2	Off-the -Job Training					
TS2a	Conference/Workshops	3	18	41	30	31
TS2b	Short Course in Soft Skills	4	10	37	41	21
TS2c	Formal Classroom Training	5	17	35	36	31
TS3	Online Training	8	29	43	16	8
TS4	Experiential Learning	2	7	26	33	46
T5	Time Space Learning	4	6	47	33	14

TABLE 9: PERCEIVED TRAINING STRATEGIES 1

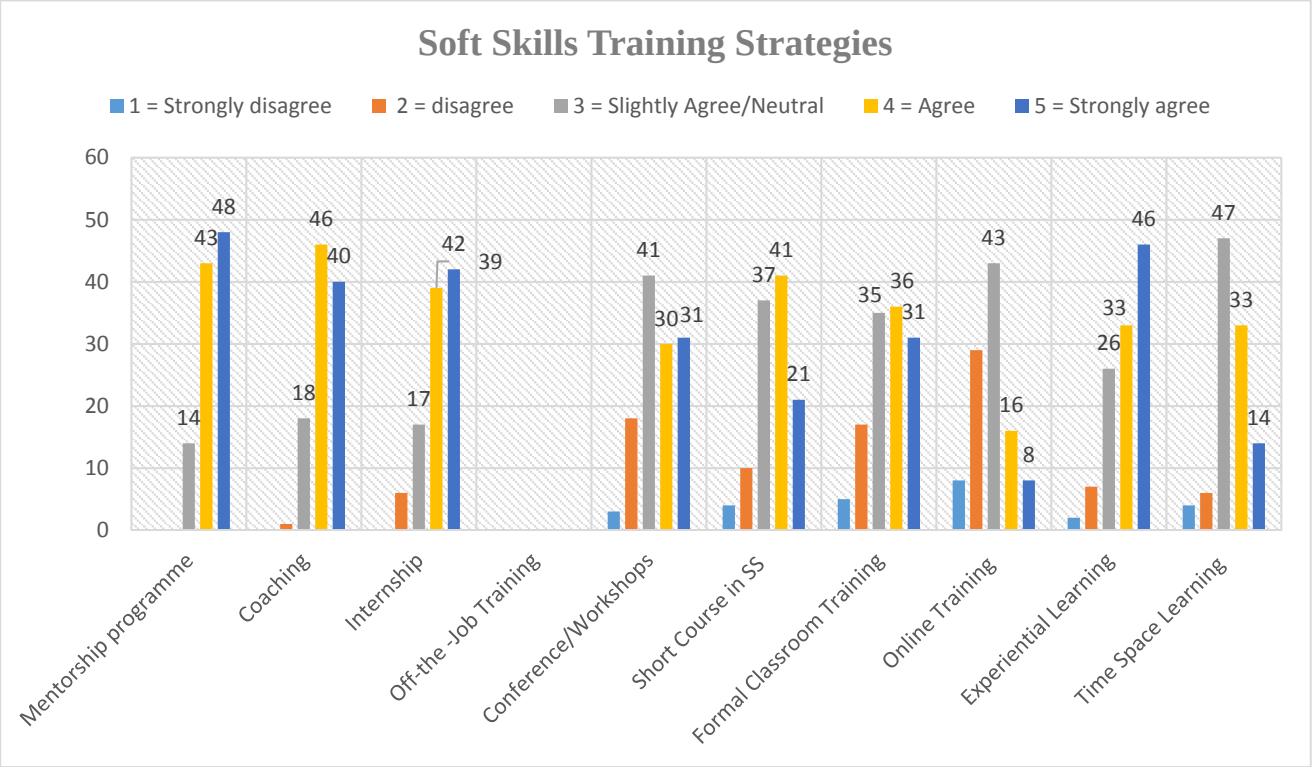


FIGURE 10: SOFT SKILLS TRAINING STRATEGIES 1

3.11 Data Screening Processes

After the data were collected, SPSS v.25 was used to preserve their integrity and originality. Data screening processes were done through reliability and normality tests (Mohammad, 2017). This research has used Likert scales, and so it is important that the researcher uses a reliability test (Croasmun, 2011).

3.12. Reliability Test

To enhance the validity and accuracy of the collected data, Cronbach's alpha was used to measure the reliability of the collected data (Ghadamsi, 2013). According to Blanche (2006:152), reliability is the extent to which the instrument yields the same results in repeated trials. Leedy *et al.* (2014: 93) further define 'reliability' as the consistency with which a measuring instrument yields a certain, consistent result when the entity being measured has not changed.

However, in order to provide an accurate reflection of the results, errors from the collected data had to be minimised in order to analyse the data, the researcher had to perform a reliability test to

ensure that it was acceptable to proceed with the analysis (Jagboro, 2012). According to Ogwueleka (2013), reliability analysis aims to test whether the results are reliable or not. Therefore, the researcher used SPSS version 25 to calculate Cronbach's alpha for this research, based on the 23 variables for questions 1 to 3, the 14 variables for question 4, and the nine variables for question 5. The results were expected to be equal to or higher than the guideline of 0.70 suggested by Nunnally (1978) and Martin (2005), which indicates a good level of internal reliability (Ling, 2011) and is deemed to be acceptable for significant consistency for this survey. According to Mallery (2003:231), the following rules provide a guide for the level of acceptance of Cronbach's alpha:

- Poor and unacceptable ≤ .5
- Questionable ≤ .6
- Acceptable ≥ .7
- Good ≥ .8
- Exellent ≥ .9

The recommended guide depends on the number of variables contained in the question; however, this has negative effects if not applied properly.

The researcher therefore performed Cronbach's alpha on all five questions before determining the overall reliability, and these are shown in Table 10

Question 1.a: Per Group

Reliability Statistics			
V2	Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N. of Items
ArchQ1	.881	.877	23
EngQ1	.894	.900	23
PMQ1	.937	.941	23
QSQ1	.929	.930	23
UndisQ1	.752	.774	22

TABLE 10: CRONBACH'S ALPHA PER GROUP 1

According to the table above, the Architects' Cronbach's alpha achieved >.881, which is good; the Engineers >.894, which is also good; the Project Managers >.937, which is excellent; and the Undisclosed group >.752, which is acceptable.

Question 1b: Combined Groups

Reliability Statistics		
Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N of Items
.912	.912	23

TABLE 11: CRONBACH'S ALPHA BASED ON FOUR GROUPS 1

The table above represents the results of the combined groups, and indicates that the groups' performance is excellent by having achieved >.912, which exceeds both Nunnally's (1978) and Martin's (2005) suggested guideline of .70.

Question 2a

Reliability Statistics			
V2	Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N. of Items
ArchQ1	.929	.927	23
EngQ1	.944	.944	23
PMQ1	.934	.935	23
QSQ1	.944	.945	23
UndisQ1	.917	.943	23

TABLE 12: QUESTION 2- INDIVIDUAL CRONBACH ALPHA 1

The table above indicates that all groups have exceeded the recommended 0.7, achieving a Cronbach's alpha of more than 0.9, which is an excellent consistency.

Question 2b

Reliability Statistics		
Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N. of Items
.939	.940	23

TABLE 13: QUESTION 2- COMBINED GROUPS' CRONBACH'S' ALPHA 1

Similarly, the combined groups' Cronbach's alpha has excellent consistency.

Question 3a: Per Group

Reliability Statistics			
V2	Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N. of Items
ArchQ1	.903	.899	23
EngQ1	.929	.928	23
PMQ1	.947	.951	23
QSQ1	.959	.959	23
UndisQ1	.576	.606	21

TABLE 14: QUESTION 3-INDIVIDUAL GROUPS' CRONBACH'S ALPHA 1

The table above indicates significant consistency of more than 0.9 from the first three groups, which is an excellent achievement, while the undisclosed group has obtained a poor and unacceptable Cronbach's alpha.

Question 3b: All Groups

Reliability Statistics		
Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N. of Items
.941	.942	23

TABLE 15: QUESTION 3- COMBINED GROUPS' CRONBACH'S ALPHA 1

However, the combined Cronbach's alpha in table 15 is >0.9. and is regarded as an excellent significant consistency.

Question 4a: Per Group

Reliability Statistics			
V2	Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N of Items
ArchQ1	0.719	0.758	14
EngQ1	0.808	0.821	14

PMQ1	0.952	0.953	14
QSQ1	0.912	0.910	14
UndisQ1	0.894	0.891	12

TABLE 16: QUESTION 4-INDIVIDUAL CRONBACH'S ALPHA 1

The table above indicates that the Architects' Cronbach Alpha is within the acceptable bracket, the Engineers and the Undisclosed group have achieved a good Cronbach's alpha, while the project managers and quantity surveyors obtained an excellent consistency.

Question 4b: Combined Groups

Reliability Statistics		
Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N of Items
.894	.898	14

TABLE 17: QUESTION 4-COMBINED GROUPS' CRONBACH'S ALPHA 1

The overall consistency for this question is good because it is above 0.8 and below 0.9.

Question 5a: Per Group

Reliability Statistics			
V2	Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N. of Items
ArchQ1	.719	.758	14
EngQ1	.808	.821	14
PMQ1	.952	.953	14
QSQ1	.912	.910	14
UndisQ1	.894	.891	12

TABLE 18: QUESTION 5-INDIVIDUAL CRONBACH'S ALPHA 1

Question 5b: Combined Groups

Reliability Statistics		
Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N. of Items
.700	.690	9

TABLE 19: QUESTION 5- COMBINED GROUPS' CRONBACH ALPHA 1

The table above indicates that the question had a total number of nine items, which has a bearing on the achieved Cronbach's alpha, which is just within both Nunnally's (1978) and Martin's (2005) suggested guideline of 0.70, and within an acceptable bracket.

However, on carrying out the group and combined calculation of Cronbach's alpha, the researcher had to conduct further calculations on five questions in order to determine an overall Cronbach's alpha for the research. Table 20 shows an overall reliability of 0.954 for the combined questions, which is higher than expected, and consists of 92 items. Although indicating slightly less than the standardised items, it can be confirmed that it is an excellent consistency.

Reliability Statistics		
Cronbach's alpha	Cronbach's alpha Based on Standardised Items	N of Items
.954	.956	92

TABLE 20: CRONBACH'S ALPHA 1

Although some questions indicate low achievement, the overall Cronbach's alpha came out to be an excellent achievement in terms of significant consistency, which further indicates that the survey has adequate internal consistency. According to Wu (2017), a higher Cronbach's alpha indicates a stronger correlation between items and internal consistency. According to Table 20, a Cronbach's alpha of 0.954 achieved for this study suggests that the research instrument used is acceptable (Alzahrani, 2013).

Chapter 4

4 Data Analysis

Having performed reliability tests and confirmed the results as excellent (>.9), it was found necessary and worthwhile to proceed with data analysis (Ajayi, 2016). According to McCord (2015), descriptive analysis is an important measure of soft skills attributes when investigating the trends of the participants 'perceptions. However, a number of survey techniques were considered for analysis (McCord, 2015) and. in reference to Visesbora (2015), it was important for the researcher to select a precise and appropriate unit of analysis. Descriptive statistics were used to analyse the responses from the participants in determining the mean and standard deviation, and to rank the order of importance of the soft skill competencies. Data collected through a survey questionnaire consisting of five questions with variables ranging between 9 and 23 were analysed statistically using SPSS version 25. Initially, the researcher planned to place the participants in four groups: Architects, Engineers, Project Managers, and Quantity Surveyors. However, it was found that, after the respondents had submitted their responses, some of them did not indicate the category to which they belonged, and so a fifth group was created. Therefore raw data received based on the feedback from these five groups is subjected to analysis without excluding any of the feedback unless otherwise stated elsewhere in this investigation.

4.1 The structure of the analysis

The researcher's approach to data analysis was first to compute the results of the individual groups per their disciplines in order to determine the means, rank, and standard deviations of all questions. Secondly, the researcher had to put individual disciplines into a group of two. Thirdly, the researcher created a comparison table that compares the group means according to group rating on each variable. However, due to the size of the sample of both engineers and undisclosed participants, and according to Albhaisi (2016), a sample is normally distributed when the sample size is above 30; and based on that point, the researcher could not compare the engineers or the undisclosed participants with any other discipline; thus a group called 'others' was created. Therefore the following three groups form part of this research:

- Group 1: Architects + Others
- Group 2: Project Managers + Others

- Group 3: Quantity Surveyors + Others

Figure 9 below indicates the flowchart of this chapter and the next.



FIGURE 11: DATA ANALYSIS FLOWCHART 1

4.2 Quantitative Data Analysis

Quantitative data collected from construction professionals through the survey questionnaire were analysed descriptively using IBM's Statistical Package for Social Sciences (SPSS version 25). Prior to statistical analysis, the data were captured on an Excel spreadsheet, initially with all variables coded and a file (SPSS Data) created. A vertical column was then created for the different participant groups, which were entered in a coded format. SPSS version 25 was used to extract all questions from the Excel file, and to calculate the frequency, mean, and standard deviation of all individual variables according to the five questions. Participants were grouped according to their respective disciplines, and the data collected from them were allocated accordingly.

SPSS version 25 was also used to determine the mean scores and standard deviations of the variables based on the perceptions of the respondents (Ikediashi, 2014; Hamid, 2014). The means of the individual variables are presented in the table below. In order to determine the ranking level of the individual variables, the means were presented in descending order and divided by the highest score on the Likert scale (5) to determine the relative importance index. The calculated relative importance index was also used to rank the variables according to their level of 'needed', 'lacking', and 'important'. Due to limitations of space, only a few histograms were generated from the mean and standard deviations. The researcher's approach to data analysis was to determine the mean scores and standard deviations of all the questions according to the perceptions of the participants, grouped according to their disciplines. The first group in all questions was the Architects, followed by the Engineers, the Project Managers, the Quantity Surveyors, and lastly, the Undisclosed group.

The objective of question 1 was to identify the soft skills that are needed for contractors in complex projects, and the participants had to rate each of the 23 variables on a five-point Likert scale where 1 represented 'not needed' and 5 'extremely needed'. The perceptions of the architects are shown in Table 21 below.

4.3 Measurements

The Statistical Package for the Social Sciences (SPSS version 25) was used for the data analysis, and the researcher used the following measurements to carry out the data analysis (Albhaisi, 2016):

4.3.1 Normal Distribution

- Normality Test
- Kolmogorov-Smirnova Test
- Homogeneity Test

4.3.2 Descriptive Statistics

- Mean Scores and Standard Deviations, Relative Importance Index, Ranking Level

4.3.3 Bivariate (Inferential Statistics)

- Spearman Correlation and Kendall
- Independent T-test Sample
- Analysis of Variance (One-Way ANOVA)

4.4 Normality Tests

This research is structured around the five questions that related to the soft skills needed by construction managers in complex projects, the soft skills lacking in construction managers in complex projects, the importance of soft skills, the benefits of construction managers' soft skills in complex projects, and the training strategies needed to enhance construction managers' soft skills.

A survey was conducted to collect the data and to obtain the construction professionals' perceptions on these five questions, with 105 responses being received. The data collected had to be tested for normality prior to statistical analysis to determine whether the distribution of the data was normal or not (Ghasemi, 2012).

Descriptives				
			Statistic	Std. Error
Variables	Mean		53.00	2.972
	95% Confidence Interval for Mean	Lower Bound	47.11	
		Upper Bound	58.89	
	5% Trimmed Mean		53.00	
	Median		53.00	
	Variance		927.500	
	Std. Deviation		30.455	
	Minimum		1	
	Maximum		105	
	Range		104	
	Interquartile Range		53	
	Skewness		.000	.236
	Kurtosis		-1.200	.467

TABLE 21: DESCRIPTIVE STATISTICS 1

Figure 10 represents a histogram for the statistical test created through the application of SPSS, and shows that the rating of the variables is not normally distributed (Direito, 2012).

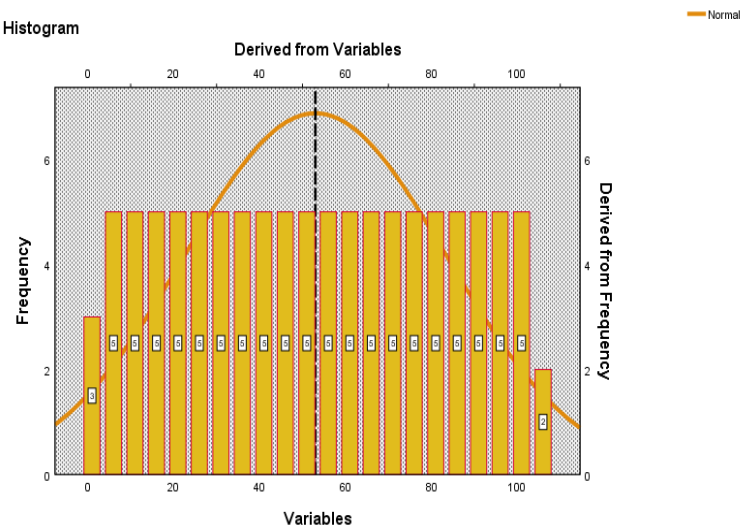


FIGURE 12: STATISTIC NORMALITY TEST 1

The histogram was also supported by the normal Q-Q Plot and the detrended normal Q-Q Plot, with both of them indicating a deviation from the normal distribution line.

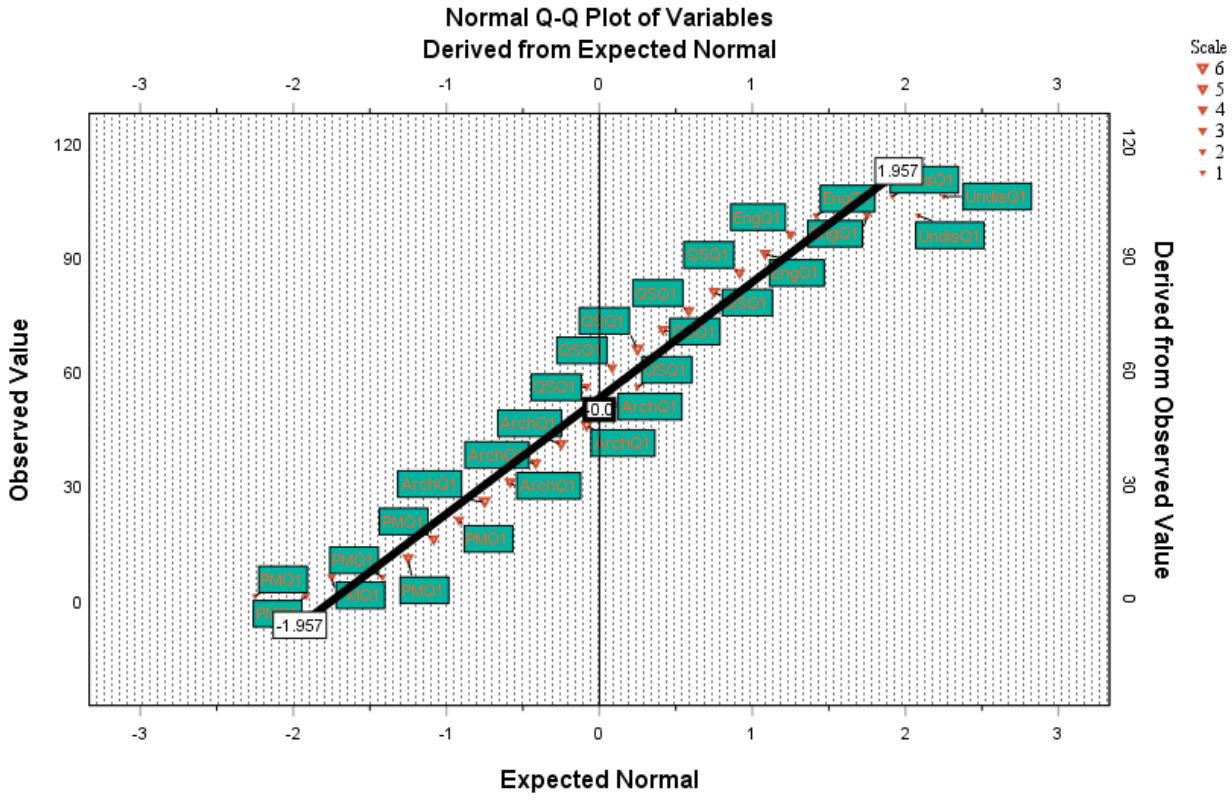


FIGURE 13: NORMAL Q-Q PLOT 1

Figure 12 below indicates a departure from the normal distribution according to the collected data and perceptions of the participants.

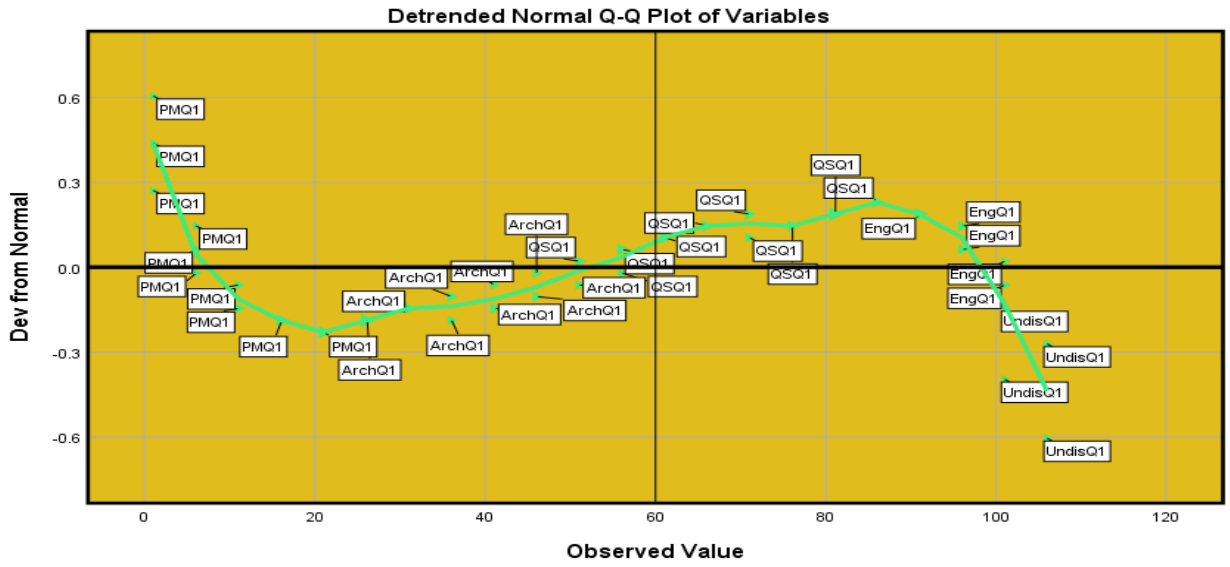


FIGURE 14: DETRENDED NORMAL Q-Q PLOT 1

Each table of normality test is supported by the histogram based on the rating obtained from the participants, indicating that the rating was not normally distributed (Direito, 2012). In addition, the above Figures (10-12) were created to support the skewness of the distribution of the rating scores according to the participants' perceptions.

4.5 Kolmogorov-Smirnova Test

According to Direito (2012), normality tests are supplementary to the graphical assessment of normality, and the main tests are:

- Kolmogrov-Smirnova (K-S) test
- Lilliefors corrected K-S test, Shapiro-Wilk (S-W) test
- Anderson-Darling test
- Cramer-von Mises test
- D'Agostino Skewness test
- Anscombe-Glynn Kurtosis test
- D'Agostino-Pearson omnibus test and the Jarque-Bera test

Ghasemi (2012) states that K-S is the commonly used approach for testing departure from normality. This statement was supported by Wu (2017), when stating that K-S is designed to test normality by comparing the original data with a normal distribution with the same mean and standard deviation of an observed sample, and is suitable for a large pool of respondents (>2000), while S-W is suitable for a smaller number of respondents (< 2000). However, the previous research on the relationship between design and build selection criteria and project performance conducted by Ghadamsi (2011) states that a distribution is considered significantly different from a normal distribution if the test values obtained are significant when $p<0.05$. According to Albhaisi (2016), a sample is normally distributed when the size of such sample is above 30 and takes the shape of a normal distributed sample when it increases. Therefore, to confirm the assumption, a normality test was performed to determine whether the distribution of the data obtained from the participants for this research is normal or not. A One-Sample Kolmogorov-Smirnova test, which is recommended as the most suitable and commonly used to test departure from normality (Ghadamsi, 2011), was thus performed. Tables 22-26 below were generated through the application of SPSS, which indicates the significant value of each variable that is less than 0.05, and confirms that the distribution of these variables (based on both methods, K-S and S-W, and as per the data collected, which is based on the perceptions of the participants) was not normally distributed.

Question 1: Test of Normality

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SS1	.423	105	.000	.627	105	.000
SS2	.335	105	.000	.725	105	.000
SS3	.377	105	.000	.694	105	.000
SS4	.233	105	.000	.841	105	.000
SS5	.368	105	.000	.621	105	.000
SS6	.290	105	.000	.785	105	.000
SS7	.377	105	.000	.695	105	.000
SS8	.324	105	.000	.744	105	.000
SS9	.246	105	.000	.815	105	.000
SS10	.243	105	.000	.833	105	.000
SS11	.239	105	.000	.897	105	.000

SS12	.211	105	.000	.899	105	.000
SS13	.259	105	.000	.883	105	.000
SS14	.273	105	.000	.874	105	.000
SS15	.222	105	.000	.895	105	.000
SS16	.244	105	.000	.797	105	.000
SS17	.282	105	.000	.723	105	.000
SS18	.366	105	.000	.703	105	.000
SS19	.245	105	.000	.857	105	.000
SS20	.248	105	.000	.862	105	.000
SS21	.247	105	.000	.817	105	.000
SS22	.278	105	.000	.792	105	.000
SS23	.252	105	.000	.809	105	.000
a. Lilliefors Significance Correction						

TABLE 22: QUESTION 1-KOLOMOGROV-SMIRNOV'S TEST OF NORMALITY 1

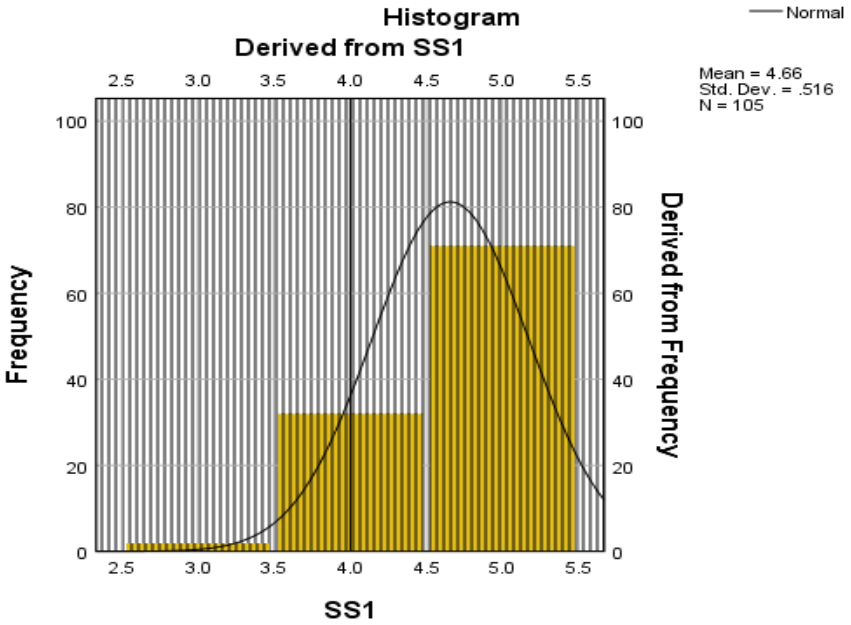


FIGURE 15: QUESTION-COMMUNICATION SKILLS FREQUENCY 1

Question 2: Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SS1	.196	104	.000	.908	104	.000
SS2	.231	104	.000	.900	104	.000
SS3	.242	104	.000	.892	104	.000
SS4	.215	104	.000	.884	104	.000
SS5	.175	104	.000	.913	104	.000
SS6	.188	104	.000	.911	104	.000
SS7	.223	104	.000	.902	104	.000
SS8	.191	104	.000	.909	104	.000
SS9	.247	104	.000	.875	104	.000
SS10	.250	104	.000	.894	104	.000
SS11	.168	104	.000	.916	104	.000
SS12	.200	104	.000	.903	104	.000
SS13	.189	104	.000	.905	104	.000
SS14	.205	104	.000	.902	104	.000
SS15	.216	104	.000	.892	104	.000
SS16	.262	104	.000	.868	104	.000
SS17	.224	104	.000	.899	104	.000
SS18	.228	104	.000	.902	104	.000
SS19	.239	104	.000	.884	104	.000
SS20	.274	104	.000	.867	104	.000
SS21	.193	104	.000	.905	104	.000
SS22	.212	104	.000	.902	104	.000
SS23	.234	104	.000	.888	104	.000
a. Lilliefors Significance Correction						

TABLE 23: QUESTION 2-KOLMOGROV-SMIRNOV'S TEST OF NORMALITY 1

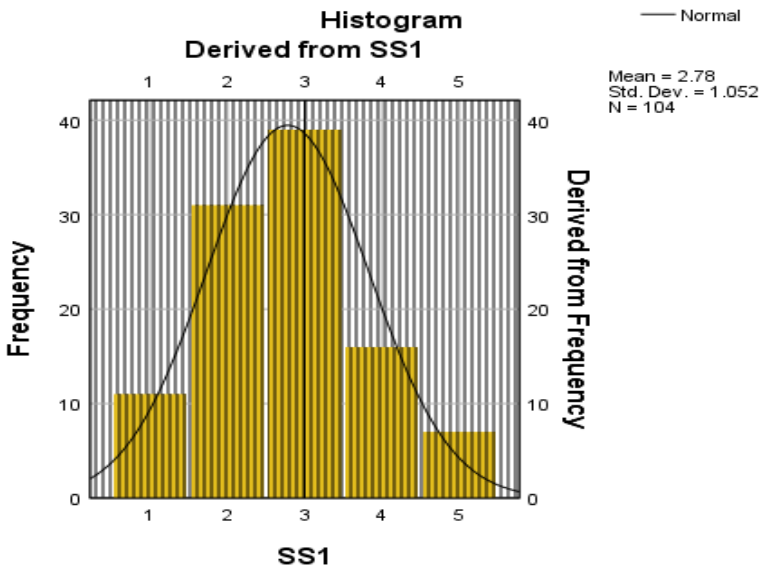


FIGURE 16: QUESTION 2-COMMUNICATION SKILLS FREQUENCY 1

Question 3: Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SS1	.196	104	.000	.908	104	.000
SS2	.231	104	.000	.900	104	.000
SS3	.242	104	.000	.892	104	.000
SS4	.215	104	.000	.884	104	.000
SS5	.175	104	.000	.913	104	.000
SS6	.188	104	.000	.911	104	.000
SS7	.223	104	.000	.902	104	.000
SS8	.191	104	.000	.909	104	.000
SS9	.247	104	.000	.875	104	.000
SS10	.250	104	.000	.894	104	.000
SS11	.168	104	.000	.916	104	.000
SS12	.200	104	.000	.903	104	.000
SS13	.189	104	.000	.905	104	.000
SS14	.205	104	.000	.902	104	.000
SS15	.216	104	.000	.892	104	.000
SS16	.262	104	.000	.868	104	.000
SS17	.224	104	.000	.899	104	.000
SS18	.228	104	.000	.902	104	.000

SS19	.239	104	.000	.884	104	.000
SS20	.274	104	.000	.867	104	.000
SS21	.193	104	.000	.905	104	.000
SS22	.212	104	.000	.902	104	.000
SS23	.234	104	.000	.888	104	.000
a. Lilliefors Significance Correction						

TABLE 24: QUESTION 3-KOLMOGROV-SMIRNOV'S TEST OF NORMALITY 1

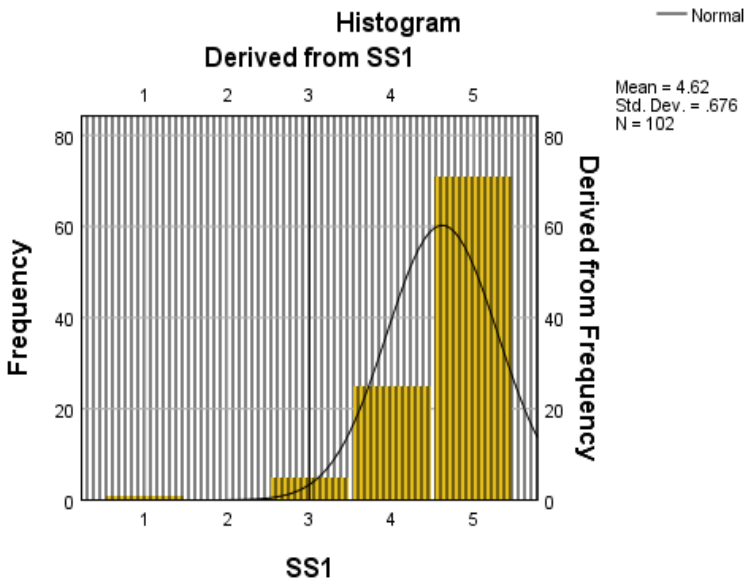


FIGURE 17: QUESTION 3-COMMUNICATION SKILLS FREQUENCY 1

Question 4: Test of Normality

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
I1	.357	105	.000	.714	105	.000
I2	.347	105	.000	.688	105	.000
I3	.326	105	.000	.708	105	.000
I4	.318	105	.000	.764	105	.000
I5	.289	105	.000	.748	105	.000
I6	.307	105	.000	.769	105	.000
I7	.317	105	.000	.707	105	.000
I8	.273	105	.000	.742	105	.000
I9	.288	105	.000	.777	105	.000
I10	.383	105	.000	.665	105	.000

I11	.246	105	.000	.811	105	.000
I12	.250	105	.000	.856	105	.000
I13	.303	105	.000	.760	105	.000
I14	.259	105	.000	.799	105	.000
a. Lilliefors Significance Correction						

TABLE 25: QUESTION 4-KOLMOGROV-SMIRNOV'S TEST OF NORMALITY 1

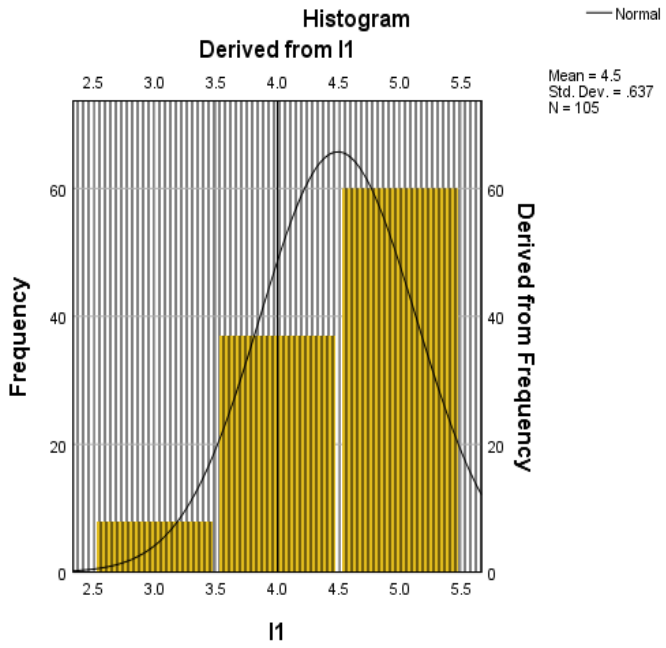


FIGURE 18: QUESTION 4-CIMPORTANCE OF CONSTRUCTION MANAGERS' SOFT SKILLS 1

Question 5: Test of Normality

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
TS1a	.279	105	.000	.776	105	.000
TS1b	.236	105	.000	.811	105	.000
TS1c	.240	105	.000	.808	105	.000
TS2a	.217	105	.000	.904	105	.000
TS2b	.223	105	.000	.887	105	.000
TS2c	.205	105	.000	.904	105	.000
TS3	.214	105	.000	.915	105	.000
TS4	.211	105	.000	.856	105	.000
TS5	.254	105	.000	.861	105	.000

a. Lilliefors Significance Correction

TABLE 26: QUESTION 5-KOLMOGROV-SMIRNOV'S TEST OF NORMALITY 1

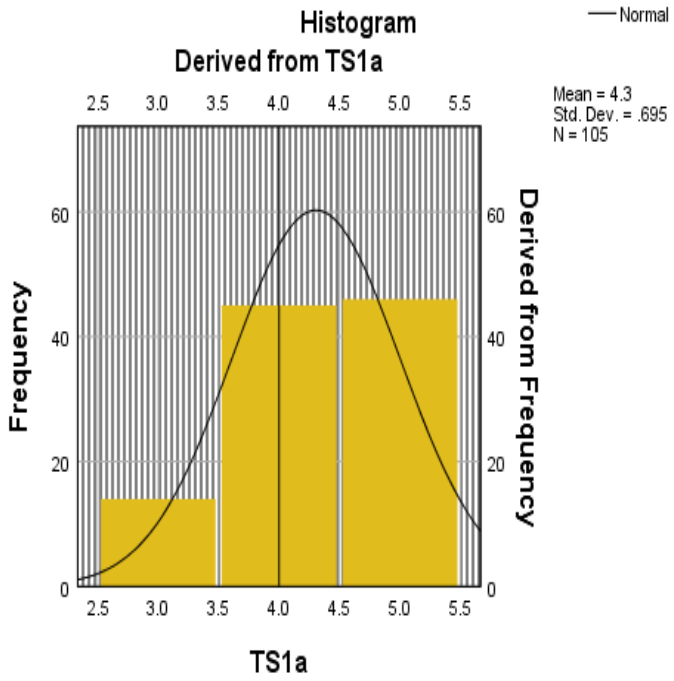


FIGURE 19: MENTORSHIP TRAINING STRATEGY 1

After running a normality test on individual questions, a further test was conducted where the results from the five questions from each group of participants were combined and tested for normality. Table 27 below indicates the results from the five groups of participants. The results on Kolomogorov-Smirnov indicate that the Engineers' normality test is higher than the other four groups with 0.084 statistic tests, followed by the Project Managers with 0.074, the Architects with 0.071, the Quantity Surveyors with 0.068, and the undisclosed group with 0.151. The four groups – Architects, Engineers, Project Managers, and Quantity Surveyors – all recorded significance values (.200*) that are higher than the p-value of 0.05, which indicate that there is no significant variation from the professionals' perceptions (Sani, 2017). However, no value was recorded for the Undisclosed group column, meaning that the value was too small to be recorded.

Participants' Test of Normality[a]							
	V2	Kolmogorov-Smirnov[b]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Variables	ArchQ1	.071	28	.200*	.958	28	.310
	EngQ1	.084	14	.200*	.965	14	.796
	PMQ1	.074	23	.200*	.959	23	.447
	QSQ1	.068	36	.200*	.957	36	.169
	UndisQ1	.151	4	.	.993	4	.972
*. This is a lower bound of the true significance.							
a. There are no valid cases for Variables when V2 = .000. Statistics cannot be computed for this level.							
b. Lilliefors Significance Correction							

TABLE 27: GROUPS' TEST OF NORMALITY 1

After the individual variables' test of normality and the group test of normality were conducted on the five questions, the research based on the perceptions of the participants was conducted on the overall results. Table 28 below indicates the results of both the Kolmogorov-Smirnov and Shapiro-Wilk tests. The results from the Kolomogorov-Smirnov test indicate the test statistic of .061 with the degree of freedom of 105 which is the number of the participants, and a significance value of .200*, which is higher than the p-value of 0.05 and indicates that the mean scores within the groups are normal. However, the Shapiro-Wilk test indicates a test statistic of .955 with degree of freedom of 105 and a significant $p< 0.001$ which is less than 0.05 and indicates a deviation from normality (Field, 2009).

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Variables	.061	105	.200*	.955	105	.001

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

TABLE 28: TEST OF NORMALITY ON OVERALL VARIABLES 1

The above table is further supported by Table 29 below which is based only on the Kolomogorov-Smirnov test and indicates a similar statistic value of .061. The table further indicates an exact significance at 2-tailed and the point of probability that is within $p<0.05$.

One-Sample Kolmogorov-Smirnov Test		
		Variables
N		105
Normal Parameters[a,b]	Mean	53.00
	Std. Deviation	30.455
Most Extreme Differences	Absolute	.061
	Positive	.061
	Negative	-.061
Test Statistic		.061
Asymp. Sig. (2-tailed)		.200[c,d]
Exact Sig. (2-tailed)		.809
Point Probability		.000
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		
d. This is a lower bound of the true significance.		

TABLE 29: ONE-SAMPLE KOLMOGROV-SMIRNOV'S TEST 1

Both Tables 28 and 29 above are supported by Figures 18 and 19 above, which indicate the departure from normal distribution. However, based on the evidence from Table 19-23, and according to Ghadamsi (2011), when the results of the variables have p-values that are significant with $p < .05$, it is an indication that the distribution of the collected data does not follow that of a nomal distribution, and therefore the researcher can confirm that the non-parametric statistics are suitable for conducting data analysis.

4.6 Test for homogeneity of variance

The test for homogeneity of variance is a test of measure that controls the increase between the means and the spread of the scores. Hence, the researcher conducts a further test to confirm the significance value of the test of homogeneity of variance if it is less than the significance value of 0.05. Table 27 below indicates Levine's Statistic, two columns of degrees of freedom (df1 and df2), and the significance values that are less than 0.05. However, Field (2009) states that if the significance values are less than 0.05, this means that the variance of the variables is significantly different in different groups; and this is also confirmed in Table 4 – 28 below. Field (2009) further states that if the values in the significant columns are smaller than the standard 0.05, this means that the homogeneity of variance assumption has been violated.

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Variables	Based on Mean	20.538	4	100	.000
	Based on Median	13.529	4	100	.000
	Based on Median and with adjusted df	13.529	4	25.542	.000
	Based on trimmed mean	17.902	4	100	.000

TABLE 30: TEST OF HOMOGENEITY OF VARIABLES 1

Table 28 below confirms Field's statement (2009: p 151) when stating that if Levine's test is significant (sig. is less than 0.05), then the variances are significantly different in different groups.

Therefore, the variances in the table are different between the groups of Architects, Engineers, Project Managers, Quantity Surveyors, and the Undisclosed group. Furthermore, the skewness column indicates significance values that are less than 0.05, while the Kurtosis column indicates negative values (-1.200).

Report						
Variables						
V2	Mean	Std. Deviation	Variance	Skewness	Kurtosis	N
ArchQ1	37.50	8.226	67.667	.000	-1.200	28
EngQ1	94.50	4.183	17.500	.000	-1.200	14
PMQ1	12.00	6.782	46.000	.000	-1.200	23
QSQ1	69.50	10.536	111.000	.000	-1.200	36
UndisQ1	103.50	1.291	1.667	.000	-1.200	4

TABLE 31: VARIABLES' VARIANCES 1

4.7 Descriptive Statistics

4.7.1 Question 1: The Mean Perceptions of the Needed Soft Skills

SPSS version 25 was used to compute the mean scores for all variables in all questions based on the respondents' given rating and perceptions. The mean scores were tabulated in descending order, and the researcher used the mean scores to determine the ranking of the variables. Standard deviations were considered where variables had the same mean scores.

4.7.2 Architects (ArchQ1)

A total of 28 architects participated in this question, in which a five-point Likert scale was applied to determine the level of needed soft skills according to the perceptions of the participants. The analysis and determination of the standard deviations and mean scores was performed through the application of SPSS version 25. Table 32 below consists of 23 variables that were identified to investigate the perceptions of construction professionals (Architects) about the soft skills needed for contractors in complex projects. The mean scores are based on the responses received from the architects who participated in the survey. The mean scores were then documented in descending order and used to rank the contractors' needed soft skills in complex projects. A mean value of 3.00 was used as the benchmark for identifying the needed skills. Where two or more items had the same mean, the item with the smaller standard deviation was ranked higher, such as SS16, SS21, and SS17 (Tunji-Olayeni, 2016).

Descriptive Statistics[a]						
Variables	Code	N	Mean	Std. Deviation	RII	Ranking
Ethics and Professional Moral Skills	SS18	28	4.68	.548	0.936	1
Critical Thinking and Problem-solving Skills	SS5	28	4.61	.629	0.832	2
Communication Skills	SS1	28	4.54	.508	0.908	3
Leadership Skills	SS2	28	4.50	.577	0.900	4
Coordination Skills	SS8	28	4.46	.693	0.892	5
Collaboration/Teamwork Skills	SS3	28	4.43	.634	0.886	6
Decision-Making Skills	SS7	28	4.39	.685	0.878	7
Team Integration Skills	SS16	28	4.32	.612	0.864	8
Team Building Skills	SS21	28	4.32	.723	0.864	9
Self-management Skills	SS17	28	4.32	1.020	0.864	10
Delegation Skills	SS9	28	4.29	.810	0.858	11
Conflict Management Skills	SS6	28	4.25	.701	0.850	12
Motivation Skills	SS22	28	4.21	.833	0.842	13
Information Management Skills	SS10	28	4.18	.772	0.836	14
Interpersonal Skills	SS23	28	4.14	.756	0.828	15
Negotiation Skills	SS4	28	3.82	.819	0.764	16
Stakeholder Management Skills	SS14	28	3.61	.875	0.722	17
Cultural Alignment Skills	SS15	28	3.54	.838	0.708	18

Persuasion Skills	SS19	28	3.50	.882	0.700	19
Influencing Skills	SS20	28	3.46	.838	0.692	20
Political Skills	SS12	28	3.25	.799	0.650	21
Entrepreneurial Skills	SS13	28	3.04	.838	0.608	22
Presentation Skills	SS11	28	2.96	.999	0.592	23
	Valid N	28				

TABLE 32: ARCHITECTS' PERCEPTION ON NEEDED SOFT SKILLS 1

According to the responses from the architects, one soft skill (Presentation Skills) scored less than 3 (2.96 mean) according to the mean score, and was thus not needed by the contractors for complex projects. By contrast, contractors have to update the programme and the status of the project timeously in order to present them during site meetings and elaborate on how they plan to mitigate any delays that might be caused by insufficient resources or outstanding information. The table also indicates seven soft skills (Negotiation Skills, Stakeholder Management Skills, Cultural Alignments, Persuasion Skills, Influencing Skills, Political Skills, and Entrepreneurial Skills) with mean scores above 3, which are thus needed, although not critical. Furthermore, the table indicates 15 soft skills that are highly needed, with Ethics and Professional Moral Skills and Critical Thinking being top of the list, and Communication and Leadership third and fourth from the top. Coordination and Collaboration skills are next on the list. According to the Architects' perceptions, Communication and Collaboration in complex projects are not as needed as Ethics and Professional Moral Skills. Complex construction projects involve multidisciplinary team members with a common objective, which is to complete the project successfully through communication and collaboration in order to address all the challenges that might be encountered during the planning and execution of such a project. Furthermore, due to the complexity of the projects and the team members being multidisciplinary, political issues will always be challenging, and need good negotiation skills. The diagraph below is a histogram for Ethics and Professional Moral Skills, which rated high on the list of the needed soft skills for contractors in complex projects. Figure 19 below was generated from SPSS, and indicates the mean score, the standard deviation, and the number of participants/architects who participated in rating the skills. However, the skewness of the figure indicates that the distribution of the results is not normal, and a non-parametric approach was thus used.

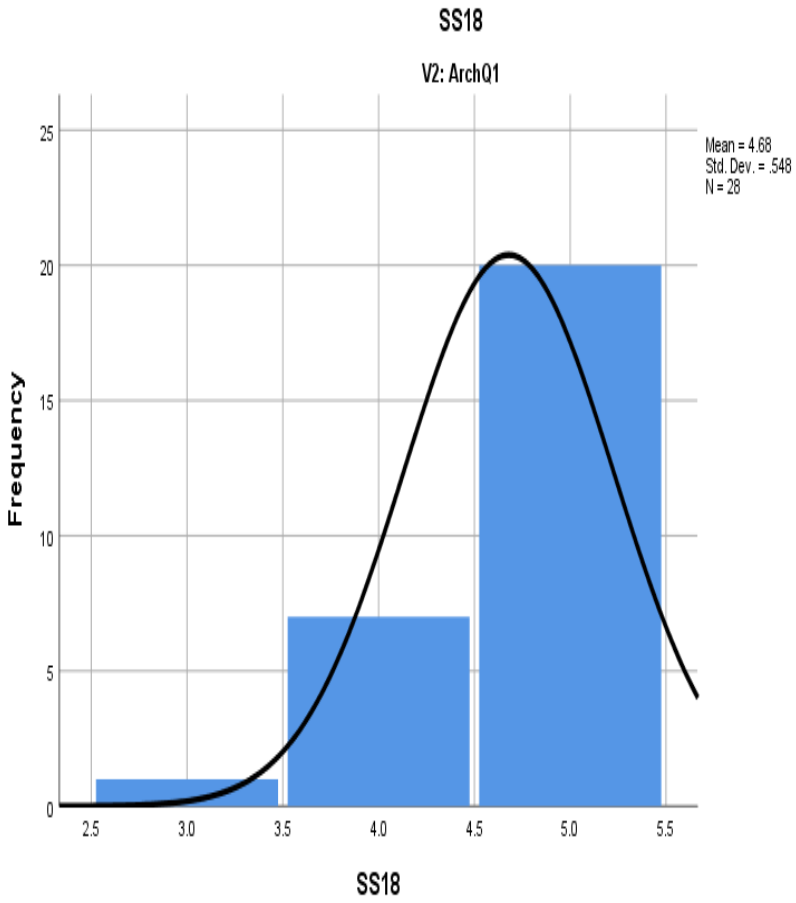


FIGURE 20: ETHICS AND PROFESSIONAL MORALS KILLS' FREQUENCY 1

4.7.3 Engineers (EngQ1)

A total of 14 engineers participated and submitted their responses; this is 13.33% of the total number of responses. SPSS was also used to analyse their responses, based on the 23 variables, as indicated in Table 33 below. The mean scores and standard deviation were used to determine the level of needed soft skills according to the engineers' responses.

Descriptive Statistics[a]						
Variables		N	Mean	Std. Deviation	RII	Ranks
Communication Skills	SS1	14	4.71	.469	0.942	1
Conflict Management	SS6	14	4.57	.646	0.914	2
Leadership Skills	SS2	14	4.57	.514	0.914	3
Ethics and Professional Moral Skills	SS18	14	4.50	.855	0.900	4

Team Integration Skills	SS16	14	4.43	.514	0.886	5
Collaboration/Teamwork Skills	SS3	14	4.43	.646	0.886	6
Decision-Making Skills	SS7	14	4.43	.756	0.886	7
Critical Thinking and Problem-solving Skills	SS5	14	4.43	.756	0.886	8
Delegation Skills	SS9	14	4.29	.726	0.858	9
Coordination Skills	SS8	14	4.29	.611	0.858	10
Self-management Skills	SS17	14	4.14	.770	0.828	11
Negotiation Skills	SS4	14	4.14	.770	0.828	12
Information Management Skills	SS10	14	4.07	.829	0.814	13
Interpersonal Skills	SS23	14	3.93	.616	0.786	14
Motivation Skills	SS22	14	3.93	.829	0.786	15
Influencing Skills	SS20	14	3.86	.535	0.772	16
Persuasion Skills	SS19	14	3.86	.535	0.772	17
Cultural Alignment Skills	SS15	14	3.71	.825	0.742	18
Stakeholder Management Skills	SS14	14	3.71	.726	0.742	19
Team Building Skills	SS21	14	3.64	.929	0.728	20
Political Skills	SS12	14	3.50	.941	0.700	21
Presentation Skills	SS11	14	3.14	1.167	0.628	22
Entrepreneurial Skills	SS13	14	2.86	1.099	0.572	23
	Valid N	14				

TABLE 33: ENGINEERS' PERCEPTIONS ON NEEDED SOFT SKILLS 1

According to Table 33 above, the engineers' perceive that entrepreneurial skills are not needed for contractors in complex projects – the mean score was the lowest on the list, with a mean of 2.86, which signifies this skill as not needed. However, nine soft skills achieved mean scores over 3, with interpersonal skills being scored the highest. Of the nine needed soft skills, there are three sets of soft skills with the same mean scores. The soft skill with the lowest standard deviation becomes the first in that set – for example, interpersonal skills, with a mean score of 3.93 and a .616 standard deviation, while motivation skills has the same mean score (3.93) but the standard deviation (.829) is higher than that of interpersonal skills. Similarly, influencing skills has a mean of 3.86 with a standard deviation of .535, while persuasion skills has a mean score of 3.86 with a standard deviation of .535.

However, the determining factor here is the rounding off of the number to three decimal places. Another 13 soft skills were recorded as highly needed, according to the perceptions of the engineers, with Communication topping the list with a mean score of 4.71, followed by Conflict

Management Skills and Leadership Skills, both with a mean score of 4.57 but with different standard deviations. Here again, the determining factor is meant to be the lowest standard deviation; however, conflict management came second on the list with a higher standard deviation of .646, while leadership skills was third on the list with a standard deviation of .514. Further down on the list are those with same mean score and standard deviation, with a different result due to rounding off.

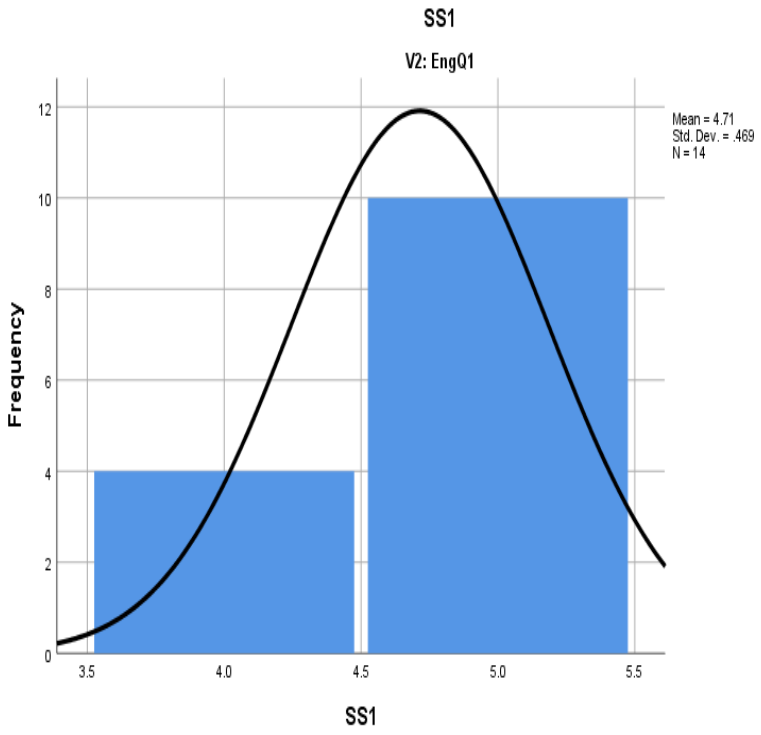


FIGURE 21: COMMUNICATION SKILLS 1

Different from the architects' perceptions, the engineer's results indicate that Communication Skills is highly needed for contractors in complex projects, and has been ranked higher than the rest.

4.7.4 Project Managers (PMQ1)

A total of 23 project managers participated in the research, which is a better response than that from the engineers and a little less than that from the architects. The responses were captured in SPSS, and the mean scores and standard deviations were generated and used to rank the different variables.

Descriptive Statistics[a]						
Variables		N	Mean	Std. Deviation	RII	Rank
Decision-Making Skills	SS7	23	4.61	.583	0.922	1
Communication Skills	SS1	23	4.61	.656	0.922	2
Critical Thinking and Problem-solving Skills	SS5	23	4.61	.583	0.922	3
Motivation Skills	SS22	23	4.52	.665	0.904	4
Ethics and Professional Moral Skills	SS18	23	4.43	.843	0.886	5
Self-Management Skills	SS17	23	4.43	.788	0.886	6
Collaboration/Teamwork Skills	SS3	23	4.43	.788	0.886	7
Leadership Skills	SS2	23	4.43	.590	0.886	8
Team Building Skills	SS21	23	4.35	.775	0.870	9
Conflict Management Skills	SS6	23	4.26	.752	0.852	10
Delegation Skills	SS9	23	4.22	.736	0.844	11
Coordination Skills	SS8	23	4.22	.951	0.844	12
Interpersonal Skills	SS23	23	4.17	.834	0.834	13
Team Integration Skills	SS16	23	4.17	.834	0.834	14
Information Management Skills	SS10	23	4.09	.733	0.818	15
Negotiation Skills	SS4	23	4.04	.767	0.808	16
Influencing Skills	SS20	23	4.00	.798	0.800	17
Stakeholder Management Skills	SS14	23	3.91	.949	0.782	18
Persuasion Skills	SS19	23	3.74	.915	0.748	19
Cultural Alignment Skills	SS15	23	3.48	.846	0.696	20
Presentation Skills	SS11	23	3.39	.839	0.678	21
Entrepreneurial Skills	SS13	23	3.13	1.014	0.626	22
Political Skills	SS12	23	3.13	1.140	0.626	23
	Valid N	23				

TABLE 34: PROJECT MANAGERS' PERCEPTIONS ON NEEDED SOFT SKILLS 1

According to the project managers' perceptions, seven soft skills are needed for contractors in complex projects, while 16 are highly needed. Of the highly needed, three of them – decision-

making skills, communication skills, and critical thinking and problem-solving skills – have similar mean scores of 4.61. However, decision-making skills is top on the list due to a smaller standard deviation of .583 when compared with the other two. Motivation skills is fourth on the list with a mean score of 4.52, followed by ethics and professional moral skills, which share the same mean score number of 4.43 with self-management skills, Collaboration/teamwork skills, and leadership skills, but all with different standard deviations. However, political skills have been ranked last on the list with a mean score of 3.13, the same as entrepreneurial skills, which is second from the bottom, and with the only differentiating factor being their standard deviations of between 1.014 and 1.14. The researcher can therefore confirm that project managers were more consistent in answering this question than both the architects and the engineers.

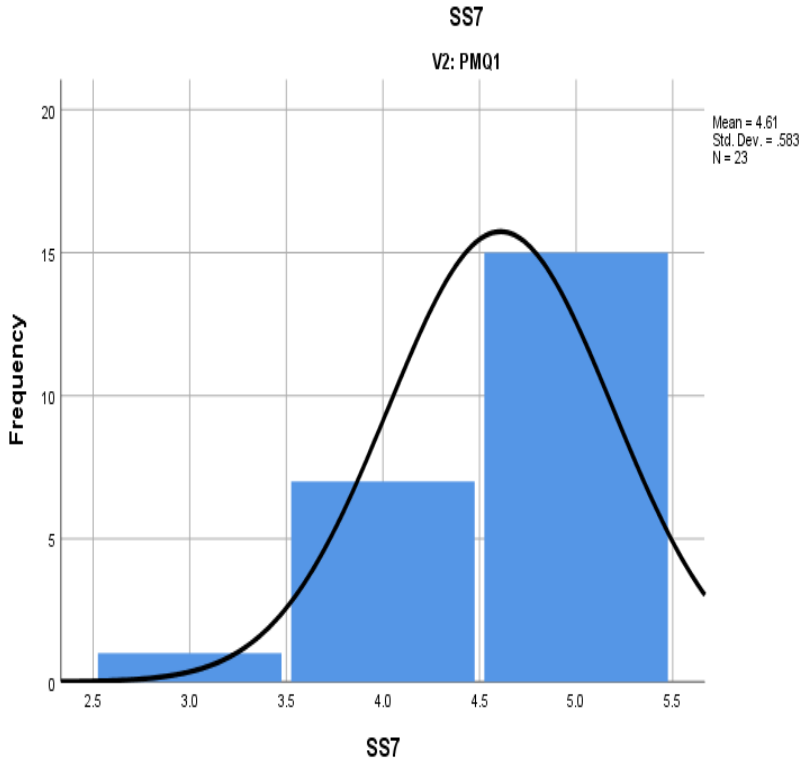


FIGURE 22: DECISION-MAKING SKILLS 1

Project managers' perceptions indicate that decision-making skills are highly needed and are therefore ranked number 1.

4.7.5 Quantity Surveyors (QSQ1)

A total of 36 quantity surveyors took part in the research survey and submitted their feedback through email. This number is higher than the first three groups, and represents 34.29% of the

total responses. The mean scores and standard deviations of this group were calculated through SPSS; Table 35 below shows the mean scores and standard deviations in their descending orders, which were used to rank the different variables.

Descriptive Statistics[a]						
		N	Mean	Std. Deviation	RII	Rank
Communication Skills	SS1	36	4.72	.454	0.944	1
Collaboration/Teamwork Skills	SS3	36	4.67	.586	0.934	2
Decision-Making Skills	SS7	36	4.56	.773	0.912	3
Critical Thinking and Problem-solving Skills	SS5	36	4.47	.971	0.894	4
Leadership Skills	SS2	36	4.44	.652	0.888	5
Conflict Management Skills	SS6	36	4.36	.762	0.872	6
Coordination Skills	SS8	36	4.36	.931	0.872	7
Ethics and Professional Moral Skills	SS18	36	4.33	.894	0.866	8
Interpersonal Skills	SS23	36	4.31	.822	0.862	9
Self-management Skills	SS17	36	4.22	.989	0.844	10
Motivation Skills	SS22	36	4.19	.856	0.838	11
Team Integration Skills	SS16	36	4.08	.906	0.816	12
Information Management Skills	SS10	36	4.06	.860	0.812	13
Team Building Skills	SS21	36	4.00	.956	0.800	14
Negotiation Skills	SS4	36	4.00	.793	0.800	15
Delegation Skills	SS9	36	3.97	1.028	0.794	16
Influencing Skills	SS20	36	3.75	.874	0.750	17
Persuasion Skills	SS19	36	3.64	.723	0.728	18
Stakeholder Management Skills	SS14	36	3.47	.910	0.694	19
Cultural Alignment Skills	SS15	36	3.47	1.055	0.694	20
Presentation Skills	SS11	36	3.28	.849	0.656	21
Political Skills	SS12	36	3.03	.878	0.606	22
Entrepreneurial Skills	SS13	36	2.86	.723	0.572	23
	Valid N	36				

TABLE 35: QUANTITY SURVEYORS' PERCEPTIONS ON NEEDED SOFT SKILLS 1

According to the perceptions of the quantity surveying group, one soft skill (entrepreneurial skills) is not needed because the mean score is below the benchmark bracket. Seven other soft skills (delegation, influencing, persuasion, stakeholder management, cultural alignment, presentation, and political Skills) are identified as needed skills. However, 15 soft skills had been identified as highly needed, with communication skills top of the list with a mean score of 4.72, followed by collaboration/teamwork skills. Once again, conflict management and coordination Skills have the same mean score of 4.36, while team building and negotiation skills have a mean score of 4.00. The position of the ranking on four of the soft skills was determined by the small standard deviations.

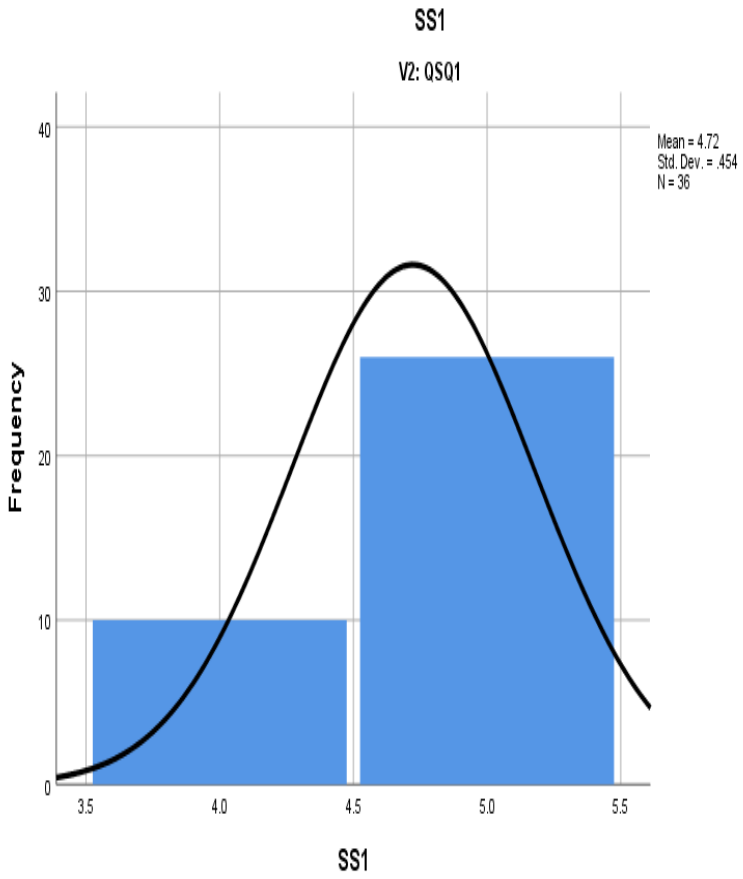


FIGURE 23: COMMUNICATION SKILLS 1

4.7.6 Undisclosed Group (UndisQ1)

Descriptive Statistics[a]						
Codes	Variables	N	Mean	Std. Deviation	RII	Rank
SS1	Communication Skills	4	5.00	.000	1.000	1
SS22	Motivation Skills	4	4.75	.500	0.950	2
SS21	Team Building Skills	4	4.75	.500	0.950	3
SS17	Self-management Skills	4	4.75	.500	0.950	4
SS8	Coordination Skills	4	4.75	.500	0.950	5
SS7	Decision-Making Skills	4	4.75	.500	0.950	6
SS3	Collaboration/Teamwork Skills	4	4.75	.500	0.950	7
SS23	Interpersonal Skills	4	4.50	.577	0.900	8
SS16	Team Integration Skills	4	4.50	.577	0.900	9
SS5	Critical Thinking and Problem-solving Skills	4	4.50	.577	0.900	10
SS2	Leadership Skills	4	4.25	.957	0.850	11
SS9	Delegation Skills	4	4.00	.816	0.800	12
SS4	Negotiation Skills	4	4.00	.816	0.800	13
SS18	Ethics and Professional Moral Skills	4	3.75	.500	0.750	14
SS20	Influencing Skills	4	3.50	.577	0.700	15
SS19	Persuasion Skills	4	3.50	.577	0.700	16
SS10	Information Management Skills	4	3.50	.577	0.700	17
SS6	Conflict Management Skills	4	3.25	.957	0.650	18
SS14	Stakeholder Management Skills	4	3.00	1.155	0.600	19
SS13	Entrepreneurial Skills	4	3.00	1.414	0.600	20
SS15	Cultural Alignment Skills	4	2.50	1.291	0.500	21
SS11	Presentation Skills	4	2.50	.577	0.500	22
SS12	Political Skills	4	2.25	.957	0.450	23

TABLE 36: UNDISCLOSED GROUP'S PERCEPTIONS ON NEEDED SOFT SKILLS 1

According to the perceptions of this group, communication skills (SS1) is highly needed by contractors in complex projects.

4.7.7 Question 2: The Mean Perceived Lack of Soft Skills

The objective of this question was to determine whether there are any soft skills lacking from contractors in complex projects in South Africa, with data being collected from Architects, Engineers, Project Managers, and Quantity Surveyors based and working in Gauteng Province. Once again, the researcher used the mean scores to determine the ranking of the variables and to determine any soft skills that are lacking. Any mean score below 3 was considered not lacking, and from 3 and above was considered lacking. The tables below present the results of the lack of soft skills from the consultants' perspective.

4.7.8 Architects (ArchQ2)

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	28	37.50	8.226		
SS11	28	3.32	.863	0.664	1
SS6	28	2.96	.999	0.592	2
SS22	28	2.93	.858	0.586	3
SS5	28	2.93	1.215	0.586	4
SS3	28	2.93	1.120	0.586	5
SS23	28	2.86	1.008	0.572	6
SS15	28	2.86	1.044	0.572	7
SS21	28	2.79	1.067	0.558	8
SS16	28	2.79	1.067	0.558	9
SS14	28	2.75	.752	0.550	10
SS8	28	2.75	.887	0.550	11
SS12	28	2.68	.945	0.536	12
SS18	28	2.64	1.026	0.528	13
SS4	28	2.61	.737	0.522	14
SS1	28	2.61	.994	0.522	15
SS13	28	2.61	.994	0.522	16
SS19	28	2.57	.790	0.514	17

SS10	28	2.57	.920	0.514	18
SS20	28	2.54	.838	0.508	19
SS7	28	2.50	1.036	0.500	20
SS2	28	2.50	.962	0.500	22
SS17	28	2.36	.951	0.472	23
SS9	28	2.29	.810	0.458	23

TABLE 37: ARCHITECTS' PERCEPTIONS ON LACK OF SOFT SKILLS 1

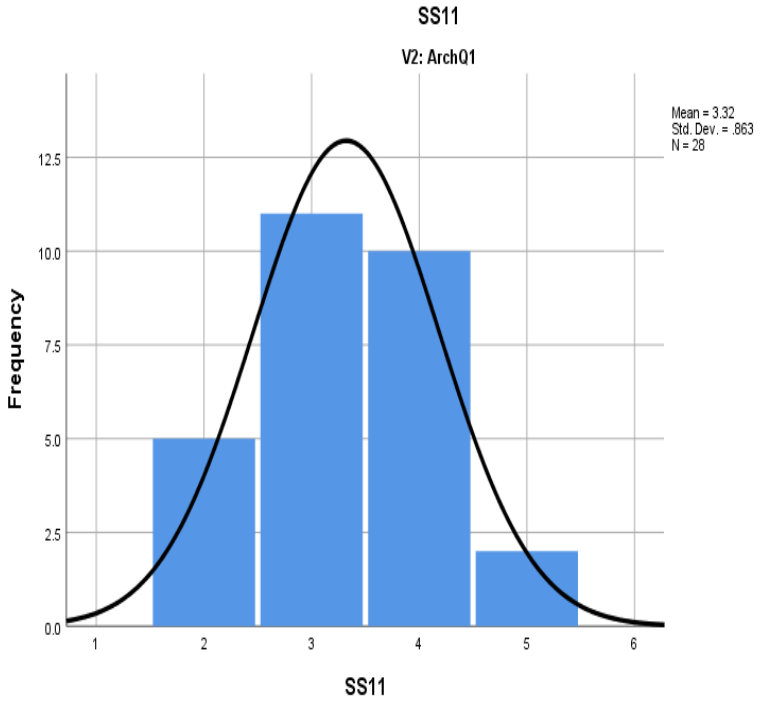


FIGURE 24: PRESENTATION SKILLS 1

According to the perceptions of the group of architects, only presentation skills (SS11) was lacking from contractors, with a mean score of 3.32.

4.7.9 Engineers (EngQ1)

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	14	94.50	4.183		
SS15	14	3.21	1.122	0.642	1

SS11	14	3.00	1.519	0.600	2
SS18	14	3.00	1.240	0.600	3
SS16	14	3.00	1.109	0.600	4
SS5	14	3.00	.961	0.600	5
SS8	14	2.93	1.328	0.586	6
SS2	14	2.93	1.207	0.586	7
SS21	14	2.86	1.099	0.572	8
SS1	14	2.86	1.099	0.572	9
SS13	14	2.86	1.027	0.572	10
SS6	14	2.79	1.251	0.558	11
SS3	14	2.79	1.122	0.558	12
SS7	14	2.79	1.051	0.558	13
SS17	14	2.71	1.139	0.542	14
SS14	14	2.71	.994	0.542	15
SS12	14	2.71	.825	0.542	16
SS10	14	2.71	1.490	0.542	17
SS19	14	2.71	1.139	0.542	18
SS4	14	2.71	1.069	0.542	19
SS23	14	2.64	.929	0.528	20
SS22	14	2.64	1.216	0.528	21
SS20	14	2.57	.938	0.514	22
SS9	14	2.21	1.188	0.442	23

TABLE 38: ENGINEERS' PERCEPTIONS ON LACK OF SOFT SKILLS 1

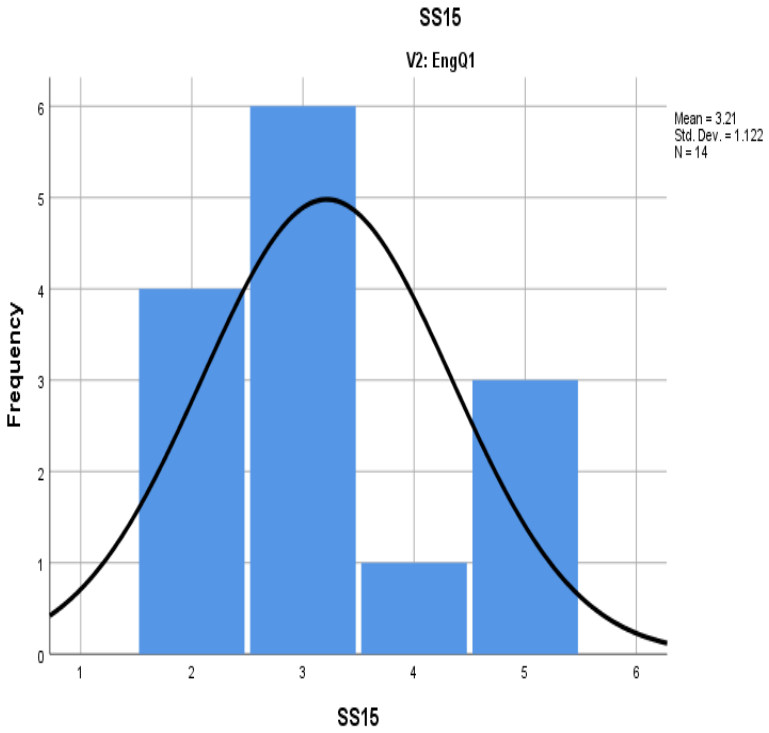


FIGURE 25: CULTURAL ALIGNMENT SKILLS 1

The results from the engineers indicate five soft skills lacking from contractors, and their belief that cultural alignmentsSkills is the most lacking soft skill, and is hence ranked 1 according to SPSS's calculation of the mean.

4.7.10 Project Managers (PMQ2)

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	23	12.00	6.782		
SS1	23	3.39	.988	0.678	1
SS12	23	3.35	1.191	0.670	2
SS6	23	3.26	1.010	0.652	3
SS5	23	3.17	1.072	0.634	4
SS10	23	3.13	1.140	0.626	5
SS15	23	3.09	1.083	0.618	6
SS14	23	3.09	1.041	0.618	7
SS2	23	3.09	1.164	0.618	8
SS22	23	3.04	1.022	0.608	9
SS7	23	3.00	1.087	0.600	10

SS4	23	2.96	.878	0.592	11
SS18	23	2.96	1.147	0.592	12
SS13	23	2.91	1.276	0.582	13
SS21	23	2.91	.949	0.582	14
SS23	23	2.87	.869	0.574	15
SS17	23	2.78	.902	0.556	16
SS11	23	2.78	1.126	0.556	17
SS8	23	2.78	1.043	0.556	18
SS3	23	2.74	1.054	0.548	19
SS16	23	2.70	1.020	0.540	20
SS19	23	2.61	1.033	0.522	21
SS20	23	2.57	.896	0.514	22
SS9	23	2.48	.947	0.496	23

TABLE 39: PROJECT MANAGERS' PERCEPTIONS ON LACK OF SOFT SKILLS 1

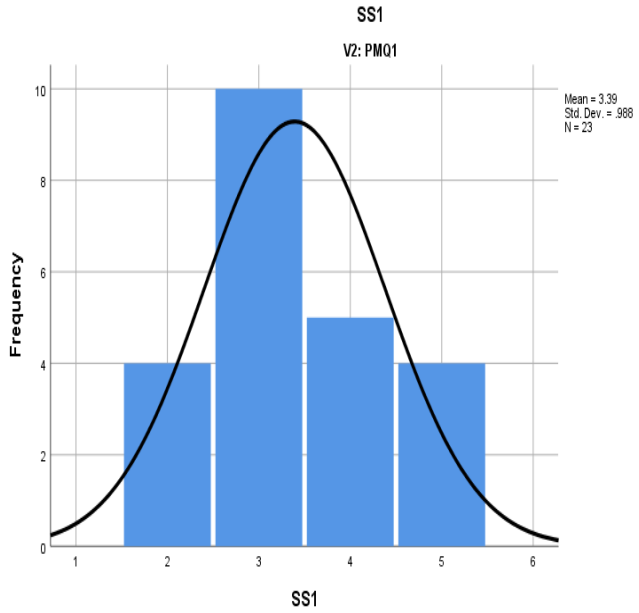


FIGURE 26: COMMUNICATION SKILLS 1

The Project managers' perceptions differed from those of the Architects and Engineers, as the results identified ten soft skills lacking from contractors, with communication skills still topping the list. The Project managers' result on this question confirms their perceptions on question 1, where communication skills were identified as highly needed.

4.7.11 Quantity Surveyors (QSQ2)

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	36	69.50	10.536		
SS12	36	2.78	1.045	0.556	1
SS11	36	2.72	1.059	0.544	2
SS6	36	2.69	1.215	0.538	3
SS21	36	2.67	.986	0.534	4
SS10	36	2.64	.931	0.528	5
SS7	36	2.61	1.202	0.522	6
SS3	36	2.61	1.103	0.522	7
SS18	36	2.58	1.156	0.516	8
SS23	36	2.58	.967	0.516	9
SS22	36	2.58	.937	0.516	10
SS15	35	2.57	.917	0.514	11
SS13	36	2.56	1.081	0.512	12
SS16	36	2.53	.971	0.506	13
SS8	36	2.50	1.159	0.500	14
SS1	36	2.47	1.028	0.494	15
SS14	36	2.44	1.027	0.488	16
SS17	36	2.44	1.081	0.488	17
SS4	36	2.44	.998	0.488	18
SS2	36	2.39	1.076	0.478	19
SS5	36	2.36	.990	0.472	20
SS19	36	2.36	.762	0.472	21
SS20	36	2.31	.822	0.462	22
SS9	36	2.06	1.068	0.412	23

TABLE 40: QUANTITY SURVEYORS' PERCEPTIONS ON LACK OF SOFT SKILLS 1

According to the data, Quantity Surveyors have different perceptions from the other groups, and they perceive that no soft skills are lacking from contractors.

4.7.12 Undisclosed Group

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	4	103.50	1.291		
SS6	4	3.50	.577	0.700	1
SS2	4	3.25	.957	0.650	2
SS22	4	3.00	.816	0.600	3
SS8	4	3.00	1.414	0.600	4
SS3	4	3.00	.816	0.600	5
SS21	4	2.75	.957	0.550	6
SS16	4	2.75	.957	0.550	7
SS10	4	2.75	1.500	0.550	8
SS23	4	2.50	1.291	0.500	9
SS20	4	2.50	.577	0.500	10
SS13	4	2.50	1.000	0.500	11
SS7	4	2.50	.577	0.500	12
SS5	4	2.50	1.291	0.500	13
SS1	4	2.50	1.000	0.500	14
SS19	4	2.25	.957	0.450	15
SS18	4	2.25	.957	0.450	16
SS14	4	2.25	.500	0.450	17
SS4	4	2.25	.957	0.450	18
SS17	4	2.00	.816	0.400	19
SS15	4	2.00	1.414	0.400	20
SS12	4	2.00	.816	0.400	21
SS11	4	1.75	.500	0.350	22
SS9	4	1.75	.500	0.350	23

TABLE 41: UNDISCLOSED GROUP'S PERCEPTIONS ON LACK OF SOFT SKILLS 1

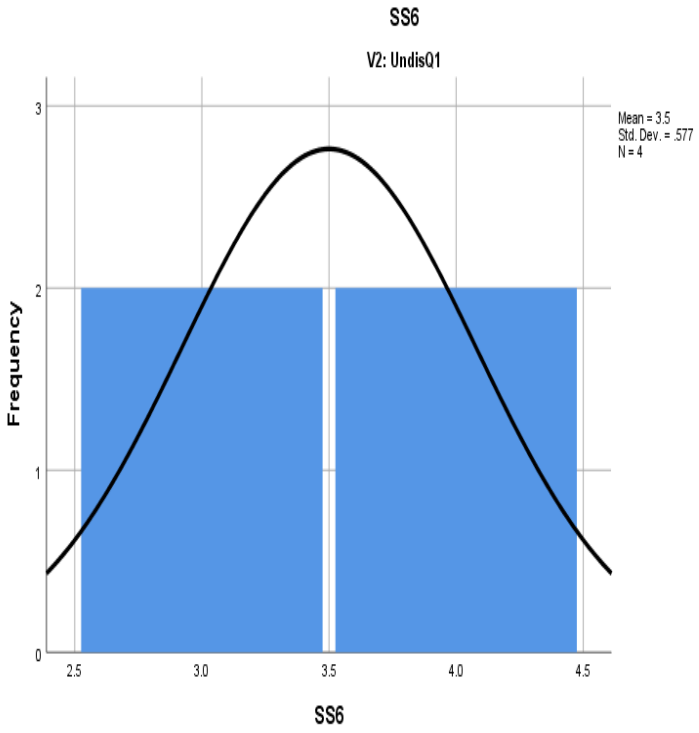


FIGURE 27: CONFLICT MANAGEMENT SKILLS 1

According to the undisclosed group's perception, five soft skills are lacking from contractors, with conflict management skills topping the list with a 3.50 mean.

4.7.13 Question 3: Perceived Mean of the Important Soft Skills

The objective of this question was to identify soft skills that are important, very important, and extremely important for contractors in complex projects, based on the perceptions of participants. The mean scores were used to determine the ranking levels of the variables on all questions.

4.7.14 ArchQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	28	37.50	8.226		
SS1	28	4.79	.418	0.958	1

SS18	28	4.64	.621	0.928	2
SS5	28	4.64	.559	0.928	3
SS2	28	4.50	.577	0.900	4
SS7	28	4.50	.638	0.900	5
SS3	28	4.39	.685	0.878	6
SS6	28	4.36	.780	0.872	7
SS17	28	4.32	.612	0.864	8
SS8	28	4.32	.723	0.864	9
SS22	28	4.21	.630	0.842	10
SS21	28	4.21	.686	0.842	11
SS16	28	4.18	.670	0.836	12
SS9	28	4.14	.651	0.828	13
SS23	28	4.14	.848	0.828	14
SS10	28	4.11	.685	0.822	15
SS4	27	3.81	.879	0.762	16
SS20	28	3.61	.737	0.722	17
SS15	28	3.61	1.066	0.722	18
SS14	28	3.50	.962	0.700	19
SS12	28	3.50	1.072	0.700	20
SS19	28	3.46	.793	0.692	21
SS11	28	3.18	1.090	0.636	22
SS13	28	2.89	.956	0.578	23

TABLE 42: ARCHITECTS' PERCEPTIONS ON IMPORTANT SOFT SKILLS 1

According to the response from the Architects, seven soft skills are important for contractors in complex projects, 15 soft skills are very important, and one is less important. However, communication skills obtained a higher rating of 4.79 (Very Important) according to the mean table, as and it's further shown in the histogram below. Ethics and professional moral skills and critical thinking and problem-solving skills each obtained a rating of 4.64 (Very Important), while leadership and decision-making skills both obtained a rating of 4.50, which is highly important.

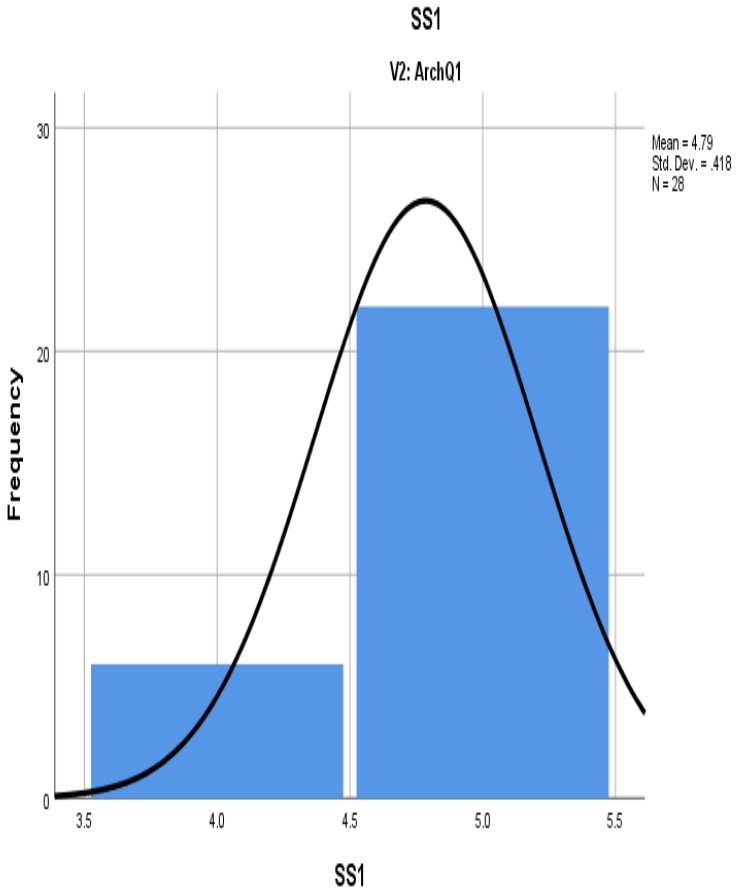


FIGURE 28: COMMUNICATION SKILLS 1

4.7.15 EngQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	14	94.50	4.183		
SS6	14	4.71	.611	0.942	1
SS7	14	4.71	.611	0.942	2
SS1	14	4.57	.646	0.914	3
SS18	14	4.43	.938	0.886	4
SS2	14	4.43	.514	0.886	5
SS5	14	4.43	.756	0.886	6
SS16	14	4.36	.745	0.872	7
SS3	14	4.36	.745	0.872	8
SS17	14	4.21	.802	0.842	9
SS9	14	4.21	.802	0.842	10
SS22	14	4.14	.535	0.828	11
SS4	14	4.14	.770	0.828	12
SS8	14	4.07	.730	0.814	13
SS21	14	4.00	.961	0.800	14
SS20	14	4.00	.679	0.800	15
SS19	14	4.00	.555	0.800	16
SS23	14	3.79	.893	0.758	17
SS14	14	3.71	.994	0.742	18

SS15	14	3.64	1.277	0.728	19
SS10	14	3.64	.929	0.728	20
SS12	14	3.43	1.222	0.686	21
SS11	14	3.14	1.231	0.628	22
SS13	14	2.86	1.099	0.572	23

TABLE 43: ENGINEERS' PERCEPTIONS ON IMPORTANT SOFT SKILLS 1

According to the Engineers' perceptions, 16 of the soft skills are very important, with conflict management and decision-making skills rated 4.71 (Very Important), six are Important, and one unimportant, as indicated on the mean table above and the histograms.

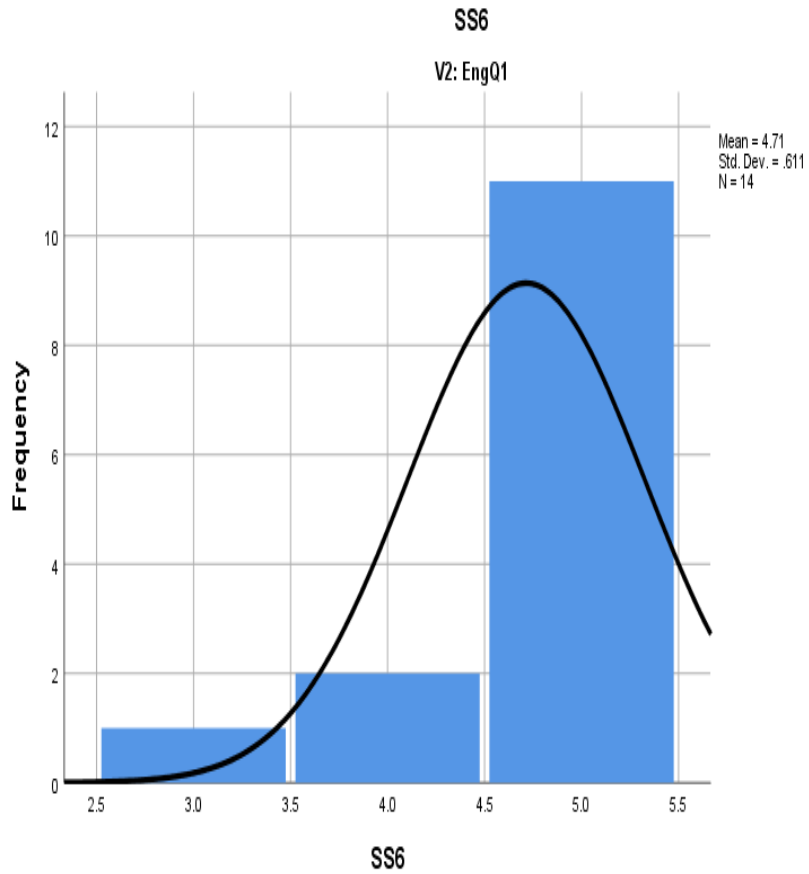


FIGURE 29: CONFLICT MANAGEMENT SKILLS 1

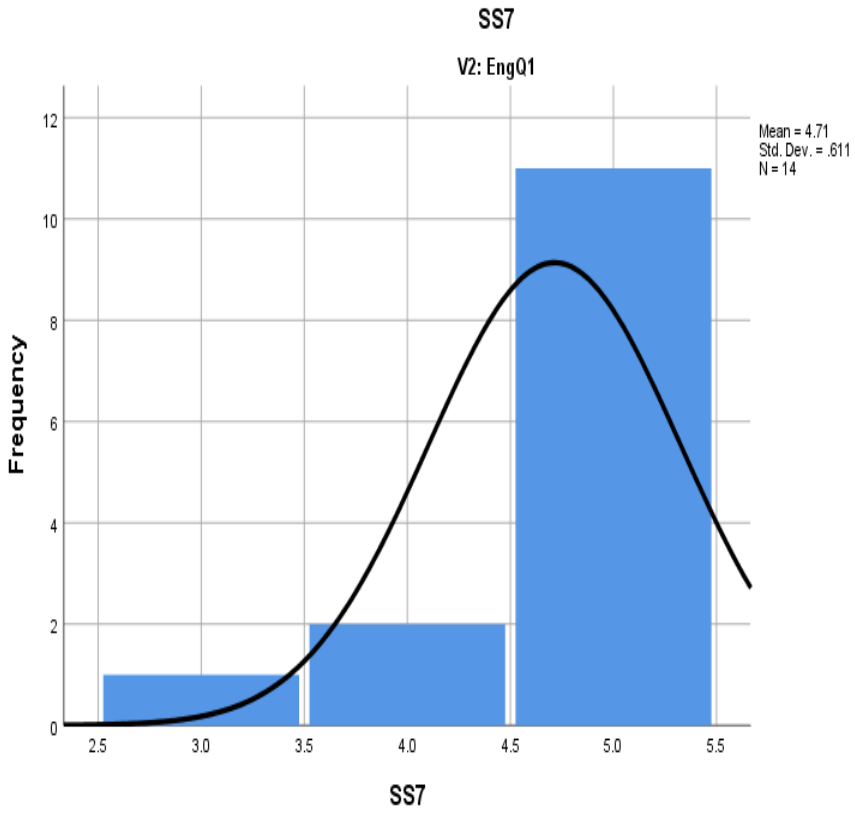


FIGURE 30: DECISION-MAKING SKILLS 1

4.7.16 PMQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	23	12.00	6.782		
SS5	23	4.57	.590	0.914	1
SS1	23	4.57	.662	0.914	2
SS2	23	4.48	.593	0.896	3
SS7	23	4.48	.593	0.896	4
SS18	23	4.43	.945	0.886	5
SS17	23	4.26	.915	0.852	6

SS14	23	4.26	.689	0.852	7
SS3	23	4.26	.689	0.852	8
SS22	23	4.17	.834	0.834	9
SS6	23	4.17	.778	0.834	10
SS21	23	4.09	.900	0.818	11
SS10	23	4.09	.733	0.818	12
SS9	23	4.09	.793	0.818	13
SS8	23	4.04	.878	0.808	14
SS23	23	4.00	.798	0.800	15
SS16	23	4.00	1.087	0.800	16
SS4	23	4.00	.739	0.800	17
SS20	23	3.91	.733	0.782	18
SS19	23	3.74	.689	0.748	19
SS15	23	3.52	.994	0.704	20
SS11	23	3.35	.775	0.670	21
SS12	23	3.30	1.105	0.660	22
SS13	23	3.22	.998	0.644	23

TABLE 44: PROJECT MANAGERS' PERCEPTIONS ON IMPORTANT SOFT SKILLS 1

Project Managers rated 17 soft skills as Very Important and six as Important, according to the mean table above, with critical thinking and problem-solving skills topping the list with 4.57 each (Very Important).

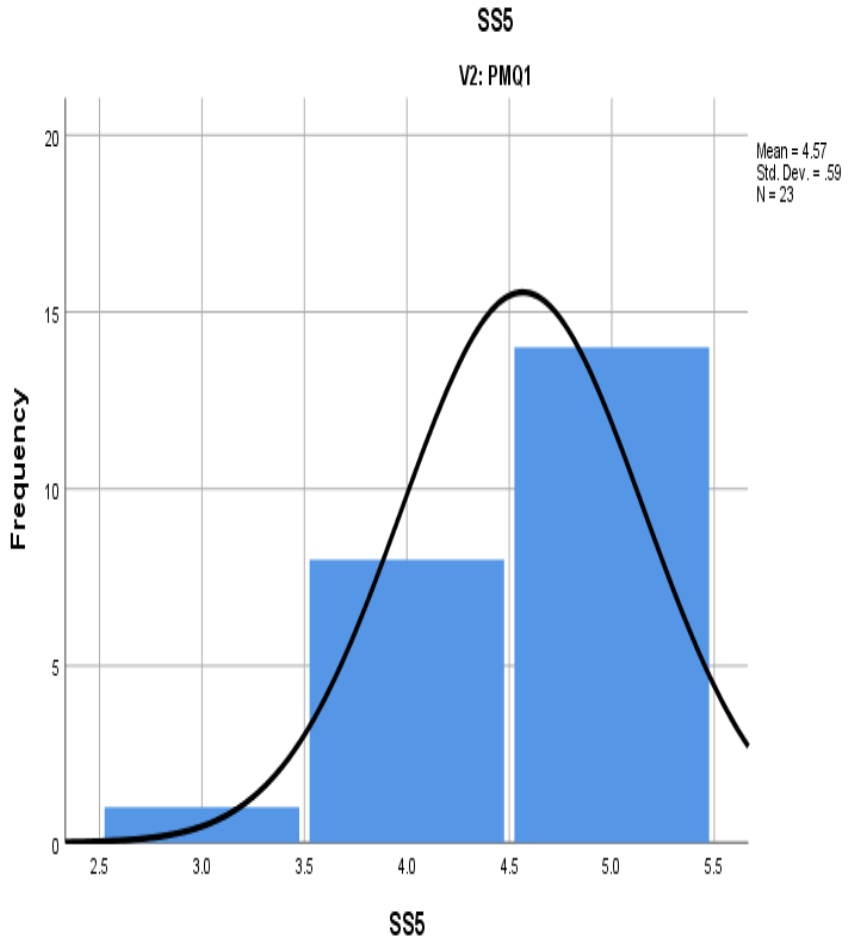


FIGURE 31: CRITICAL THINKING AND PROBLEM-SOLVING SKILLS 1

4.7.17 QSQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	36	69.50	10.536		
SS5	36	4.53	.810	0.906	1
SS3	36	4.53	.810	0.906	2
SS1	35	4.51	.853	0.902	3
SS7	36	4.50	.775	0.900	4

SS2	36	4.44	.773	0.888	5
SS8	36	4.33	1.042	0.866	6
SS18	36	4.28	1.003	0.856	7
SS6	36	4.25	.806	0.850	8
SS23	36	4.14	1.150	0.828	9
SS17	36	4.06	1.170	0.812	10
SS22	36	4.06	1.013	0.812	11
SS10	36	4.06	1.068	0.812	12
SS16	36	4.00	1.195	0.800	13
SS4	36	3.94	.791	0.788	14
SS21	36	3.92	1.052	0.784	15
SS9	36	3.83	1.134	0.766	16
SS20	36	3.67	1.195	0.734	17
SS19	36	3.67	.986	0.734	18
SS14	36	3.61	1.128	0.722	19
SS15	35	3.34	1.259	0.668	20
SS11	36	3.19	1.091	0.638	21
SS13	36	3.08	1.079	0.616	22
SS12	36	3.03	23	1.253	

TABLE 45: QUANTITY SURVEYORS' PERCEPTIONS ON IMPORTANT SOFT SKILLS 1

The Quantity Surveyors' perceptions are that 13 soft skills are very important, while 10 are important, as seen in the table and the histogram example below. Critical thinking and problem solving skills were rated higher than other soft skills, with a score of 4.53.

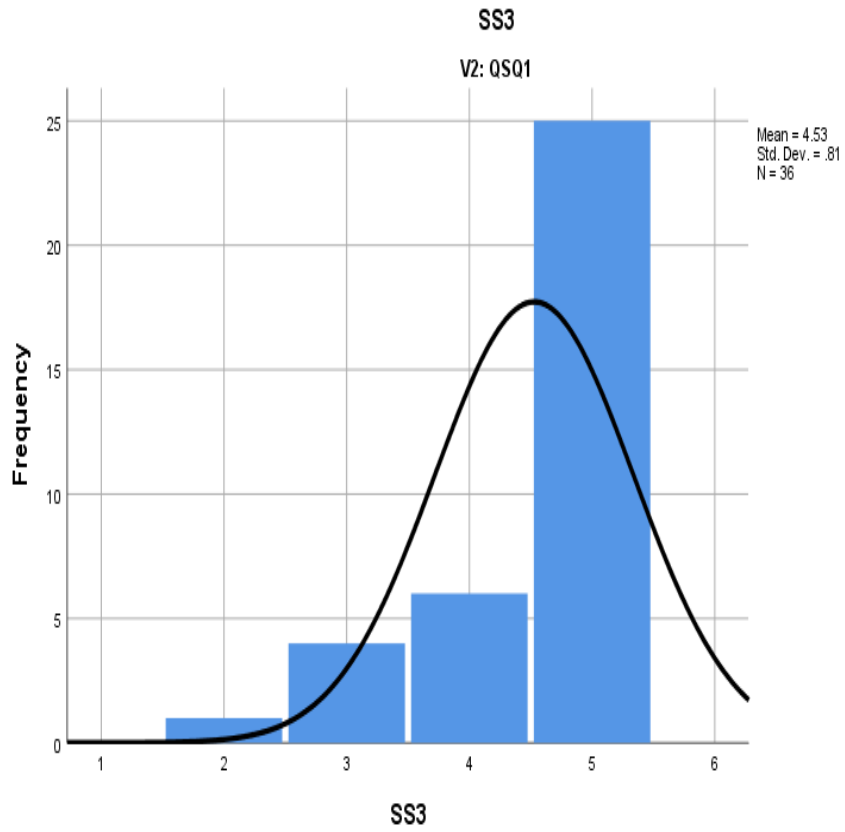


FIGURE 32: COLLABORATION/TEAMWORK SKILLS 1

4.7.18 UndisQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	4	103.50	1.291		
SS1	4	5.00	.000	1.00	1
SS22	4	4.75	.500	0.950	2
SS21	4	4.75	.500	0.950	3
SS18	4	4.75	.500	0.950	4
SS17	4	4.75	.500	0.950	5
SS3	4	4.75	.500	0.950	6

SS2	4	4.75	.500	0.950	7
SS23	4	4.50	.577	0.900	8
SS16	4	4.50	.577	0.900	9
SS8	4	4.50	.577	0.900	10
SS7	4	4.25	.957	0.850	11
SS6	4	4.25	.957	0.850	12
SS5	4	4.25	.957	0.850	13
SS9	4	4.00	.000	0.800	14
SS4	4	4.00	.816	0.800	15
SS14	4	3.75	.500	0.750	16
SS20	4	3.50	1.000	0.700	17
SS10	4	3.50	1.000	0.700	18
SS19	4	3.25	.957	0.650	29
SS13	4	3.00	.816	0.600	20
SS15	4	2.75	.957	0.550	21
SS12	4	2.75	.500	0.550	22
SS11	4	2.50	.577	0.500	23

TABLE 46: UNDISCLOSED GROUP'S PERCEPTIONS ON IMPORTANT SOFT SKILLS 1

This group's perception is that one soft skill is Extremely Important, 14 soft skills are Very Important, five are Important, and three are unimportant. Communication skills tops the list with a rating of 5.

4.7.19 Question 4: Perceived Importance of Soft Skills in Complex Projects

The objective of this question was to ascertain the importance of soft skills in complex construction projects. Participants were requested to rate each of the variables on a five-point Likert scale of 1= Strongly disagree, 2 = Disagree, 3= Neutral, 4 = Agree, and 5 = Strongly agree.

4.7.20 ArchQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	28	37.50	8.226		
I10	28	4.71	.535	0.942	1
I7	28	4.71	.535	0.942	2
I13	28	4.57	.504	0.914	3
I1	28	4.57	.573	0.914	4
I3	28	4.54	.576	0.908	5
I2	28	4.54	.508	0.908	6
I8	28	4.46	.576	0.892	7
I9	28	4.43	.690	0.886	8
I5	28	4.39	.567	0.878	9
I6	28	4.32	.670	0.864	10
I4	28	4.32	.723	0.864	11
I14	28	4.32	.670	0.864	12
I11	28	4.18	.772	0.836	13
I12	28	3.54	1.232	0.708	14

TABLE 47: ARCHITECTS' PERCEPTIONS ON IMPORTANCE OF CONSTRUCTION MANAGERS' SOFT SKILLS 1

There was agreement from the Architects when answering this question, since their perceptions agreed on thirteen of the variables based on a score of 4, and one of the variables was identified as neutral.

4.7.21 EngQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	14	94.50	4.183		
I2	14	4.64	.497	0.928	1
I6	14	4.64	.497	0.928	2
I7	14	4.57	.646	0.914	3
I5	14	4.57	.514	0.914	4
I4	14	4.50	.760	0.900	5
I8	14	4.43	.646	0.886	6
I1	14	4.43	.756	0.886	7
I3	14	4.29	.825	0.858	8
I10	14	4.29	.726	0.858	9
I14	14	4.21	.699	0.842	10
I13	14	4.21	.699	0.842	11
I11	14	4.07	.730	0.814	12
I9	14	3.86	1.027	0.772	13
I12	14	3.71	1.204	0.742	14

TABLE 48: ENGINEERS' PERCEPTIONS ON IMPORTANCE OF CONSTRUCTION MANAGERS' SOFT SKILLS 1

Most of the Engineers agreed with the listed variables on this question when they rated twelve of them on a score of 4 (agree), and only two were rated neutral.

4.7.22 PMQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	23	12.00	6.782		
I1	23	4.61	.583	0.922	1
I10	23	4.57	.788	0.914	2
I6	23	4.43	.788	0.886	3

I5	23	4.43	.945	0.886	4
I4	23	4.39	.783	0.878	5
I2	23	4.35	.832	0.870	6
I9	23	4.30	.876	0.860	7
I3	23	4.30	.926	0.860	8
I13	23	4.26	.810	0.852	9
I14	23	4.22	.902	0.844	10
I8	23	4.17	.984	0.834	11
I7	23	4.04	1.261	0.808	12
I11	23	3.91	.996	0.782	13
I12	23	3.78	1.043	0.756	14

TABLE 49: PROJECT MANAGERS' PERCEPTIONS ON CONSTRUCTION MANAGERS' SOFT SKILLS 1

4.7.23 QSQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	36	69.50	10.536		
I2	36	4.53	.506	0.906	1
I3	36	4.50	.609	0.900	2
I10	36	4.47	.696	0.894	3
I9	36	4.39	.688	0.878	4
I13	36	4.36	.683	0.872	5
I1	36	4.33	.676	0.866	6
I11	36	4.25	.806	0.850	7
I6	36	4.25	.806	0.850	8
I7	36	4.25	.770	0.850	9
I14	36	4.22	.797	0.844	10
I4	36	4.22	.832	0.844	11
I5	36	4.17	.811	0.834	12
I12	36	4.14	.798	0.828	13
I8	36	4.06	.860	0.812	14

TABLE 50: QUANTITY SURVEYORS' PERCEPTIONS ON IMPORTANCE OF CONSTRUCTION MANAGERS' SOFT SKILLS 1

SKILLS

The Quantity Surveyors agreed on all the variables, and hence gave a rating of 4 on all of them.

4.7.24 UndisQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	4	103.50	1.291		
I10	4	5.00	.000	1.00	1
I1	4	5.00	.000	1.00	2
I11	4	4.75	.500	0.950	3
I4	4	4.75	.500	0.950	4
I3	4	4.75	.500	0.950	5
I2	4	4.75	.500	0.950	6
I13	4	4.50	1.000	0.900	7
I7	4	4.50	.577	0.900	8
I5	4	4.50	1.000	0.900	9
I14	4	4.25	.500	0.850	10
I9	4	4.25	.500	0.850	11
I8	4	4.25	.500	0.850	12
I6	4	4.00	.816	0.800	13
I12	4	3.75	.957	0.750	14

TABLE 51: UNDISCLOSED GROUP'S PERCEPTIONS ON CONSTRUCTION MANAGERS' SOFT SKILLS 1

The undisclosed group agreed closely on two variables when scoring them 5, agreed on 11 and scored them 4, while only one was given a score of 3 (neutral).

4.7.25 Question 5: Perceived Soft Skill Training Strategies

The objective of this question was to identify training strategies for contractors in complex projects in order to enhance the performance of construction projects, and ultimately to improve their human skills in order to deal with growing project complexities and challenges.

4.7.26 ArchQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	28	37.50	8.226		
TS1a	28	4.29	.713	0.858	1
TS1b	28	4.18	.723	0.836	2
TS1c	28	4.04	1.105	0.808	3
TS4	28	3.89	.956	0.778	4
TS2c	28	3.54	.693	0.708	5
TS2a	28	3.54	.881	0.708	6
TS2b	28	3.36	.951	0.672	7
TS5	28	3.25	1.266	0.650	8
TS3	28	2.89	.786	0.578	9

TABLE 52: ARCHITECTS' PERCEPTIONS ON SOFT SKILLS TRAINING STRATEGIES 1

Architects' perceptions agreed on three training strategies and scored them 4, **of** while they were neutral on five strategies and disagreed on one.

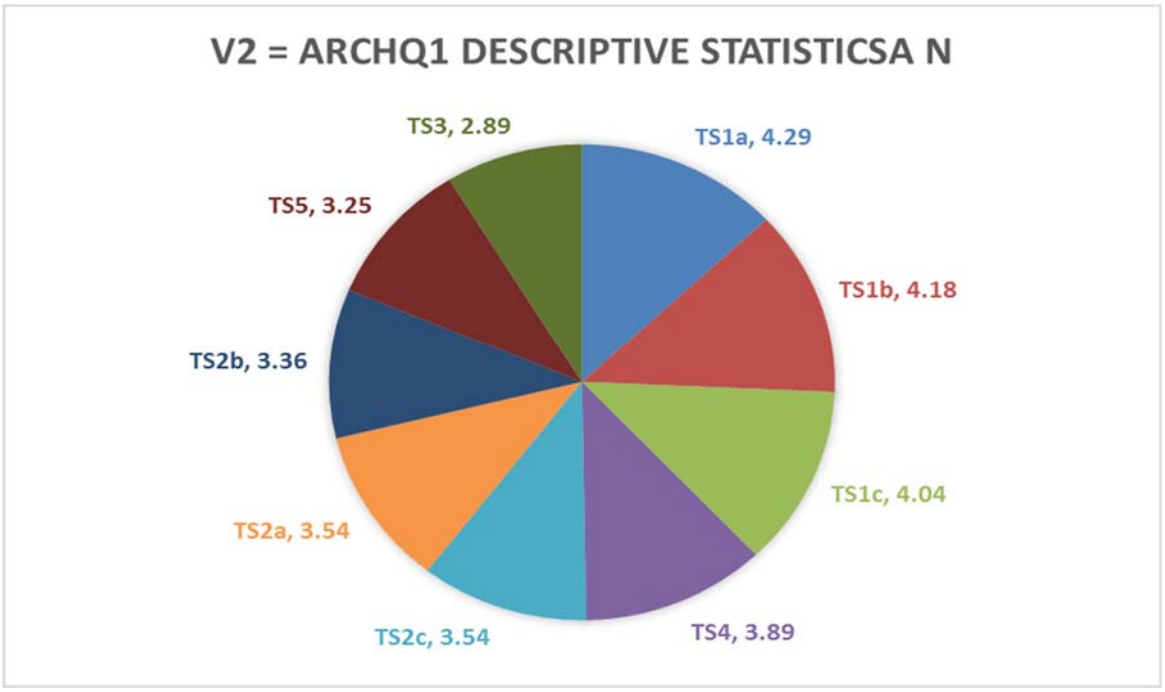


FIGURE 33: STRATEGIC MEANS OF SOFT SKILLS TRAINING 1

4.7.27 EngQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	14	94.50	4.183		
TS1a	14	4.36	.633	0.872	1
TS1b	14	4.07	.917	0.814	2
TS4	14	3.93	.829	0.786	3
TS1c	14	3.79	.802	0.758	4
TS2a	14	3.29	1.204	0.658	5
TS5	14	3.21	.802	0.642	6
TS2b	14	3.07	1.141	0.614	7
TS2c	14	2.86	.949	0.572	8
TS3	14	2.21	1.051	0.442	9
Valid N (listwise)	14				

TABLE 53: ENGINEERS' PERCEPTIONS ON SOFT SKILLS TRAINING STRATEGIES 1

The Engineers agreed on four training strategies, were neutral on five, and disagreed on two training strategies.

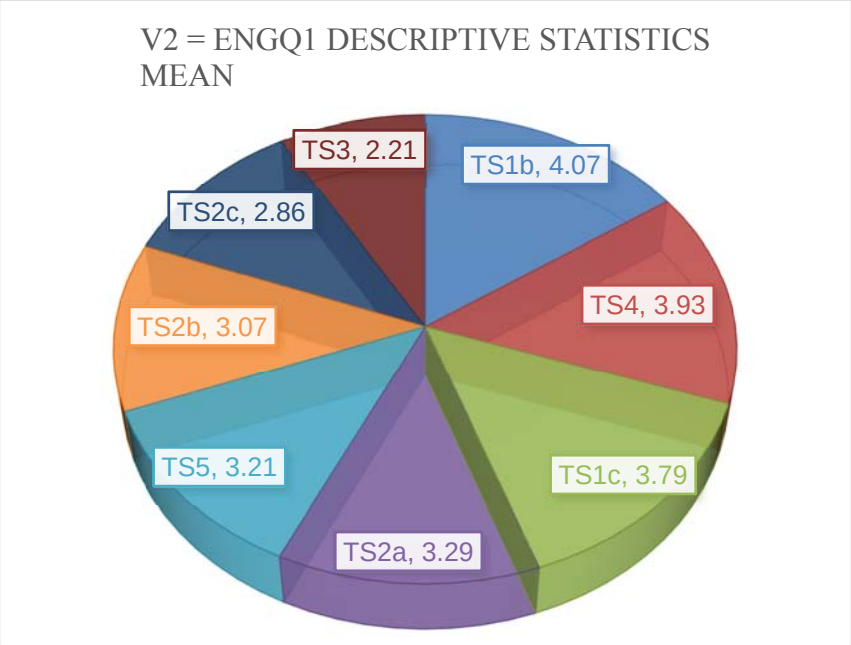


FIGURE 34: ENGINEERS' PERCEIVED TRAINING NEEDS 1

4.7.28 PMQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	23	12.00	6.782		
TS1a	23	4.30	.703	0.860	1
TS1b	23	4.13	.694	0.826	2
TS1c	23	4.04	1.065	0.808	3
TS4	23	3.87	1.180	0.774	4
TS2b	23	3.61	1.076	0.722	5
TS5	23	3.43	1.121	0.686	6
TS2c	23	3.30	1.063	0.660	7
TS2a	23	3.04	1.022	0.608	8
TS3	23	2.83	1.029	0.566	9
Valid N (listwise)	23				

T

TABLE 54: PROJECT MANAGERS' PERCEPTIONS ON SOFT SKILLS TRAINING STRATEGIES 1

Project Managers agreed on three strategies, were neutral about five, and disagreed about Online Training.

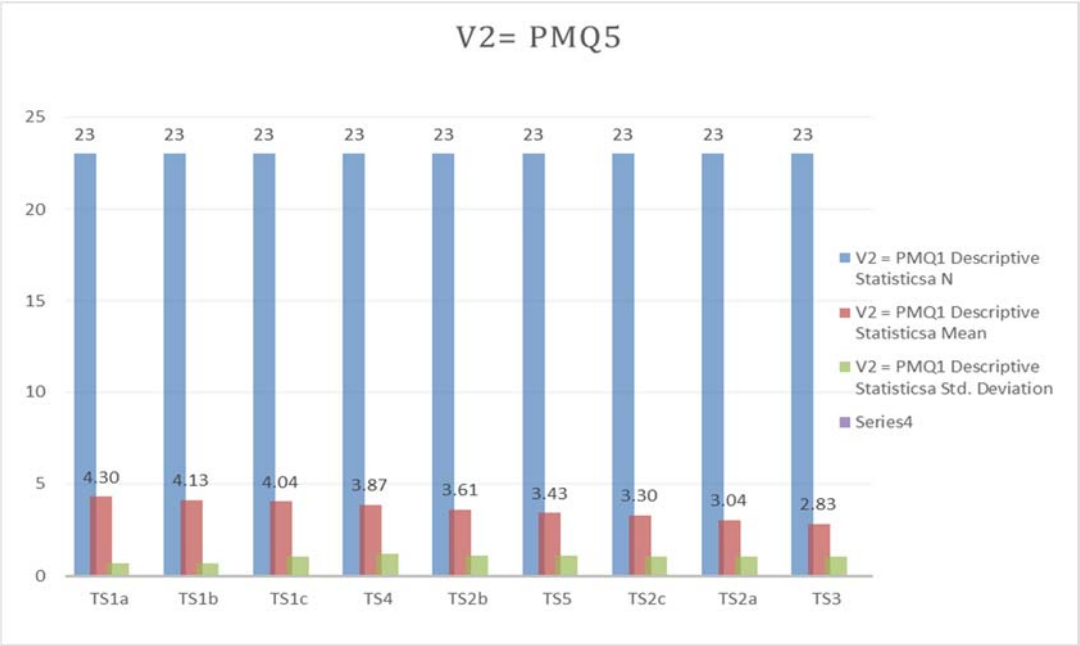


FIGURE 35: PROJECT MANAGERS' PERCEPTIONS OF TRAINING NEEDS 1

4.7.29 QSQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	36	69.50	10.536		
TS1a	36	4.22	.722	0.844	1
TS1c	36	4.17	.910	0.834	2
TS1b	36	4.17	.697	0.834	3
TS4	36	3.86	1.150	0.772	4
TS2b	36	3.50	.941	0.700	5
TS2c	36	3.50	1.108	0.700	6
TS5	36	3.42	.967	0.684	7
TS2a	36	3.31	1.009	0.662	8
TS3	36	3.08	1.228	0.616	9

TABLE 55: QUANTITY SURVEYORS' PERCEPTIONS ON SOFT SKILLS TRAINING STRATEGIES 1

However, quantity surveyors agreed on three training strategies and were neutral on the other six.

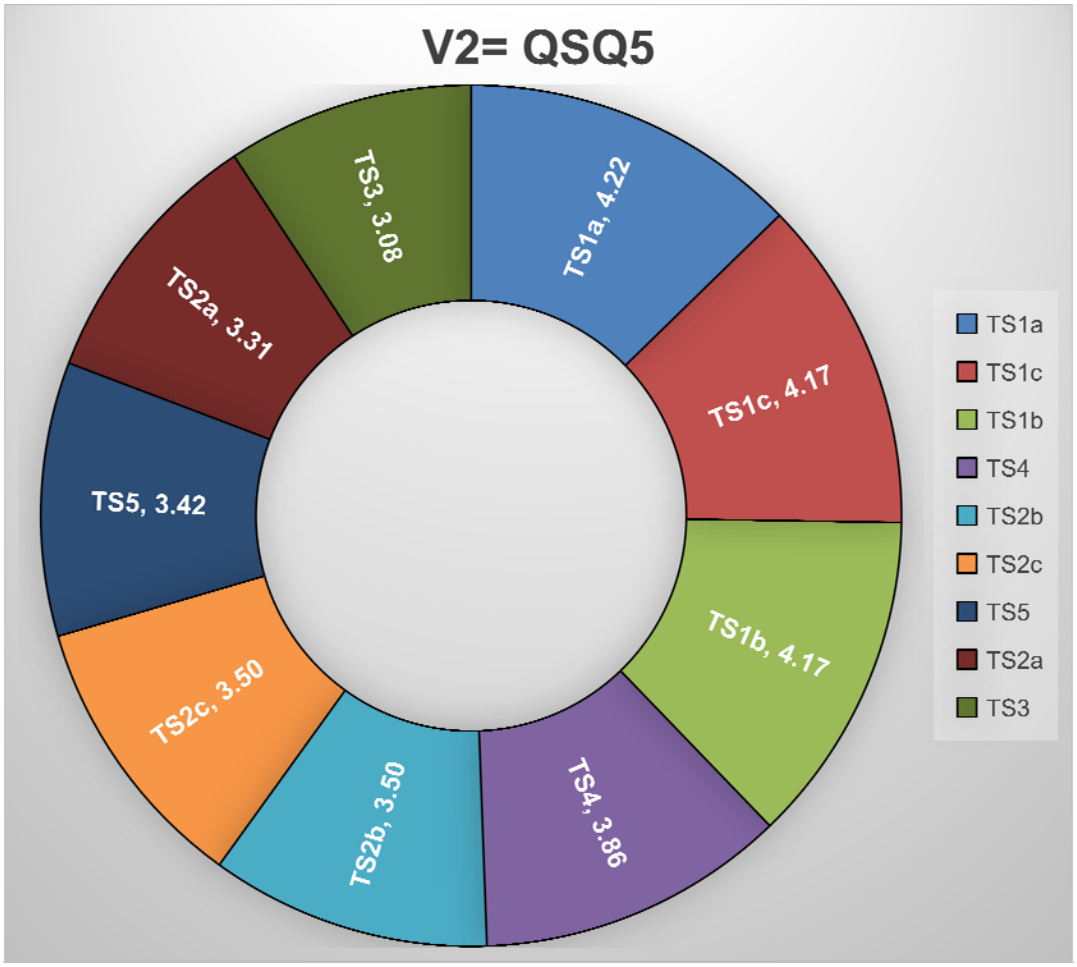


FIGURE 36: QUANTITY SURVEYORS' OFTRAININING NEEDS 1

4.7.30 UndisQ1

Descriptive Statistics[a]					
	N	Mean	Std. Deviation	RII	Rank
V1	4	103.50	1.291		
TS1b	4	5.00	.000	1.00	1
TS1a	4	5.00	.000	1.00	2
TS1c	4	4.75	.500	0.950	3

TS4	4	4.00	.000	0.800	4
TS5	4	3.50	.577	0.700	5
TS2b	4	3.50	.577	0.700	6
TS2c	4	3.00	1.414	0.600	7
TS2a	4	3.00	.000	0.600	8
TS3	4	2.75	.500	0.550	9

TABLE 56: UNDISCLOSED GROUP'S PERCEPTIONS ON SOFT SKILLS TRAINING STRATEGIES 1

The Undisclosed group strongly agreed on two strategies, agreed on two strategies, were neutral on three strategies, and disagreed on one.

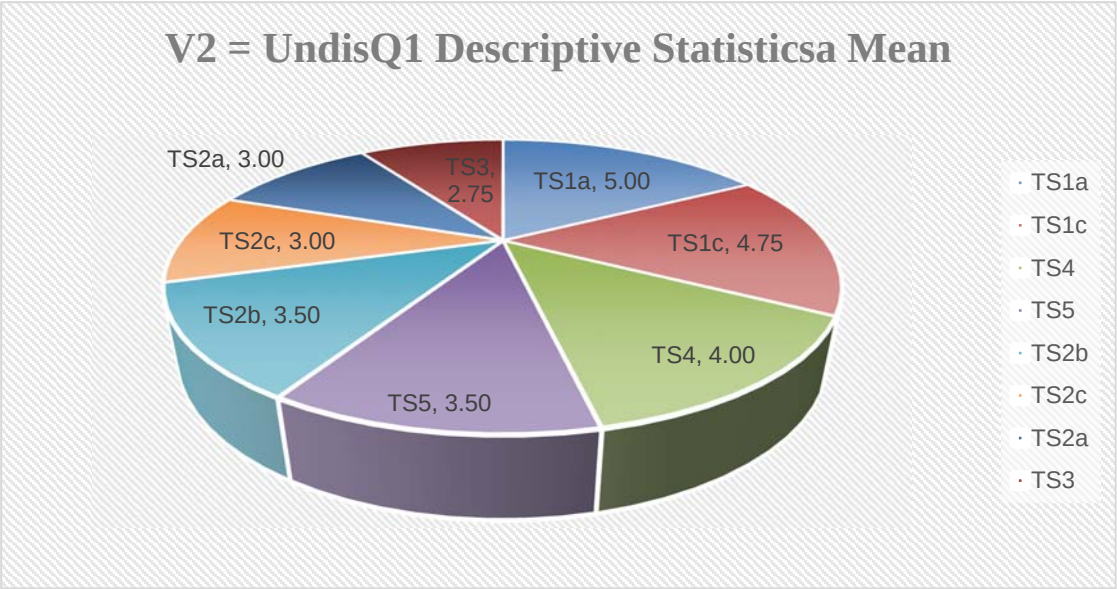


FIGURE 37: UNDISCLOSED GROUP'S PERCEPTIONS OF TRAINING NEEDS 1

4.8 Bivariate Inferential Statistics

4.8.1 Independent sample T-test and p-values

Participants were grouped into groups of three in order to perform the Independent T-test and test for the effect of size. Levine's test for equality was also performed in order to determine the significance value, the t-value, and the degree of freedom. Due to the small number of participants from the Engineers, the researcher was unable to create a group that could be compared with the others. The following groups were therefore established for this research:

- Architects and Others
- Project Managers and Others
- Quantity Surveyors and Others

4.8.2 Independent T-test: Architects and Others

Table 0-54 below, representing the group of Architects and Others, shows Levine's test for equality of variance and the T-test for equality of means. However, Levine's test is significant because the p-value is less than 0.05 and, according to Field (2009), indicates that the variances are significantly different.

T-Test

Group Statistics

Architect		N	Mean	Std. Deviation	Std. Error Mean
V1	Artchitect	28	37.50	8.226	1.555
	Others	77	58.64	33.533	3.821

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		Effect of Size
									Lower	Upper	
V1	Equal variances assumed	42.088	0.000	-3.290	103	0.001	-21.136	6.424	-33.877	-8.395	
	Equal variances not assumed			-5.123	95.847	0.000	-21.136	4.126	-29.326	-12.947	0.042

TABLE 57: INDEPENDENT T-TEST- ARCHITECTS AND OTHERS 1

Due to the small p-value from Levine's test, the effect of size was calculated using the equal variances not assumed, and 0.042 was recorded, which can be declared a minor effect. Furthermore, the T-test for equality of means indicates a p-value of 0.001, which is less than 0.05 at 2-tailed, and the mean difference between equal variances assumed and not assumed are the same (-21.136). Therefore, it is concluded that the size of the participants has an effect on the survey results.

4.8.3 Independent T-test: Project Managers and Others

Table 58 below represents the group of Project Managers and Others, and shows the Levine's test for equality of variances and the T-test for equality of means. However, Levine's test is significant because the p-value is less than 0.05 and, according to Field (2009), indicates that the variances are significantly different.

T-Test

Group Statistics

Project management		N	Mean	Std. Deviation	Std. Error Mean
V1	Others	82	64.50	23.815	2.630
	Project management	23	12.00	6.782	1.414

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
									95% Confidence Interval of the Difference		
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper	Effect Size
V1	Equal variances assumed	34.352	0.000	10.421	103	0.000	52.500	5.038	42.509	62.491	
	Equal variances not assumed			17.582	102.930	0.000	52.500	2.986	46.578	58.422	0.043

TABLE 58: INDEPENDENT T-TEST - PROJECT MANAGERS AND OTHERS 1

Similarly, to Table 57, the p-value from Levine's test is less than 0.05, and therefore the effect size is calculated using the equal variances not assumed, and 0.043 is recorded, which can be declared a minor effect. Furthermore, the T-test for equality of means indicates a p-value of 0.000 at 2-tailed 0.05, and the mean difference between the equal variances assumed and not assumed are the same (52.500). Therefore, it is concluded that the size of the participants has an effect on the survey results.

4.8.4 Independent T-test: Quantity Surveyors and Others

Table 0-56 below represents the group of Quantity Surveyors and Others, and shows the Levine's test for equality of variances and the T-test for equality of means. However, Levine's test is significant because the p-value of is less than 0.05 and, according to Field (2009), it indicates that the variances are significantly different.

T-Test

Group Statistics

QS		N	Mean	Std. Deviation	Std. Error Mean
V1	Others	69	44.39	33.794	4.068
	Quantity Surveyors	36	69.50	10.536	1.756

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper	Effect Size
V1	Equal variances assumed	35.106	0.000	-4.340	103	0.000	-25.109	5.785	-36.582	-13.636	
	Equal variances not assumed			-5.666	89.650	0.000	-25.109	4.431	-33.912	-16.305	0.047

TABLE 59: INDEPENDENT T-TEST –QUANTITY SURVEYORS AND OTHERS 1

Similar to the two tables 57 and 58 above, the p-value from Levine's test is less than 0.05, and therefore the effect size is calculated using the equal variances not assumed, and 0.047 is recorded, which can be declared a minor effect. Furthermore, the T-test for equality of means indicates a p-value of 0.000 at 2-tailed 0.05, and the mean difference between the equal variances assumed and not assumed is the same (-25.109). Therefore, it is concluded that the size of the participants has an effect on the survey results.

Adding to Field's statement, Haupt (2015) states that equal variances assumed must be considered when the significance value is larger than 0.05, and while equal variances not assumed must be used when the p-value is less than 0.05. Haupt (2015) further states that when

the value in the significant (2-tailed) column is equal to or less than 0.05, there is a significant difference in the mean scores on each of the dependent variables for each of the two groups. Therefore, the significant (2-tailed) column in Tables 44, 45, and 46 has significance values that are less than 0.05, meaning that there are significant differences in the mean scores among the groups.

A separate one-way ANOVA was performed on the individual variables to ascertain there are any substantial significant differences in the respondents' answers on each variable. The last column of Table 47 below shows such significant differences obtained from applying SPSS. Many of the variables indicate significant p-values that are higher than 0.05, meaning that there are no substantial significant differences or effects according to the participants' perceptions, except on the following variables:

- Conflict Management Skills (SS6), which indicates 0.039
- Team Building Skills (SS21), which indicates 0.037
- Communication Skills (SS1) in question 2, which indicates which indicates 0.017
- Presentation Skills (SS11), which indicates 0.046
- To help change the blame culture and instil a spirit of being a responsible team member (I7), which indicates 0.049. The five variables above indicate significance values that are less than 0.05 and, according to both Field (2009) and Haupt (2015), this means there are significant differences in the mean scores.

Variables	ArchQ1		EngQ1		PMQ1		QSQ1		UndisQ1		Total		ANOVA
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	**Sig. LVL**
Question 1													
SS1	4.54	0.51	4.71	0.47	4.61	0.66	4.72	0.45	5.00	0.00	4.66	0.52	0.375
SS2	4.50	0.58	4.57	0.51	4.43	0.59	4.44	0.65	4.25	0.96	4.47	0.61	0.894
SS3	4.43	0.63	4.43	0.65	4.43	0.79	4.67	0.59	4.75	0.50	4.52	0.65	0.479
SS4	3.82	0.82	4.14	0.77	4.04	0.77	4.00	0.79	4.00	0.82	3.98	0.78	0.757
SS5	4.61	0.63	4.43	0.76	4.61	0.58	4.47	0.97	4.50	0.58	4.53	0.76	0.914
SS6	4.25	0.70	4.57	0.65	4.26	0.75	4.36	0.76	3.25	0.96	4.30	0.76	0.039
SS7	4.39	0.69	4.43	0.76	4.61	0.58	4.56	0.77	4.75	0.50	4.51	0.69	0.728
SS8	4.46	0.69	4.29	0.61	4.22	0.95	4.36	0.93	4.75	0.50	4.36	0.82	0.714
SS9	4.29	0.81	4.29	0.73	4.22	0.74	3.97	1.03	4.00	0.82	4.15	0.86	0.595
SS10	4.18	0.77	4.07	0.83	4.09	0.73	4.06	0.86	3.50	0.58	4.08	0.79	0.633
SS11	2.96	1.00	3.14	1.17	3.39	0.84	3.28	0.85	2.50	0.58	3.17	0.93	0.271
SS12	3.25	0.80	3.50	0.94	3.13	1.14	3.03	0.88	2.25	0.96	3.14	0.94	0.166
SS13	3.04	0.84	2.86	1.10	3.13	1.01	2.86	0.72	3.00	1.41	2.97	0.89	0.805
SS14	3.61	0.88	3.71	0.73	3.91	0.95	3.47	0.91	3.00	1.15	3.62	0.90	0.247
SS15	3.54	0.84	3.71	0.83	3.48	0.85	3.47	1.06	2.50	1.29	3.49	0.94	0.260
SS16	4.32	0.61	4.43	0.51	4.17	0.83	4.08	0.91	4.50	0.58	4.23	0.76	0.515
SS17	4.32	1.02	4.14	0.77	4.43	0.79	4.22	0.99	4.75	0.50	4.30	0.91	0.711
SS18	4.68	0.55	4.50	0.85	4.43	0.84	4.33	0.89	3.75	0.50	4.45	0.80	0.182
SS19	3.50	0.88	3.86	0.53	3.74	0.92	3.64	0.72	3.50	0.58	3.65	0.78	0.661
SS20	3.46	0.84	3.86	0.53	4.00	0.80	3.75	0.87	3.50	0.58	3.73	0.81	0.182
SS21	4.32	0.72	3.64	0.93	4.35	0.78	4.00	0.96	4.75	0.50	4.14	0.87	0.037
SS22	4.21	0.83	3.93	0.83	4.52	0.67	4.19	0.86	4.75	0.50	4.26	0.81	0.160
SS23	4.14	0.76	3.93	0.62	4.17	0.83	4.31	0.82	4.50	0.58	4.19	0.77	0.538
Question 2													
SS1	2.61	0.99	2.86	1.10	3.39	0.99	2.47	1.03	2.50	1.00	2.76	1.06	0.017
SS2	2.50	0.96	2.93	1.21	3.09	1.16	2.39	1.08	3.25	0.96	2.68	1.11	0.084
SS3	2.93	1.12	2.79	1.12	2.74	1.05	2.61	1.10	3.00	0.82	2.76	1.08	0.818
SS4	2.61	0.74	2.71	1.07	2.96	0.88	2.44	1.00	2.25	0.96	2.63	0.92	0.274
SS5	2.93	1.21	3.00	0.96	3.17	1.07	2.36	0.99	2.50	1.29	2.78	1.11	0.050
SS6	2.96	1.00	2.79	1.25	3.26	1.01	2.69	1.21	3.50	0.58	2.93	1.11	0.293
SS7	2.50	1.04	2.79	1.05	3.00	1.09	2.61	1.20	2.50	0.58	2.69	1.09	0.548
SS8	2.75	0.89	2.93	1.33	2.78	1.04	2.50	1.16	3.00	1.41	2.70	1.09	0.686
SS9	2.29	0.81	2.21	1.19	2.48	0.95	2.06	1.07	1.75	0.50	2.22	0.98	0.461
SS10	2.57	0.92	2.71	1.49	3.13	1.14	2.64	0.93	2.75	1.50	2.74	1.08	0.413
SS11	3.32	0.86	3.00	1.52	2.78	1.13	2.72	1.06	1.75	0.50	2.90	1.12	0.046

SS12	2.68	0.94	2.71	0.83	3.35	1.19	2.78	1.05	2.00	0.82	2.84	1.05	0.059
SS13	2.61	0.99	2.86	1.03	2.91	1.28	2.56	1.08	2.50	1.00	2.69	1.09	0.718
SS14	2.75	0.75	2.71	0.99	3.09	1.04	2.44	1.03	2.25	0.50	2.70	0.96	0.123
SS15	2.86	1.04	3.21	1.12	3.09	1.08	2.57	0.92	2.00	1.41	2.83	1.06	0.096
SS16	2.79	1.07	3.00	1.11	2.70	1.02	2.53	0.97	2.75	0.96	2.70	1.02	0.661
SS17	2.36	0.95	2.71	1.14	2.78	0.90	2.44	1.08	2.00	0.82	2.51	1.01	0.404
SS18	2.64	1.03	3.00	1.24	2.96	1.15	2.58	1.16	2.25	0.96	2.72	1.12	0.522
SS19	2.57	0.79	2.71	1.14	2.61	1.03	2.36	0.76	2.25	0.96	2.51	0.89	0.651
SS20	2.54	0.84	2.57	0.94	2.57	0.90	2.31	0.82	2.50	0.58	2.47	0.84	0.737
SS21	2.79	1.07	2.86	1.10	2.91	0.95	2.67	0.99	2.75	0.96	2.78	1.00	0.920
SS22	2.93	0.86	2.64	1.22	3.04	1.02	2.58	0.94	3.00	0.82	2.80	0.97	0.380
SS23	2.86	1.01	2.64	0.93	2.87	0.87	2.58	0.97	2.50	1.29	2.72	0.96	0.711
Question 3													
SS1	4.79	0.42	4.57	0.65	4.57	0.66	4.51	0.85	5.00	0.00	4.63	0.67	0.400
SS2	4.50	0.58	4.43	0.51	4.48	0.59	4.44	0.77	4.75	0.50	4.48	0.64	0.921
SS3	4.39	0.69	4.36	0.74	4.26	0.69	4.53	0.81	4.75	0.50	4.42	0.73	0.594
SS4	3.81	0.88	4.14	0.77	4.00	0.74	3.94	0.79	4.00	0.82	3.95	0.79	0.793
SS5	4.64	0.56	4.43	0.76	4.57	0.59	4.53	0.81	4.25	0.96	4.54	0.69	0.794
SS6	4.36	0.78	4.71	0.61	4.17	0.78	4.25	0.81	4.25	0.96	4.32	0.78	0.313
SS7	4.50	0.64	4.71	0.61	4.48	0.59	4.50	0.77	4.25	0.96	4.51	0.68	0.761
SS8	4.32	0.72	4.07	0.73	4.04	0.88	4.33	1.04	4.50	0.58	4.24	0.87	0.616
SS9	4.14	0.65	4.21	0.80	4.09	0.79	3.83	1.13	4.00	0.00	4.03	0.88	0.572
SS10	4.11	0.69	3.64	0.93	4.09	0.73	4.06	1.07	3.50	1.00	4.00	0.89	0.371
SS11	3.18	1.09	3.14	1.23	3.35	0.78	3.19	1.09	2.50	0.58	3.19	1.03	0.675
SS12	3.50	1.07	3.43	1.22	3.30	1.11	3.03	1.25	2.75	0.50	3.26	1.15	0.440
SS13	2.89	0.96	2.86	1.10	3.22	1.00	3.08	1.08	3.00	0.82	3.03	1.01	0.778
SS14	3.50	0.96	3.71	0.99	4.26	0.69	3.61	1.13	3.75	0.50	3.74	0.99	0.068
SS15	3.61	1.07	3.64	1.28	3.52	0.99	3.34	1.26	2.75	0.96	3.47	1.14	0.599
SS16	4.18	0.67	4.36	0.74	4.00	1.09	4.00	1.20	4.50	0.58	4.11	0.97	0.664
SS17	4.32	0.61	4.21	0.80	4.26	0.92	4.06	1.17	4.75	0.50	4.22	0.92	0.588
SS18	4.64	0.62	4.43	0.94	4.43	0.95	4.28	1.00	4.75	0.50	4.45	0.88	0.528
SS19	3.46	0.79	4.00	0.55	3.74	0.69	3.67	0.99	3.25	0.96	3.66	0.83	0.280
SS20	3.61	0.74	4.00	0.68	3.91	0.73	3.67	1.20	3.50	1.00	3.74	0.92	0.563
SS21	4.21	0.69	4.00	0.96	4.09	0.90	3.92	1.05	4.75	0.50	4.08	0.91	0.400
SS22	4.21	0.63	4.14	0.53	4.17	0.83	4.06	1.01	4.75	0.50	4.16	0.81	0.589
SS23	4.14	0.85	3.79	0.89	4.00	0.80	4.14	1.15	4.50	0.58	4.08	0.95	0.642
Question 4													
I1	4.57	0.57	4.43	0.76	4.61	0.58	4.33	0.68	5.00	0.00	4.50	0.64	0.190
I2	4.54	0.51	4.64	0.50	4.35	0.83	4.53	0.51	4.75	0.50	4.51	0.59	0.534
I3	4.54	0.58	4.29	0.83	4.30	0.93	4.50	0.61	4.75	0.50	4.45	0.71	0.558

I4	4.32	0.72	4.50	0.76	4.39	0.78	4.22	0.83	4.75	0.50	4.34	0.77	0.617
I5	4.39	0.57	4.57	0.51	4.43	0.95	4.17	0.81	4.50	1.00	4.35	0.76	0.437
I6	4.32	0.67	4.64	0.50	4.43	0.79	4.25	0.81	4.00	0.82	4.35	0.73	0.390
I7	4.71	0.53	4.57	0.65	4.04	1.26	4.25	0.77	4.50	0.58	4.38	0.86	0.049
I8	4.46	0.58	4.43	0.65	4.17	0.98	4.06	0.86	4.25	0.50	4.25	0.79	0.278
I9	4.43	0.69	3.86	1.03	4.30	0.88	4.39	0.69	4.25	0.50	4.30	0.79	0.226
I10	4.71	0.53	4.29	0.73	4.57	0.79	4.47	0.70	5.00	0.00	4.55	0.68	0.199
I11	4.18	0.77	4.07	0.73	3.91	1.00	4.25	0.81	4.75	0.50	4.15	0.83	0.329
I12	3.54	1.23	3.71	1.20	3.78	1.04	4.14	0.80	3.75	0.96	3.83	1.05	0.237
I13	4.57	0.50	4.21	0.70	4.26	0.81	4.36	0.68	4.50	1.00	4.38	0.68	0.432
I14	4.32	0.67	4.21	0.70	4.22	0.90	4.22	0.80	4.25	0.50	4.25	0.76	0.986
Question 5													
TS1a	4.29	0.71	4.36	0.63	4.30	0.70	4.22	0.72	5.00	0.00	4.30	0.70	0.333
TS1b	4.18	0.72	4.07	0.92	4.13	0.69	4.17	0.70	5.00	0.00	4.18	0.73	0.244
TS1c	4.04	1.10	3.79	0.80	4.04	1.07	4.17	0.91	4.75	0.50	4.08	0.98	0.482
TS2a	3.54	0.88	3.29	1.20	3.04	1.02	3.31	1.01	3.00	0.00	3.30	0.99	0.484
TS2b	3.36	0.95	3.07	1.14	3.61	1.08	3.50	0.94	3.50	0.58	3.43	0.99	0.575
TS2c	3.54	0.69	2.86	0.95	3.30	1.06	3.50	1.11	3.00	1.41	3.36	1.00	0.225
TS3	2.89	0.79	2.21	1.05	2.83	1.03	3.08	1.23	2.75	0.50	2.85	1.05	0.137
TS4	3.89	0.96	3.93	0.83	3.87	1.18	3.86	1.15	4.00	0.00	3.89	1.03	0.999
TS5	3.25	1.27	3.21	0.80	3.43	1.12	3.42	0.97	3.50	0.58	3.35	1.05	0.932

TABLE 60: ONE-WAY ANOVA TEST 1

4.9 One-Way ANOVA Test: Groups

Group 1: Architects and Others

The Architect group consisted of 28 participants, while the Others group had 77 participants. The following test was carried out though the application of SPPS version 25 to determine the significant level between participants from the Architectural discipline and the Others.

4.9.1 Test of Homogeneity of Variances: Architects and Others

Table 61 – 64 below shows the Levene statistic test of homogeneity of variance between the group of Architects and the Others. The significant difference between the groups is smaller than the p-value of 0.05, based on the mean score of 42.09.

		Levene Statistic	df1	df2	Sig.
V1	Based on Mean	42.088	1	103	.000
	Based on Median	27.557	1	103	.000
	Based on Median and with adjusted df	27.557	1	78.123	.000
	Based on trimmed mean	40.520	1	103	.000

TABLE 61: TEST OF HOMOGENEITY OF VARIANCE – ARCHITECTS AND OTHERS 1

4.9.2 Architect Group and Others: One-Way ANOVA Test

Table 62 below shows a one-way ANOVA test between the group of Architects and the Others; the significant level between the groups is smaller than the p-value of 0.05, which indicates that the Architect group has an effect on the Others group.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9173.182	1	9173.182	10.825	.001
Within Groups	87286.818	103	847.445		
Total	96460.000	104			

TABLE 62: ONE-WAY ANOVA TEST BETWEEN ARCHITECTS GROUP AND OTHERS 1

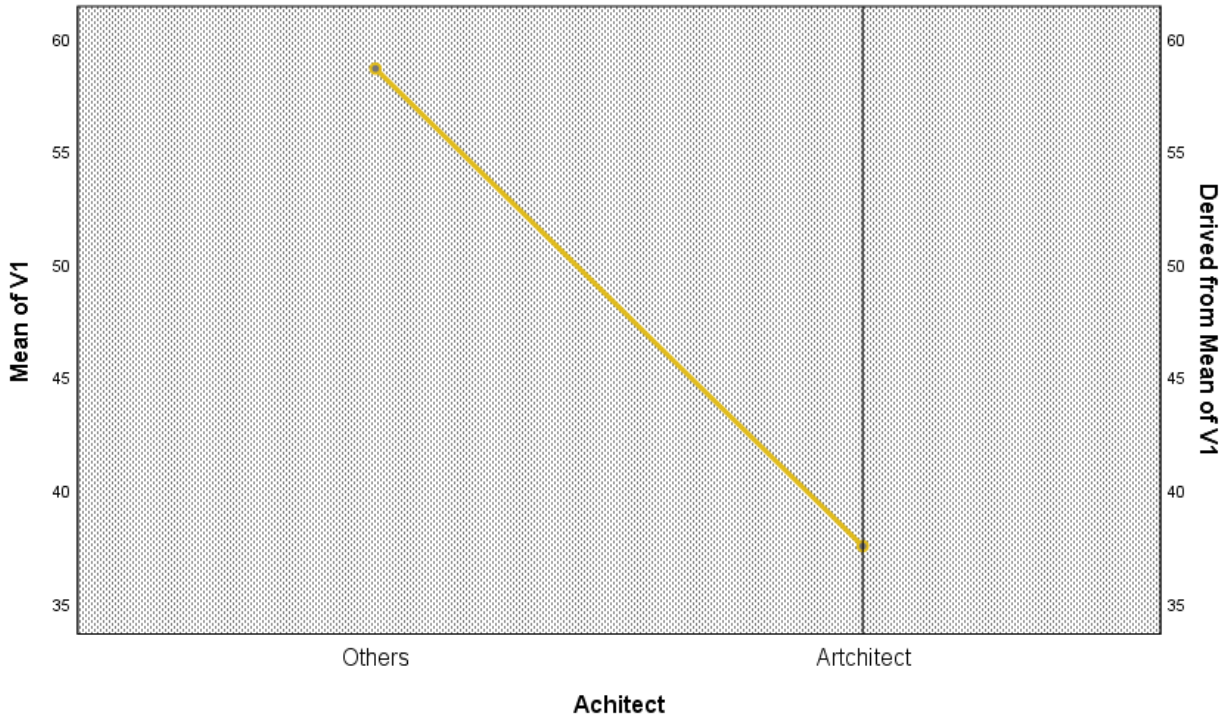


FIGURE 38: ARCHITECTS AND OTHERS MEAN PLOT 1

4.9.3 Group Two: Project Managers and Others

The Project Managers group consisted of 23 participants, while the Others group consisted of 82 participants. The following tests were carried out through the application of SPPS version 25 to determine the significant level between the participants from the project management discipline and the others.

4.9.4 Test of Homogeneity of Variances: Project Managers Group and Others

Table 63 below shows Levene's statistic test of homogeneity of variances between the group of Project Managers and the Others. Based on the table, the significant p-value is smaller than 0.05, based on a mean score of 34.35.

		Levene Statistic	df1	df2	Sig.
V1	Based on Mean	34.352	1	103	.000
	Based on Median	34.352	1	103	.000
	Based on Median and with adjusted df	34.352	1	84.477	.000
	Based on trimmed mean	34.352	1	103	.000

TABLE 63: ONE-WAY ANOVA PROJECT MANAGERS AND OTHERS 1

4.9.5 Observed Means Plot

The figure 39 below indicates the observed means, which, according to the participants' scoring, were not normally distributed.



FIGURE 39: PROJECT MANAGERS AND OTHERS MEAN PLOT 1

4.9.6 Group Three: Quantity Surveyors' and Others

The Quantity Surveyors group consisted of 36 participants, while the Others group consisted of 69 participants. The following tests were carried out through the application of SPPS version 25 to determine the significant level between the participants from the Quantity Surveyors' discipline and the Others.

4.9.7 Test of Homogeneity of Variances: Quantity Surveyors Group and Others

Table 64 below shows Levene's statistic test of homogeneity of variances between a group of Quantity Surveyors and Others. Based on the table, the significant p-value is smaller than 0.05, based on a mean score of 35.11.

		Levene Statistic	df1	df2	Sig.
V1	Based on Mean	35.106	1	103	.000
	Based on Median	21.201	1	103	.000
	Based on Median and with adjusted df	21.201	1	71.733	.000
	Based on trimmed mean	32.859	1	103	.000

TABLE 64: ONE-WAY ANOVA BETWEEN QUANTITY SURVEYORS AND OTHERS 1

4.9.7 Observed Means Plot

The figure 40 below indicates the observed means according to the participants' scoring, which was normally distributed because the number of participants from the Quantity Surveyors is more than 30.

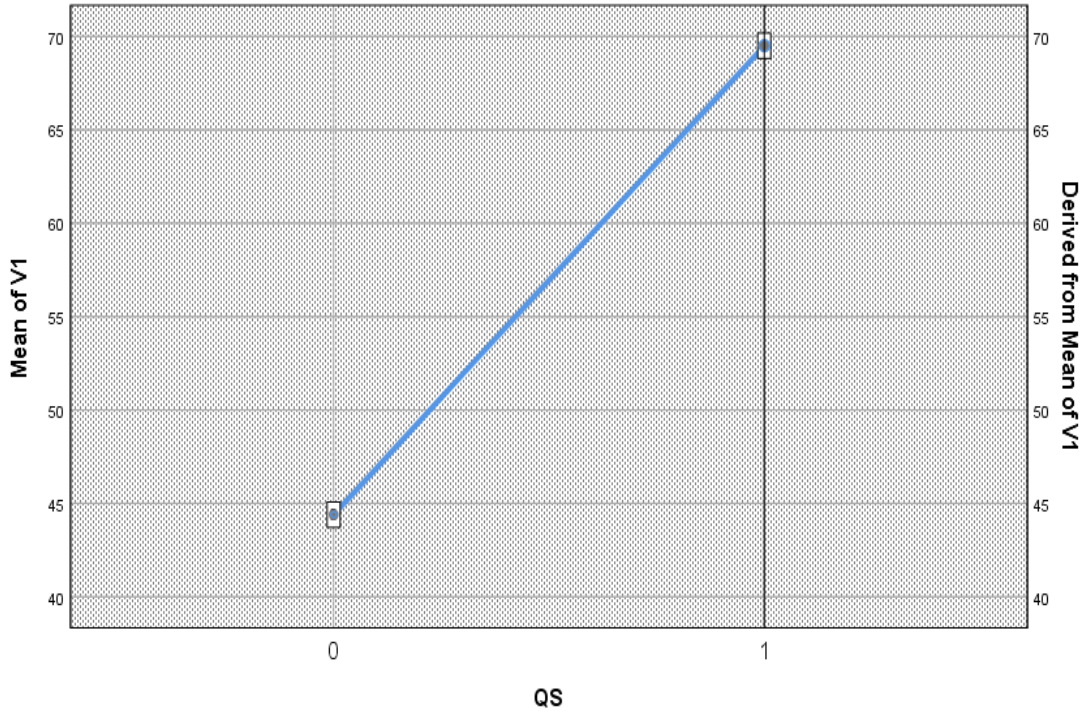


FIGURE 40: QUANTITY SURVEYORS AND OTHERS MEAN PLOT 1

4.10 Correlation/Coefficient

To test the strength of the relationship between the variables needed for contractors in complex projects based on the perceptions of the participants, a Spearman correlation was conducted to ascertain such agreement or disagreement between the groups of construction consultants, since the data collected for this study are non-parametric. However, Field (2009) recommends that,

before conducting such an analysis, a scatterplot graph should be performed. The figure below was thus introduced, which consisted of:

- Architects
- Engineers
- Project Managers
- Quantity Surveyors
- Undisclosed groups

Inside the circle and along the groups are scatterplots that represent the number of participants who submitted the feedback in the research survey.

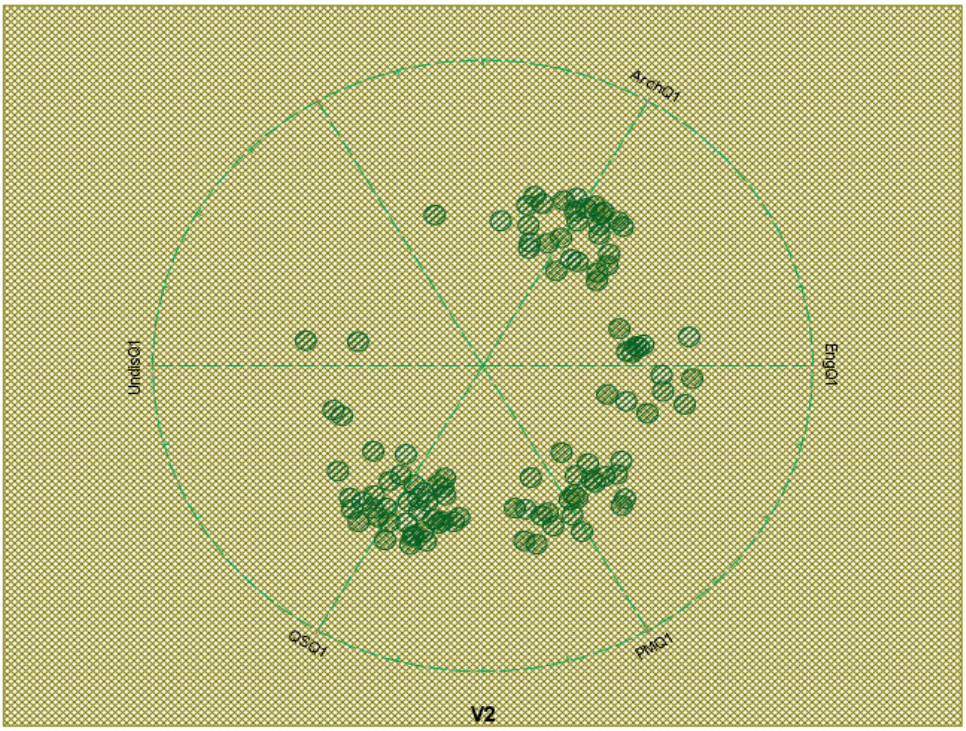


FIGURE 41: GROUPS' SCATTER PLOT 1

According to Alinaitwe (2013), the strength of the relationships of groups of variables being studied is ascertained by the correlation relationships; and a powerful method of examining such relationships between groups of variables is to conduct Spearman's Rank-Order correlation. The correlation coefficient ranges from -1 to +1, and the closer the p-value to +1 or -1, the more closely the variables are related (Alinaitwe, 2013; Memon, 2010). The correlation coefficient of

+ 1.00 is a perfect positive correlation, while a coefficient of -1.00 is a perfect negative correlation; a coefficient of zero means there is no relationship between the two variables (Liphadzi, 2015; Alinaitwe, 2013). Furthermore, this study bases the interpretation of the correlation between various variables on Table 4-52 below.

Correlation Coefficient (r)	Interpretation
-1	Perfect negative relationship
-0.00 to -0.60	Strong negative relationship
-0.59 to -0.30	Moderate negative relationship
-0.29 to -0.01	Weak negative relationship
0	No relationship
0.1 to 0.29	Weak positive relationship
0.30 to 0.59	Moderate positive relationship
0.60 to 0.99	Strong positive relationship
+ 1	Perfect positive relationship

TABLE 65: INTERPRETATION OF CORRELATION (WONGKALASIN, 2013)1

When citing Pallant (2005), Liphadzi (2015) explains that the p-value "is the probability of obtaining a test statistic result of at least as extreme or as close to one that was actually observed assuming that the null hypothesis is true". After the determination of the mean of the variables, the assessment of the respondents' feedback, and the realisation of non-normal data, the researcher used SPSS version 25 to generate a table based on Spearman's correlation coefficient to examine the respondents' consensus in answering all the questions.

The researcher assumed 95% confidence and a 5% confidence interval at the time of estimating the expected number of respondents, and hence the analysis of Spearman's correlation on this study is based on a 0.05 significant level (2-tailed). The interpretation of the correlation between various variables is based on those that have been flagged with an asterisk (*).

4.10.1 Question 1: Correlation of Needed Soft Skills at 0.05 Significant Level (2-tailed).

The objective of this question was to identify the soft skills needed for contractors in complex projects, and a list of variables was compiled and distributed to professionals (consultants) to

determine their perceptions. However, this section aimed at determining the relationship between the variables, and these results are based on the perceptions of the participants – hence Spearman's correlation was used for analysing the associations.

Question 1: Correlations of Needed Soft Skills

Spearman's rho Variables			SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12	SS13	SS14	SS15	SS16	SS17	SS18	SS19	SS20	SS21	SS22	SS23
	SS1	Correlation Coefficient	1	.214*	.252**	.319**	0.019	.262**	0.144	.297**	0.189	0.183	.193*	0.12	0.188	0.088	.201*	0.163	0.068	-0.019	0.054	0.09	0.091	0.063	.231*
		Sig. (2-tailed)		0.03	0.01	0.00	0.85	0.01	0.14	0.00	0.05	0.06	0.05	0.22	0.06	0.37	0.04	0.10	0.49	0.84	0.58	0.36	0.36	0.52	0.02
		N		105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
	SS2	Correlation Coefficient		1	.452**	.469**	.286**	.403**	.382**	.276**	.400**	.261**	.377**	.224*	.269**	.285**	.242*	.292**	.385**	.303**	.372**	.407**	.229*	.313**	.379**
		Sig. (2-tailed)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
		N			105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
	SS3	Correlation Coefficient			1	.287**	.221*	.287**	.415**	.449**	.476**	.392**	.208*	0.057	.276**	0.067	.220*	.277**	.395**	.197*	.340**	.299**	.292**	.341**	.396**
		Sig. (2-tailed)				0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.03	0.56	0.00	0.50	0.02	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
		N				105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
	SS4	Correlation Coefficient				1	.349**	.500**	.367**	.349**	.388**	.350**	.363**	.215*	.352**	.342**	.319**	.363**	.409**	.279**	.501**	.431**	.308**	.267**	.361**
		Sig. (2-tailed)					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
		N					105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
	SS5	Correlation Coefficient					1	.229*	.475**	.428**	.253**	.243*	.205*	0.143	0.183	0.067	.211*	.202*	.295**	.215*	.297**	.207*	0.191	0.19	.287**
		Sig. (2-tailed)						0.02	0.00	0.00	0.01	0.01	0.04	0.15	0.06	0.50	0.03	0.04	0.00	0.03	0.00	0.03	0.05	0.05	0.00
		N						105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
	SS6	Correlation Coefficient						1	.379**	.284**	.423**	.414**	.358**	.363**	.213*	.246*	.421**	.393**	.353**	.269**	.462**	.412**	0.173	0.105	.406**
		Sig. (2-tailed)							0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.08	0.29	0.00
		N							105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
	SS7	Correlation Coefficient							1	.333**	.335**	0.123	.386**	.277**	.307**	.252**	.399**	.296**	.471**	.307**	.385**	.391**	.441**	.443**	.390**
		Sig. (2-tailed)								0.00	0.00	0.21	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N								105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
	SS8	Correlation Coefficient								1	.510**	.463**	0.076	0.159	.247*	0.014	.231*	.309**	.325**	0.123	.296**	0.183	.322**	.321**	.462**
		Sig. (2-tailed)									0.00	0.00	0.44	0.11	0.01	0.89	0.02	0.00	0.00	0.21	0.00	0.06	0.00	0.00	0.00
		N									105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
	SS9	Correlation Coefficient									1	.571**	.248*	.205*	.354**	.198*	.386**	.408**	.418**	0.104	.344**	.306**	.343**	.362**	.370**
		Sig. (2-tailed)										0.00	0.01	0.04	0.00	0.04	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00
		N										105	105	105	105	105	105	105	105	105	105	105	105	105	105
	SS10	Correlation Coefficient										1	.213*	.216*	.300**	0.166	.333**	.363**	.272**	0.08	.418**	.196*	.198*	.249*	.285**
		Sig. (2-tailed)											0.03	0.03	0.00	0.09	0.00	0.00	0.01	0.42	0.00	0.05	0.04	0.01	0.00
		N											105	105	105	105	105	105	105	105	105	105	105	105	105
	SS11	Correlation Coefficient											1	.298**	.466**	.418**	.257**	0.163	.353**	.325**	.348**	.359**	.235*	.279**	.353**
		Sig. (2-tailed)												0.00	0.00	0.00	0.01	0.10	0.00	0.00	0.00	0.00	0.02	0.00	0.00
		N												105	105	105	105	105	105	105	105	105	105	105	105
	SS12	Correlation Coefficient												1	.349**	.367**	.636**	.461**	0.173	.307**	.269**	.396**	.266**	.237*	.358**
		Sig. (2-tailed)													0.00	0.00	0.00	0.00	0.08	0.00	0.01	0.00	0.01	0.02	0.00
		N													105	105	105	105	105	105	105	105	105	105	105
	SS13	Correlation Coefficient													1	.301**	.318**	.201*	.305**	.218*	.269**	.225*	.263**	.285**	.269**
		Sig. (2-tailed)														0.00	0.00	0.04	0.00	0.03	0.01	0.02	0.01	0.00	0.01
		N														105	105	105	105	105	105	105	105	105	105
	SS14	Correlation Coefficient														1	.464**	.278**	.329**	.363**	.315**	.329**	0.149	.215*	.272**
		Sig. (2-tailed)															0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.03	0.01
		N															105	105	105	105	105	105	105	105	105
	SS15	Correlation Coefficient															1	.459**	.277**	.393**	.435**	.363**	.292**	.245*	.388**
		Sig. (2-tailed)																0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
		N																105	105	105	105	105	105	105	105
	SS16	Correlation Coefficient																1	.375**	.210*	.352**	.399**	.564**	.433**	.428**
		Sig. (2-tailed)																	0.00	0.03	0.00	0.00	0.00	0.00	0.00
		N																	105	105	105	105	105	105	105
	SS17	Correlation Coefficient																	1	.300**	.437**	.411**	.404**	.495**	.517**
		Sig. (2-tailed)																		0.00	0.00	0.00	0.00	0.00	0.00
		N																		105	105	105	105	105	105
	SS18	Correlation Coefficient																		1	.305**	.331**	.277**	0.107	.295**
		Sig. (2-tailed)																			0.00	0.00	0.00	0.28	0.00
		N																			105	105	105	105	105
	SS19	Correlation Coefficient																			1	.608**	.292**	.433**	.552**
		Sig. (2-tailed)																				0.00	0.00	0.00	0.00
		N																				105	105	105	105
	SS20	Correlation Coefficient																				1	.426**	.522**	.527**
		Sig. (2-tailed)																					0.00	0.00	0.00
		N																					105	105	105
	SS21	Correlation Coefficient																					1	.702**	.486**
		Sig. (2-tailed)																						0.00	0.00
		N																						105	105
	SS22	Correlation Coefficient																						1	.549**
		Sig. (2-tailed)																							0.00
		N																							105
	SS23	Correlation Coefficient																							1
		Sig. (2-tailed)																							
		N																							

* Correlation is significant at the 0.05 level (2-tailed).

TABLE 66: SPEARMAN'S RHO - NEEDED SOFT SKILLS 1

Question 1: Correlations of Needed Soft Skills																
Spearman's rho	Variables		SS2	SS10	SS11	SS12	SS13	SS14	SS15	SS16	SS17	SS18	SS19	SS20	SS21	SS2-
	SS1	Correlation Coefficient	.214*	0.183	.193*		0.188		.201*			-0.019				
		Sig. (2-tailed)	0.03	0.06	0.05		0.06		0.04			0.84				
		N	105	105	105		105		105			105				
	SS3	Correlation Coefficient			.208*							.197*				
		Sig. (2-tailed)			0.03							0.04				
		N			105							105				
	SS4	Correlation Coefficient				.215*										
		Sig. (2-tailed)				0.03										
		N				105										
	SS5	Correlation Coefficient			.205*		0.183		.211*	.202*		.215*		.207*	0.191	0.19
		Sig. (2-tailed)			0.04		0.06		0.03	0.04		0.03		0.03	0.05	0.05
		N			105		105		105	105		105		105	105	105
	SS8	Correlation Coefficient												0.183		
		Sig. (2-tailed)												0.06		
		N												105		
	SS9	Correlation Coefficient				.205*		.198*								
		Sig. (2-tailed)				0.04		0.04								
		N				105		105								
	SS10	Correlation Coefficient			.213*	.216*								.196*	.198*	
		Sig. (2-tailed)			0.03	0.03								0.05	0.04	
		N			105	105								105	105	
	SS13	Correlation Coefficient										.218*				
		Sig. (2-tailed)										0.03				
		N										105				
	SS14	Correlation Coefficient														.215*
		Sig. (2-tailed)														0.03
		N														105
	SS16	Correlation Coefficient										.210*				
		Sig. (2-tailed)										0.03				
		N										105				
		N														
* Correlation is significant at the 0.05 level (2-tailed).																

TABLE 67: WEAK NEGATIVE AND POSITIVE NEEDED SOFT SKILLS 1

4.10.2 Weak Negative Relationship

According to Table 67 above, there is a weak negative relationship between Communication Skills (SS1) and Ethical and Professional Moral Skills with a correlation coefficient of -0.02 and a significance value of 0.84, which is higher than the benchmark of 0.05.

4.10.3 Weak Positive Relationship

Table 0- 48 above indicates a weak positive relationship between the following variables:

i. Communication Skills (SS1) and Leadership Skills (SS2), with a correlation coefficient (r) of 0.21 and a significant p-value of 0.03(2-tailed). The p-value is lower than the level of significance, $\alpha = 0.05$.

ii. Collaboration/Teamwork Skills (SS3) and Presentation Skills (SS11), with a correlation coefficient of 0.21 with a significance value (p-value) of 0.03 (2-tailed); the significance value is less than $\alpha = 0.05$.
iii. Negotiation Skills (SS4) and Political Skills (SS12), with a correlation coefficient of 0.22 with a significance value (p-value) of 0.03 (2-tailed); the significance value is less than $\alpha = 0.05$.
iv. Critical Thinking and Problem-solving skills (SS5) and Cultural Alignment Skills (SS15) have a positive and weak relationship of 0.21 with a significance value of 0.03 (2-tailed), with the significance value lower than $\alpha = 0.05$.
v. Critical Thinking and Problem-solving Skills (SS5) and Ethical and Professional Moral Skills (SS18) have a positive and weak relationship of 0.22 with a significance value of 0.03 (2-tailed), with a significance value that is lower than the benchmark of $\alpha = 0.05$.
vi. Critical Thinking and Problem-solving Skills (SS5) and Influencing (SS20) have a weak positive relationship of 0.21 with a significance value of 0.03 (2-tailed), with a significance value that is lower than the benchmark of $\alpha = 0.05$.
vii. Information Management Skills and Presentation Skills have a weak positive relationship of 0.21 (2-tailed) with a significance value of 0.03 that is lower than $\alpha = 0.05$.
viii. Information Management Skills (SS10) and Political Skills (SS12) have a weak positive relationship of 0.22 (2-tailed) with a significance value of 0.03 that is lower than $\alpha = 0.05$.
ix. Entrepreneurial Skills (SS13) and Ethical and Professional Moral Skills (SS18) have a weak positive relationship of 0.22 (2-tailed) with a significance value of 0.03 that is less than $\alpha = 0.05$.
x. Stakeholder Management Skills and Motivation Skills have a weak positive relationship of 0.22 (2-tailed) with a significance value of 0.03 that is lower than $\alpha = 0.05$.
xi. Team Integration Skills (SS16) and Ethical and Professional Moral Skills have a weak positive relationship of 0.22 (2-tailed) with a significance value of 0.03 that is lower than $\alpha = 0.05$
xii. Communication Skills (SS1) and Cultural Alignment Skills (SS15) have a weak positive relationship of 0.20 (2-tailed) with a significance value of 0.04 that is slightly lower than $\alpha = 0.05$.

xiii. Collaboration/Teamwork Skills (SS3) and Ethical and Professional Moral Skills (SS18) have a weak positive relationship of 0.20 (2-tailed) with a significance value of 0.04 that is slightly lower than $\alpha = 0.05$.

xiv. Critical Thinking and Problem-solving Skills (SS5) and Presentation Skills (SS11) have a weak positive relationship of 0.21 (2-tailed) with a significance value of 0.04 that is slightly lower than $\alpha = 0.05$.

xv. Critical Thinking and Problem-solving Skills (SS5) and Team Integration Skills (SS16) have a weak positive relationship of 0.20 (2-tailed) with a significance value of 0.04 that is slightly lower than $\alpha = 0.05$.

xvi. Delegation Skills (SS9) and Political Skills (SS12) have a weak positive relationship of 0.21 (2-tailed) with a significance value of 0.04 that is slightly lower than $\alpha = 0.05$.

xvii. Delegation Skills (SS9) and Stakeholder Management Skills (SS14) have a weak positive relationship of 0.20 (2-tailed) with a significance of 0.04 that is slightly lower than $\alpha = 0.05$.

xviii. Information Skills (SS10) and Team Building Skills (SS21) have a weak positive relationship of 0.20 (2-tailed) with a significance value of 0.04 that is slightly lower than $\alpha = 0.05$.

xix. Critical Thinking and Problem-solving Skills (SS5) and Influencing Skills (SS20) have a moderate positive relationship of 0.21 (2-tailed) with a significance value of 0.05 that is equal to $\alpha = 0.05$.

xx. Information Management Skills (SS10) and Influencing Skills (SS20) have a moderate positive relationship of 0.20 (2-tailed) with a significance value of 0.05 that is equal to $\alpha = 0.05$.

xxi. Entrepreneurial Skills (SS13) and Ethical and Professional Moral Skills (SS18) have a moderate positive relationship of 0.22 (1-tailed) with a significance value of 0.05 that is equal to $\alpha = 0.05$.

4.10.4 Concluding Remarks

According to Alinaitwe (2013), a correlation coefficient value that lies between +- 0.1 and +- 0.3 is said to be a low degree of correlation. It can be confirmed that the analysis of these relationships was conducted through the application of SPSS and Spearman, as the data collected for this study proved to be non-parametric (Alinaitwe, 2013; Memon, 2012). Furthermore, the

results are based on the perceptions of the respondents. It was further observed that the smaller the correlation, the higher the significance realised, and vice versa.

However, it is concluded that there is good agreement between the consultants (Architects, Engineers, Project Managers, Quantity Surveyors, and the Undisclosed group (Enshassi, 2012)). It is also confirmed that there is good agreement between the groups (Biketi, 2017) about the relationships of the variables selected for this question.

4.10.5 Question 2: Correlation of the Lack of Soft Skills at 0.05 Significant Level (2-tailed).

Table 68 below represents the correlation of the variables in question 2, based on the perceived results from the participants. The data collected for this study is non-parametric (Alinaitwe, 2013), and Spearman's coefficient of correlation is used to determine the relationship between the variables (Le-Hoai, 2008) that are assumed to be lacking in contractors in complex projects in South Africa.

Correlations

Spearman's rho	variables		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12	SS13	SS14	SS15	SS16	SS17	SS18	SS19	SS20	SS21	SS22	SS23
	SS1	Correlation Coefficient	1	.690**	.595**	.493**	.570**	.505**	.556**	.394**	.435**	.320**	0.093	.200*	.223*	.280**	0.078	.404**	.386**	.300**	.442**	.346**	.338**	.368**	.448**
		Sig. (2-tailed)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.04	0.02	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N		105	105	105	105	105	105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS2	Correlation Coefficient		1	.648**	.444**	.575**	.479**	.559**	.434**	.357**	.432**	0.159	.197*	0.155	.254**	0.186	.523**	.334**	.360**	.450**	.366**	.471**	.492**	.462**
		Sig. (2-tailed)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.04	0.11	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N			105	105	105	105	105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS3	Correlation Coefficient			1	.435**	.574**	.529**	.509**	.510**	.329**	.337**	.211*	.194*	0.179	.208*	0.151	.610**	.394**	.372**	.531**	.447**	.527**	.520**	.490**
		Sig. (2-tailed)				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.07	0.03	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N				105	105	105	105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS4	Correlation Coefficient				1	.486**	.428**	.340**	.272**	.351**	.335**	.204*	.250*	.222*	.252**	.240*	.371**	.350**	.276**	.427**	.305**	.277**	.283**	.319**
		Sig. (2-tailed)					0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.01	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N					105.00	105	105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS5	Correlation Coefficient					1	.623**	.674**	.519**	.483**	.410**	.216*	.307**	.300**	.448**	.365**	.535**	.492**	.485**	.516**	.423**	.568**	.507**	.522**
		Sig. (2-tailed)						0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N						105	105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105.00
	SS6	Correlation Coefficient						1	.561**	.555**	.377**	.407**	0.189	.329**	.325**	.424**	.298**	.560**	.498**	.470**	.347**	.392**	.449**	.401**	.518**
		Sig. (2-tailed)							0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N							105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS7	Correlation Coefficient							1	.568**	.359**	.377**	0.173	.262**	.234*	.335**	.289**	.588**	.417**	.323**	.520**	.415**	.484**	.450**	.401**
		Sig. (2-tailed)								0.00	0.00	0.00	0.08	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N								105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS8	Correlation Coefficient								1	.460**	.515**	.319**	0.164	0.164	.229*	0.128	.501**	.493**	.368**	.479**	.459**	.434**	.424**	.341**
		Sig. (2-tailed)									0.00	0.00	0.00	0.09	0.09	0.02	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N									105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS9	Correlation Coefficient									1	.381**	.352**	.230*	.391**	.275**	0.107	.275**	.563**	.444**	.425**	.355**	.217*	.266**	.418**
		Sig. (2-tailed)										0.00	0.00	0.02	0.00	0.00	0.28	0.01	0.00	0.00	0.00	0.00	0.03	0.01	0.00
		N										105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS10	Correlation Coefficient										1	.445**	.262**	.247*	.454**	.324**	.411**	.374**	.341**	.316**	.374**	.338**	.312**	.303**
		Sig. (2-tailed)											0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N											105	105	105	105	104	105	105	105	105	105	105	105	105
	SS11	Correlation Coefficient											1	.276**	.332**	.447**	.385**	.327**	.287**	.284**	.348**	.425**	0.179	0.172	.305**
		Sig. (2-tailed)												0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.08	0.00
		N												105	105	105	104	105	105	105	105	105	105	105	105
	SS12	Correlation Coefficient												1	.405**	.492**	.611**	.325**	.363**	.415**	.369**	.296**	.381**	.302**	.327**
		Sig. (2-tailed)													0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N													105	105	104	105	105	105	105	105	105	105	105
	SS13	Correlation Coefficient													1	.554**	.430**	.318**	.414**	.312**	.368**	.349**	0.181	.222*	.316**
		Sig. (2-tailed)														0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.02	0.00
		N														105	104	105	105	105	105	105	105	105	105
	SS14	Correlation Coefficient														1	.662**	.447**	.375**	.449**	.215*	.314**	.338**	.234*	.417**
		Sig. (2-tailed)															0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.02	0.00
		N															104	105	105	105	105	105	105	105	105
	SS15	Correlation Coefficient															1	.523**	.286**	.505**	.306**	.327**	.433**	.303**	.335**
		Sig. (2-tailed)																0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N																104	104	104	104	104	104	104	104
	SS16	Correlation Coefficient																1	.478**	.514**	.453**	.492**	.673**	.587**	.601**
		Sig. (2-tailed)																	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N																	105	105	105	105	105	105	105
	SS17	Correlation Coefficient																	1	.632**	.487**	.568**	.422**	.516**	.543**
		Sig. (2-tailed)																		0.00	0.00	0.00	0.00	0.00	0.00
		N																		105	105	105	105	105	105
	SS18	Correlation Coefficient																		1	.381**	.457**	.537**	.399**	.599**
		Sig. (2-tailed)																			0.00	0.00	0.00	0.00	0.00
		N																			105	105	105	105	105
	SS19	Correlation Coefficient																			1	.688**	.447**	.466**	.361**
		Sig. (2-tailed)																				0.00	0.00	0.00	0.00
		N																				105	105	105	105
	SS20	Correlation Coefficient																				1	.481**	.480**	.491**
		Sig. (2-tailed)																					0.00	0.00	0.00
		N																					105	105	105
	SS21	Correlation Coefficient																					1	.654**	.567**
		Sig. (2-tailed)																						0.00	0.00
		N																						105	105
	SS22	Correlation Coefficient																						1.00	.660**
		Sig. (2-tailed)																							0.00
		N																							105
	SS23	Correlation Coefficient																							1
		Sig. (2-tailed)																							
		N																							

* Correlation is significant at the 0.05 level (2-tailed).

TABLE 68: SPEARMAN'S CORRELATION ON PERCEIVED LACKING SOFT SKILLS 1

Correlations							
Spearman's rho	Variables		SS11	SS12	SS13	SS14	SS21
	SS1	Correlation Coefficient		.200*			
		Sig. (2-tailed)		0.04			
		N		105			
	SS2	Correlation Coefficient		.197*			
		Sig. (2-tailed)		0.04			
		N		105			
	SS3	Correlation Coefficient	.211*	.194*		.208*	
		Sig. (2-tailed)	0.03	0.05		0.03	
		N	105	105		105	
	SS5	Correlation Coefficient	.216*				
		Sig. (2-tailed)	0.03				
		N	105				
	SS9	Correlation Coefficient					.217*
		Sig. (2-tailed)					0.03
		N					105
* Correlation is significant at the 0.05 level (2-tailed).							

TABLE 69: WEAK NEGATIVE AND POSITIVE RELATIONSHIPS 1

Table 69 above compares the relationship between the variables based on Spearman's correlation analysis with a significance value of 0.05 (2-tailed). However, a weak positive relationship was observed between the following variables:

i. A weak positive relationship of 0.20 (2-tailed) between Communication Skills (SS1) and Political Skills (SS12) with a significance value of 0.04 that is slightly lower than $\alpha = 0.05$.
ii. A weak positive relationship of 0.20 (2-tailed) between Leadership Skills (SS2) and Political Skills (SS12) with a significance value of 0.04 that is slightly lower than $\alpha = 0.05$.
iii. A weak positive relationship of 0.21 (2-tailed) between Collaboration/Teamwork Skills (SS3) and Presentation Skills (SS11) with a significance value of 0.03 that is lower than $\alpha = 0.05$.
iv. A weak positive relationship of 0.19 (2-tailed) between Collaboration/Teamwork Skills (SS3) and Political Skills (SS12) with a significance value of 0.05 that is equal to $\alpha = 0.05$.

v. A weak positive relationship of 0.21 (2-tailed) between Collaboration/Teamwork Skills (SS3) and Stakeholder Management Skills (SS14) with a significance value of 0.03 that is lower than $\alpha = 0.05$.
vi. A weak positive relationship of 0.22 between Critical Thinking and Problem-solving Skills (SS5) and Presentation Skills (SS11) with a significance value of 0.03 that is lower than $\alpha = 0.05$.
vii. A weak positive relationship of 0.22 between Delegation Skills (SS9) and Team Building Skills (SS21) with a significance value of 0.03 that is lower than $\alpha = 0.05$.

4.10.6 Concluding Remarks

According to Alinaitwe (2013), a correlation coefficient value that lies between +- 0.1 and +- 0.3 is said to have a low degree of correlation. It can be confirmed that the analysis of these relationships was conducted through the application of SPSS and Spearman, as the data collected for this study were proven to be non-parametric (Alinaitwe, 2013; Memon, 2012). Furthermore, the results are based on the perceptions of the respondents. It is further observed that the smaller the correlation the higher the significance realised and vice versa.

However, it is concluded that there is good agreement between the consultants (Architects, Engineers, Project Managers, Quantity Surveyors and the Undisclosed group (Enshassi, 2012)). It is also confirmed that there is a weak relationship among the variables selected for this question.

4.10.7 Question 3: Correlation of the Perceived important Soft Skills at 0.05 Significant Level (2-tailed).

Table 70 below represents the correlation of the variables in question 3, based on the perceived results from the participants. The data collected for this study are non-parametric (Alinaitwe, 2013) Spearman's coefficient of correlation is used to determine the relationship between the variables (Le-Hoai, 2008) that are assumed to be lacking in contractors in complex projects in South Africa.

Correlations

Spearman's rho	Variables		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12	SS13	SS14	SS15	SS16	SS17	SS18	SS19	SS20	SS21	SS22	SS23
	SS1	Correlation Coefficient	1	.328**	.338**	.278**	0.152	.238*	0.122	.247*	.255**	.354**	0.192	0.104	0.034	.194*	0.113	.255**	.196*	.358**	0.104	.213*	.337**	.366**	.354**
		Sig. (2-tailed)		0.00	0.00	0.01	0.12	0.02	0.22	0.01	0.01	0.00	0.05	0.30	0.73	0.05	0.26	0.01	0.05	0.00	0.29	0.03	0.00	0.00	0.00
		N		104	104	103	104	104	104	104	104	104	104	104	104	104	103	104	104	104	104	104	104	104	104
	SS2	Correlation Coefficient		1	.477**	.464**	.277**	.396**	.403**	.284**	.447**	.307**	.264**	0.031	0.118	.279**	0.129	.302**	.347**	.252**	.400**	.398**	.432**	.389**	.415**
		Sig. (2-tailed)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.75	0.23	0.00	0.19	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
		N			105	104	105	105	105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS3	Correlation Coefficient			1	.423**	.231*	.401**	.441**	.500**	.554**	.505**	.193*	.253**	.308**	.304**	.397**	.472**	.418**	.230*	.408**	.343**	.585**	.501**	.378**
		Sig. (2-tailed)				0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
		N				104	105	105	105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS4	Correlation Coefficient				1	.324**	.547**	.466**	.393**	.498**	.331**	.406**	.373**	.401**	.510**	.378**	.368**	.325**	0.177	.534**	.441**	.411**	.314**	.422**
		Sig. (2-tailed)					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00
		N					104	104	104	104	104	104	104	104	104	104	103	104	104	104	104	104	104	104	104
	SS5	Correlation Coefficient					1	.317**	.436**	.349**	.417**	.334**	0.17	0.19	.276**	.244*	.253**	.298**	0.159	.194*	.374**	.322**	.390**	.348**	.323**
		Sig. (2-tailed)						0.00	0.00	0.00	0.00	0.00	0.08	0.05	0.00	0.01	0.01	0.00	0.11	0.05	0.00	0.00	0.00	0.00	0.00
		N						105	105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS6	Correlation Coefficient						1	.529**	.288**	.509**	.373**	.263**	.366**	0.183	.348**	.410**	.408**	.303**	0.183	.399**	.463**	.372**	.299**	.406**
		Sig. (2-tailed)							0.00	0.00	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
		N							105	105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS7	Correlation Coefficient							1	.249*	.491**	.392**	.430**	.279**	.298**	.402**	.394**	.458**	.388**	0.17	.514**	.494**	.472**	.432**	.432**
		Sig. (2-tailed)								0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00
		N								105	105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS8	Correlation Coefficient								1	.592**	.507**	.242*	.220*	.267**	0.152	.274**	.463**	.306**	.207*	.328**	.253**	.493**	.465**	.478**
		Sig. (2-tailed)									0.00	0.00	0.01	0.02	0.01	0.12	0.01	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.00
		N									105	105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS9	Correlation Coefficient									1	.489**	.345**	.343**	.354**	.264**	.360**	.457**	.442**	.211*	.566**	.501**	.489**	.445**	.362**
		Sig. (2-tailed)										0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
		N										105	105	105	105	105	104	105	105	105	105	105	105	105	105
	SS10	Correlation Coefficient										1	.352**	.288**	.360**	.361**	.336**	.396**	.359**	.267**	.355**	.316**	.397**	.450**	.322**
		Sig. (2-tailed)											0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
		N											105	105	105	105	104	105	105	105	105	105	105	105	105
	SS11	Correlation Coefficient											1	.401**	.512**	.371**	.277**	.257**	.335**	.229*	.440**	.422**	.315**	.371**	.458**
		Sig. (2-tailed)												0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00
		N												105	105	105	104	105	105	105	105	105	105	105	105
	SS12	Correlation Coefficient												1	.500**	.449**	.787**	.466**	.260**	.307**	.288**	.359**	.250**	0.15	.260**
		Sig. (2-tailed)													0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.13	0.01
		N													105	105	104	105	105	105	105	105	105	105	105
	SS13	Correlation Coefficient													1	.508**	.471**	.346**	.280**	.241*	.424**	.354**	.317**	.302**	.249*
		Sig. (2-tailed)														0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01
		N														105	104	105	105	105	105	105	105	105	105
	SS14	Correlation Coefficient														1	.522**	.440**	.261**	.252**	.429**	.416**	.314**	.346**	.356**
		Sig. (2-tailed)															0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
		N															104	105	105	105	105	105	105	105	105
	SS15	Correlation Coefficient															1	.565**	.323**	.443**	.416**	.425**	.345**	0.192	.311**
		Sig. (2-tailed)																0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
		N																104	104	104	104	104	104	104	104
	SS16	Correlation Coefficient																1	.517**	.360**	.371**	.467**	.692**	.530**	.572**
		Sig. (2-tailed)																	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N																	105	105	105	105	105	105	105
	SS17	Correlation Coefficient																	1	.390**	.352**	.444**	.489**	.482**	.475**
		Sig. (2-tailed)																		0.00	0.00	0.00	0.00	0.00	0.00
		N																		105	105	105	105	105	105
	SS18	Correlation Coefficient																		1	.227*	0.174	.306**	.226*	.337**
		Sig. (2-tailed)																			0.02	0.08	0.00	0.02	0.00
		N																			105	105	105	105	105
	SS19	Correlation Coefficient																			1	.781**	.499**	.448**	.300**
		Sig. (2-tailed)																				0.00	0.00	0.00	0.00
		N																				105	105	105	105
	SS20	Correlation Coefficient																				1	.582**	.528**	.364**
		Sig. (2-tailed)																					0.00	0.00	0.00
		N																					105	105	105
	SS21	Correlation Coefficient																					1	.797**	.601**
		Sig. (2-tailed)																						0.00	0.00
		N																						105	105
	SS22	Correlation Coefficient																						1	.579**
		Sig. (2-tailed)																							0.00
		N																							105
	SS23	Correlation Coefficient																							1
		Sig. (2-tailed)																							
		N																							

* Correlation is significant at the 0.05 level (2-tailed).

TABLE 70: CORRELATION OF PERCEIVED IMPORTANT SOFT SKILLS 1

Table 71 below compares the relationship between the variables, based on Spearman's correlation analysis with a significance value of 0.05 (2-tailed).

Spearman's Correlations Coefficients							
Spearman's rho	Variables		SS11	SS17	SS18	SS20	SS22
	SS1	Correlation Coefficient		**.196***		.213*	
		Sig. (2-tailed)		**0.05**		0.03	
		N		104		104	
	SS3	Correlation Coefficient	.193*				
		Sig. (2-tailed)	0.05				
		N	105				
	SS5	Correlation Coefficient			**.194***		
		Sig. (2-tailed)			**0.05**		
		N			**105**		
	SS8	Correlation Coefficient			.207*		
		Sig. (2-tailed)			0.03		
		N			105		
	SS9	Correlation Coefficient			.211*		
		Sig. (2-tailed)			0.03		
		N			105		
* Correlation is significant at the 0.05 level (2-tailed).							

TABLE 71: MODERATED POSITIVE RELATIONSHIP 1

However, a weak positive relationship was observed between the following variables:

i. A weak positive relationship of 0.20 (2-tailed) between Communication Skills (SS1) and Self-management Skills (SS17) with a significance value of 0.05 that is equal to $\alpha = 0.05$.
ii. A weak positive relationship of 0.21 (2-tailed) between Communication Skills (SS1) and Influencing Skills (SS20) with a significance value of 0.03 that is lower than $\alpha = 0.05$.
iii. A weak positive relationship of 0.19 (2-tailed) between Collaboration/Teamwork Skills (SS3) and Presentation Skills (SS11) with a significance value of 0.03 that is lower than $\alpha = 0.05$.
iv. A weak positive relationship of 0.19 (2-tailed) between Critical Thinking and Problem-solving Skills (SS5) and Ethical and Professional Moral Skills (SS18) with a significance value of 0.05 that is equal to $\alpha = 0.05$.

v. A weak positive relationship of 0.21 (2-tailed) between Coordination Skills (SS8) and Ethical and Professional Moral Skills (SS18) with a significance value of 0.03 that is lower than $\alpha = 0.05$.
vi. A weak positive relationship of 0.21 (2-tailed) between Delegation Skills (SS9) and Ethical and Professional Moral Skills (SS18) with a significance value of 0.03 that is lower than $\alpha = 0.05$.

4.10.8 Concluding Remarks

According to Alinaitwe (2013), correlation coefficient values that lie between +- 0.1 and +- 0.3 are said to have a low degree of correlation. It can be confirmed that the analyses of these relationships were conducted through the application of SPSS and Spearman, as the data collected for this study were proven to be non-parametric (Alinaitwe, 2013; Memon, 2012). Furthermore, the results are based on the perceptions of the respondents. It is further observed that the smaller the correlation, the higher the realised significant and vice versa.

The analysis would have given a different view if the researcher had performed the analysis based on the individual groups. However, it is concluded that there is weak agreement between the groups of consultants (Architects, Engineers, Project Managers, Quantity Surveyors, and the Undisclosed group (Enshassi, 2012)), and it can be confirmed that there is good agreement between the groups (Biketi, 2017) about the relationships among the variables selected for this question.

4.10.9 Kendall's agreement between Participants, Based on 0.05 Significant Level (2-tailed).

In order to confirm whether there was agreement or disagreement among the groups of consultants (Architects, Engineers, Project Managers, and Quantity Surveyors) on the rating of the variables in questions 4-5 (Kikwasi, 2014), Kendall's tau correlation coefficient (τ) with a significance value of 0.05 (2-tailed) was conducted. The analysis of the agreement was carried out with the use of SPSS, and was based on a 95% confidence level.

4.10.10 Question 4: Benefits of Soft Skills for Contractors in Complex Projects

Tables 72 and 73 below indicate the strength of the relationships between the variables, based on the perceptions of the respondents. The analysis was carried out using Kendall's correlation coefficient with a p-value of 0.05 (2-tailed).

Correlations

Kendall's tau_b	Variables		I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14
	I1	Correlation Coefficient	1	.519**	.541**	.367**	.279**	.195*	.219*	.280**	.251**	.289**	.225*	.259**	.390**	.395**
		Sig. (2-tailed)		0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.00
		N		105	105	105	105	105	105	105	105	105	105	105	105	105
	I2	Correlation Coefficient		1	.539**	.377**	.298**	.270**	.268**	.271**	.302**	.250**	.273**	.212*	.340**	.346**
		Sig. (2-tailed)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00
		N			105	105	105	105	105	105	105	105	105	105	105	105
	I3	Correlation Coefficient			1	.500**	.284**	.315**	.378**	.271**	.341**	.393**	.482**	.411**	.498**	.471**
		Sig. (2-tailed)				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		N				105	105	105	105	105	105	105	105	105	105	105
	I4	Correlation Coefficient				1	.473**	.388**	.401**	.434**	.336**	.202*	.359**	.237**	.434**	.375**
		Sig. (2-tailed)					0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.00
		N					105	105	105	105	105	105	105	105	105	105
	I5	Correlation Coefficient					1	.525**	.504**	.369**	.375**	0.128	.267**	.239**	.424**	.399**
		Sig. (2-tailed)						0.00	0.00	0.00	0.00	0.16	0.00	0.01	0.00	0.00
		N						105	105	105	105	105	105	105	105	105
	I6	Correlation Coefficient						1	.438**	.355**	.364**	.228*	.268**	.247**	.426**	.272**
		Sig. (2-tailed)							0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
		N							105	105	105	105	105	105	105	105
	I7	Correlation Coefficient							1	.527**	.367**	.245**	.314**	.205*	.401**	.406**
		Sig. (2-tailed)								0.00	0.00	0.01	0.00	0.02	0.00	0.00
		N								105	105	105	105	105	105	105
	I8	Correlation Coefficient								1	.584**	.182*	.230**	.242**	.307**	.329**
		Sig. (2-tailed)									0.00	0.05	0.01	0.01	0.00	0.00
		N									105	105	105	105	105	105
	I9	Correlation Coefficient									1	.232*	.237**	.318**	.479**	.378**
		Sig. (2-tailed)										0.01	0.01	0.00	0.00	0.00
		N										105	105	105	105	105
	I10	Correlation Coefficient										1	.535**	.197*	.411**	.349**
		Sig. (2-tailed)											0.00	0.03	0.00	0.00
		N											105	105	105	105
	I11	Correlation Coefficient											1	.456**	.511**	.470**
		Sig. (2-tailed)												0.00	0.00	0.00
		N												105	105	105
	I12	Correlation Coefficient												1	.408**	.366**
		Sig. (2-tailed)													0.00	0.00
		N													105	105
	I13	Correlation Coefficient													1	.639**
		Sig. (2-tailed)														0.00
		N														105
	I14	Correlation Coefficient														1
		Sig. (2-tailed)														
		N														

* Correlation is significant at the 0.05 level (2-tailed).

TABLE 72: KENDALL'S CORRELATION ON IMPORTANCE OF SOFT SKILLS 1

Correlation							
Kendall's tau_b	Variables		I6	I7	I10	I11	I12
	I1	**Correlation Coefficient**	**.195***	**.219***		**.225***	
		Sig. (2-tailed)	**0.03**	**0.02**		**0.01**	
		N	**105**	**105**		**105**	
	I4	**Correlation Coefficient**			**.202***		
		Sig. (2-tailed)			**0.03**		
		N			**105**		
	I6	**Correlation Coefficient**			**.228***		
		Sig. (2-tailed)			**0.01**		
		N			**105**		
	I8	**Correlation Coefficient**			**.182***		
		Sig. (2-tailed)			**0.05**		
		N			**105**		
	I9	**Correlation Coefficient**			**.232***		
		Sig. (2-tailed)			**0.01**		
		N			**105**		
	I10	**Correlation Coefficient**			**1**		**.197***
		Sig. (2-tailed)					**0.03**
		N					**105**

TABLE 73: KENDALL'S CORRELATION ANALYSIS ON IMPORTANCE OF CONSTRUCTION MANAGERS' SOFT SKILLS 1

According to Table 73 above, a weak positive agreement between the following variables was observed:

i. To contribute to the overall performance of the project and to maintain performance continuity in highly uncertain construction environments ($\tau = 0.20$) with a significance value of 0.03 that is lower that the estimated p-value of 0.05.
ii. To contribute to the overall performance of the project and to help change the blame culture and instil a spirit of being a responsible team member ($\tau = 0.22$) with a significance value of 0.02 that is lower than the estimated p-value of 0.05.
iii. To contribute to the overall performance of the project and to reflect the organisation's good image ($\tau = 0.23$) with a significance value of 0.01 that is lower than the estimated p-value of 0.05.

iv. To be more flexible and react quickly to changes and to fulfil the expectation of the client ($\tau = 0.20$) with a significance value of 0.03 that is lower than the estimated p-value of 0.05.
v. To maintain performance continuity in highly uncertain construction environments and to fulfil the expectation of the client ($\tau = 0.23$) with a significance value of 0.01 that is lower that the estimated p-value of 0.05.
vi. To improve interdisciplinary collaboration and multi-stakeholder partnerships on construction site and to fulfil the expectation of the client ($\tau = 0.18$) with a significance value of 0.05 that is equals to the estimated p-value of 0.05. However, according to Yang (2010), if the correlation is significant at a 0.05 level, this means that the two variables have a strong correlation.
vii. To interact with all multi-stakeholders and manage construction processes effectively and to fulfil the expectation of the client ($\tau = 0.23$) with a significance value of 0.01 that is lower than the estimated p-value of 0.05.
viii. To fulfil the expectation of the client and to enhance employability with better career prospects ($\tau = 0.20$) with significance value of 0.03 that is lower than the estimated p-value of 0.05.

In summary, it can be confirmed that there was a weak positive agreement among the participants' perceptions in answering this question.

4.10.11 Question 5: Kendall's agreement between Participants Based on 0.05 Significant Level (2-tailed).

The aim of this section is to analyse the agreement among the participating groups on soft skill training strategies that can be implemented in order to enhance the contractors' soft skill competencies in South Africa.

The bivariate correlation (Kendall's concordance test) was applied to measure the agreement or disagreement among the participants on their rating of the proposed soft skill training strategies (Chan, 2010). Kendall's tau is a non-parametric correlation, and aims to determine whether or not the respondents within an individual group responded in a consistent manner (Chan, 2010).

Table 74 below presents Kendall's correlation analysis based on the perceptions of individual groups' responses on the proposed soft skills training strategies. The focus of the discussion or comment is on the variables that have been highlighted.

Correlations

Kendall's tau_b	Variables		TS1a	TS1b	TS1c	TS2a	TS2b	TS2c	TS3	TS4	TS5
	TS1a	Correlation Coefficient	1	.534**	.440**	0.049	-0.089	-0.114	-0.111	0.109	0.079
		Sig. (2-tailed)		0.00	0	0.571	0.306	0.185	0.199	0.209	0.37
		N		105	105	105	105	105	105	105	105
	TS1b	Correlation Coefficient		1	.390**	0.015	0.001	-0.055	0.055	0.166	0.079
		Sig. (2-tailed)			0.00	0.86	0.99	0.52	0.52	0.05	0.36
		N			105	105	105	105	105	105	105
	TS1c	Correlation Coefficient			1	-0.05	0.038	0.08	0.031	.255**	.177*
		Sig. (2-tailed)				0.53	0.66	0.34	0.72	0.00	0.04
		N				105	105	105	105	105	105
	TS2a	Correlation Coefficient				1	.536**	.296**	.257**	-0.069	0.1
		Sig. (2-tailed)					0.00	0.00	0.00	0.41	0.23
		N					105	105	105	105	105
	TS2b	Correlation Coefficient					1	.420**	.455**	0.107	.279**
		Sig. (2-tailed)						0.00	0.00	0.20	0.00
		N						105	105	105	105
	TS2c	Correlation Coefficient						1	.394**	0.056	.210*
		Sig. (2-tailed)							0.00	0.50	0.01
		N							105	105	105
	TS3	Correlation Coefficient							1	.189*	.248**
		Sig. (2-tailed)								0.02	0.00
		N								105	105
	TS4	Correlation Coefficient								1	.475**
		Sig. (2-tailed)									0.00
		N									105
	TS5	Correlation Coefficient									1
		Sig. (2-tailed)									
		N									

* Correlation is significant at the 0.05 level (2-tailed).

TABLE 74: KENDALL'S CORRELATION ANALYSIS ON SOFT SKILLS TRAINING STRATEGIES 1

Therefore, the level of agreement between these variables was measured using Kendall's correlation coefficient (τ_s), where the coefficient ranges between -1 (negative correlation) and +1 (positive correlation). Furthermore, if the correlation is zero, this means that there is agreement among the participants. However, the researcher's pre-determined significance value was 0.05, and where the agreements among the participants were within the stated p-value, it was assumed that there was a reasonable consensus between the groups answering the survey.

Correlations								
Kendall's tau_b	Variables		TS2a	TS2b	TS2c	TS3	TS4	TS5
	TS1a	Correlation Coefficient		-0.089	-0.114	-0.111		
		Sig. (2-tailed)		0.306	0.185	0.199		
		N		105	105	105		
	TS1b	Correlation Coefficient			-0.055			
		Sig. (2-tailed)			0.52			
		N			105			
	TS1c	Correlation Coefficient	-0.05					.177*
		Sig. (2-tailed)	0.53					0.04
		N	105					105
	TS2a	Correlation Coefficient					-0.069	
		Sig. (2-tailed)					0.41	
		N					105	
	TS2c	Correlation Coefficient						.210*
		Sig. (2-tailed)						0.01
		N						105
	TS3	Correlation Coefficient					.189*	
		Sig. (2-tailed)					0.02	
		N					105	
* Correlation is significant at the 0.05 level (2-tailed).								

TABLE 75: ANALYSIS OF SOFT SKILLS TRAINING STRATEGIES 1

The following negative and positive agreements were observed in Table 75 above:

i. There is a negative agreement between mentorship programme (TS1a) and off-the-job training (TS2b) with a correlation of $\tau = -0.09$ and a significance value of 0.31 that is higher than the pre-determined p-value of 0.05.

ii. There is a negative agreement between mentorship programme (TS1a) and conferences/workshops (TS2C) with a correlation of $\tau = -0.11$ and a significance value of 0.19 that is higher than the pre-determined p-value of 0.05.

iii. There is a negative agreement between mentorship programme (TS1a) and online training (TS3) with a correlation of $\tau = -0.11$ and a significance value of 0.20 that is higher than the pre-determined p-value of 0.05.

iv. There is a negative agreement between coaching (TS1b) and formal classroom training (TS2c) with a correlation of $\tau = -0.06$ and a significance value of 0.52 that is higher than the pre-determined p-value of 0.05.
v. There is a negative agreement between internship (Ts1c) and conferences/workshops with a correlation of $\tau = -0.05$ and a significance value of 0.53 that is higher than the pre-defined p-value of 0.05.
vi. There is a positive agreement between internship (Ts1c) and time space learning (TS5) with a correlation of $\tau = 0.18$ and a significance value of 0.04 that is slightly lower than the pre-defined p-value of 0.05.
vii. There is a negative agreement between conferences/workshops (TS2a) and experiential learning (TS4) with a correlation of $\tau = -0.07$ and a significance value of 0.41 that is higher than the pre-defined p-value of 0.05.
viii. There is a positive agreement between formal classroom training (TS2c) and time space learning (TS5) with a correlation of $\tau = 0.21$ and a significance value of 0.01 that is lower that the pre-defined p-value of 0.05.
ix. There is a positive agreement between online training (TS3) and experiential learning with a correlation of $\tau = 0.19$ and a significance value of 0.02 that is lower than the pre-defined p-value of 0.05.

In summary, based on the perceptions of the consultants and the observed information presented in Table 75 above, it is concluded that there was no agreement among the groups of participants on the suggested soft skill training strategy.

4.11 Combined Groups

In order to determine the final perceived results from the participants, the group results were combined and recorded in descending order based on the five research questions. The mean and standard deviations were calculated using SPSS version 25, and relative indices were determined by dividing the mean score by the highest rating scores, which – together with the mean scores – were used to determine the ranking level of the variables. The five tables below were created based on the survey questions, and present the overall results of the consultants' perspectives.

4.11.1 Question 1: Summary of Perceived Needed Soft Skills

The objective was to determine the perceived soft skills that are needed in contractors in complex projects in South Africa. The results from the participants were combined, and SPSS was used to calculate the mean scores and standard deviations. The researcher divided the sum of the mean scores by the highest rating scale in order to determine the indices of relative importance, which together with the mean score were used to determine the ranking level of the variables. The table below was generated, indicating Communication Skills as the most highly needed soft skill for contractors in complex projects.

Descriptive Statistics					
	N	Mean	Std. Deviation	RII	Rank
SS1	105	4.66	.516	0.932	1
SS5	105	4.53	.760	0.906	2
SS3	105	4.52	.652	0.904	3
SS7	105	4.51	.695	0.902	4
SS2	105	4.47	.606	0.894	5
SS18	105	4.45	.796	0.890	6
SS8	105	4.36	.822	0.872	7
SS17	105	4.30	.911	0.860	8
SS6	105	4.30	.759	0.860	9
SS22	105	4.26	.809	0.852	10
SS16	105	4.23	.763	0.846	11
SS23	105	4.19	.773	0.838	12
SS9	105	4.15	.864	0.830	13
SS21	105	4.14	.871	0.828	14
SS10	105	4.08	.793	0.816	15
SS4	105	3.98	.784	0.796	16
SS20	105	3.73	.812	0.746	17
SS19	105	3.65	.784	0.730	18
SS14	105	3.62	.903	0.724	19
SS15	105	3.49	.942	0.698	20

SS11	105	3.17	.935	0.634	21
SS12	105	3.14	.945	0.628	22
SS13	105	2.97	.893		23

TABLE 76: GROUPS' PERCEPTIONS ON NEEDED SOFT SKILLS 1

According to the results indicated in Table 76, seven soft skills were identified as needed, 15 as highly needed, and only one as least needed.

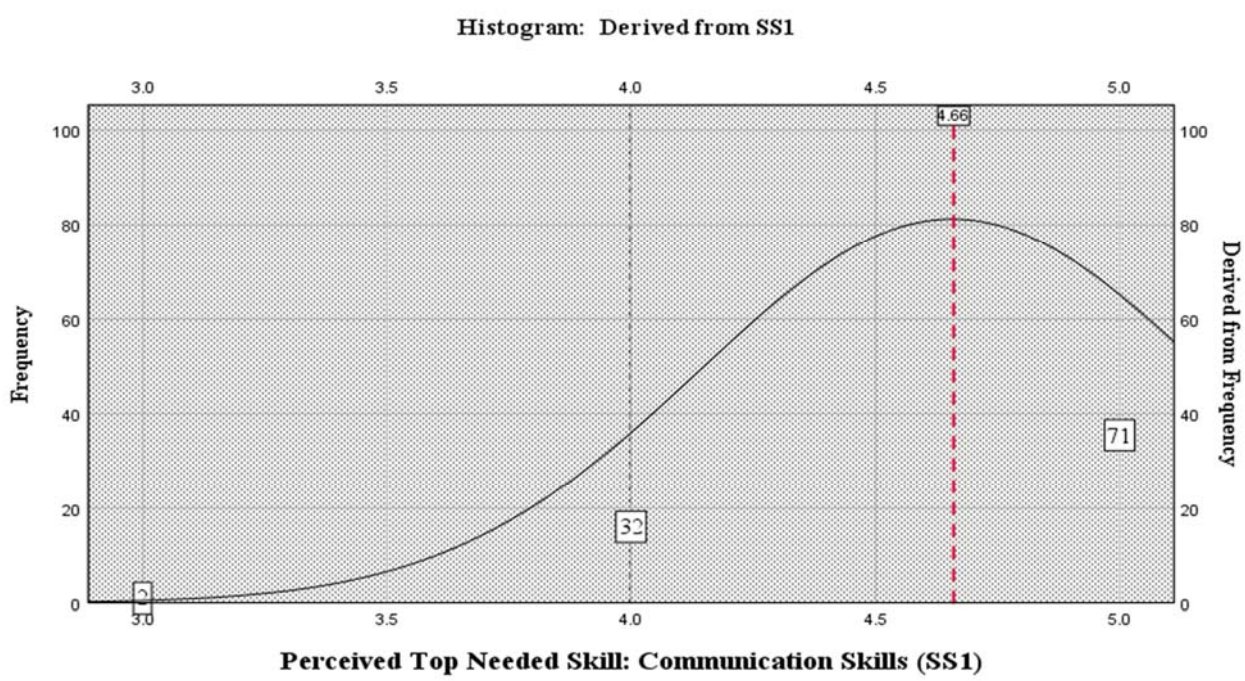


FIGURE 42: COMMUNICATION SKILLS 1

The above figure represents the histogram for Communication Skills, and indicates the results according to the participants' rating, with two participants having rated the skills on a scale of 3, 32 rating on a scale of 4, and 71 participants on a scale of 5.

Although leadership and leadership skills are so critical in construction projects, more particularly in multidisciplinary projects, only 55 participants rated it on a scale of 5, 44 on a scale of 4, and six on a scale of 3, which gave a ranking of 5 in terms of needed soft skills.

4.11.2 Question 2: Summary of Perceived Lacking Soft Skills

Descriptive Statistics					
	N	Mean	Std. Deviation	RII	Rank
SS6	105	2.93	1.112	0.586	1
SS11	105	2.90	1.117	0.580	2
SS12	105	2.84	1.048	0.568	3
SS15	104	2.83	1.056	0.566	4
SS22	105	2.80	.975	0.560	5
SS5	105	2.78	1.109	0.556	6
SS21	105	2.78	1.000	0.556	7

SS3	105	2.76	1.079	0.552	8
SS1	105	2.76	1.061	0.552	9
SS10	105	2.74	1.083	0.548	10
SS23	105	2.72	.956	0.544	11
SS18	105	2.72	1.122	0.544	12
SS8	105	2.70	1.091	0.540	13
SS16	105	2.70	1.018	0.540	14
SS14	105	2.70	.962	0.540	15
SS7	105	2.69	1.095	0.538	16
SS13	105	2.69	1.086	0.538	17
SS2	105	2.68	1.105	0.536	18
SS4	105	2.63	.923	0.526	19
SS19	105	2.51	.889	0.502	20
SS17	105	2.51	1.011	0.502	21
SS20	105	2.47	.844	0.494	22
SS9	105	2.22	.980	0.444	23

TABLE 77: GROUPS' PERCEPTIONS ON LACK OF SOFT SKILLS 1

According to the overall mean scores (results) in the table above, no soft skills are lacking in contractors in complex projects, since all have been rated below 3.

4.11.3 Question 3: Summary of Perceived Important Soft Skills

In order to determine the perceived importance of various soft skills, this study used both mean scores and a relative importance index to rank the variables, and hence Table 78 below was created. Furthermore, using the one-way ANOVA test, Table 62 above showed significance values that are greater than the p-value of 0.05, which means there is a significant agreement on participants' perceptions of the level of importance of contractors' soft skills in complex projects.

Descriptive Statistics						
		N	Mean	RII	Std. Deviation	Rank
Communication Skills	SS1	104	4.63	0.926	.671	1
Critical Thinking and Problem-solving Skills	SS5	105	4.54	0.908	.694	2
Decision-making Skills	SS7	105	4.51	0.902	.681	3
Leadership Skills	SS2	105	4.48	0.896	.637	4
Ethics and Professional Moral Skills	SS18	105	4.45	0.890	.877	5
Collaboration/Teamwork Skills	SS3	105	4.42	0.884	.731	6
Conflict Management Skills	SS6	105	4.32	0.864	.778	7
Coordination Skills	SS8	105	4.24	0.848	.872	8
Self-management Skills	SS17	105	4.22	0.844	.920	9
Motivation Skills	SS22	105	4.16	0.832	.810	10
Team Integration Skills	SS16	105	4.11	0.822	.974	11
Team Building Skills	SS21	105	4.08	0.816	.906	12
Interpersonal Skills	SS23	105	4.08	0.816	.948	13
Delegation Skills	SS9	105	4.03	0.806	.882	14
Information Management Skills	SS10	105	4.00	0.800	.888	15
Negotiation Skills	SS4	104	3.95	0.790	.793	16
Influencing Skills	SS20	105	3.74	0.748	.920	17
Stakeholder Management Skills	SS14	105	3.74	0.748	.991	18
Persuasion Skills	SS19	105	3.66	0.732	.830	19
Cultural Alignment Skills	SS15	104	3.47	0.694	1.140	20
Political Skills	SS12	105	3.26	0.652	1.152	21
Presentation Skills	SS11	105	3.19	0.638	1.029	22
Entrepreneurial Skills	SS13	105	3.03	0.606	1.014	23
	Valid N	102				

TABLE 78: GROUPS' PERCEPTIONS ON IMPORTANCE OF SOFT SKILLS 1

The mean results in the table above indicate that eight soft skills are important and 15 are highly important. However, no soft skills were identified as unimportant or extremely unimportant. Communication Skills was rated the highest needed soft skill for contractors in complex projects with an overall mean score of 4.66, and was again rated as the most important soft skill in question 3, with an overall mean score of 4.63 – slightly less than that rated in question 1. This is an indication that the ability to communicate project information effectively during the

construction process is highly important for the success of projects. On the other hand, lack of communication has an impact on information sharing among the project team members, and results in various variation orders, reworks and, ultimately, loss of time and cost overruns. Leadership Skills recorded an overall mean score of 4.48 and ranked number four in terms of important soft skills essential for contractors in complex projects, below Communication Skills, Critical Thinking and Problem-solving Skills, and Decision-making Skills. Leadership and Leadership Skills are very important for any individual assigned to a project and taking on the responsibilities of managing such a temporary endeavour to its final stage of operation.

In reference to the study carried out by Salleh (2015) on gauging industry's perspectives on the soft skills of graduate architects, Communication Skills was rated highly important although it was categorised with three skills with mean scores ranging between 4.51- 4.64. Leadership Skills was also rated hihly important, with a mean score of 4.38 – less than the mean scores recorded by Teamwork, Problem-solving, Listening, and Time Management Skills. Poor Communication Skills and poor Site Management and Supervision Skills are often highlighted as factors contributing to construction project delays.

It is therefore concluded that the perceptions of the participants in the construction industry clearly indicate that Leadership and Leadership Skills are not considered important, although many projects failed to achieve their objectives due to lack of leadership skills and poor communication during the construction process.

4.11.4 Question 4: Summary of Perceived Importance of Soft Skills in Complex Construction Projects

Descriptive Statistics					
	N	Mean	Std. Deviation	RII	Rank
I10	105	4.55	.679	0.910	1
I2	105	4.51	.590	0.902	2
I1	105	4.50	.637	0.900	3
I3	105	4.45	.707	0.890	4
I13	105	4.38	.685	0.876	5
I7	105	4.38	.859	0.876	6

I6	105	4.35	.734	0.870	7
I5	105	4.35	.759	0.870	8
I4	105	4.34	.770	0.868	9
I9	105	4.30	.786	0.860	10
I14	105	4.25	.757	0.850	11
I8	105	4.25	.794	0.850	12
I11	105	4.15	.830	0.830	13
I12	105	3.83	1.051	0.479	14

TABLE 79: GROUPS' PERCEPTIONS ON IMPORTANCE OF CONSTRUCTION MANAGERS' SOFT SKILLS 1

Respondents were neutral in answering variable I12 (To enhance employability with better career prospects I12) but agreed on all the other important soft skills in complex construction projects.

4.11.5 Question 5: Summary of Perceived Training Strategies

Descriptive Statistics					
	N	Mean	Std. Deviation	RII	Rank
TS1a	105	4.30	.695	0.860	1
TS1b	105	4.18	.731	0.836	2
TS1c	105	4.08	.978	0.816	3
TS4	105	3.89	1.031	0.778	4
TS2b	105	3.43	.989	0.686	5
TS2c	105	3.36	1.001	0.672	6
TS5	105	3.35	1.047	0.670	7
TS2a	105	3.30	.990	0.660	8
TS3	105	2.85	1.054	0.570	9

TABLE 80: GROUPS' PERCEPTIONS ON SOFT SKILLS TRAINING STRATEGIES 1

According to the results in the table above, respondents agreed on 3 training strategies

- Mentorship Programme (TS1a)
- Coaching (TS1b)
- Internship (TS1c)

Furthermore, they were neutral on five other training strategies:

- Experiential Learning (TS4)
- Short Courses in Soft Skills (TS2b)
- Formal Classroom Training (TS2c)
- Time Space Learning (TS5)
- Conference/Workshop (TS2a)

However, all who responded disagreed on one training strategy:

- Online Training (TS3)

4.12 Qualitative data collection method

The identification and selection of potential members to constitute a panel of experts is an important consideration when carrying out a research study (Yadollahi, 2014). The selection of expert participants for this study was crucial because the validity of the study was directly related to the selection process (Yadollahi, 2014). Hence, Project Managers and Architects were selected to participate in the interview processes. A semi-structured interview strategy was used to collect qualitative data (text data). In order to stimulate the conversation during the interviews, all interview questions were formulated or semi-structured in an unbiased way. A common question is, "How many qualitative interviews are enough to reach a sensible conclusion?" The answer to this question depends on many factors that might influence the outcome of the research, including the research method, such as interpretive phenomenological analysis, which is likely to entail a much smaller sample size due to the fine-grained analysis that is often involved (Baker, 2012). Furthermore, there is very little consensus about what the minimum sample size for a qualitative interview should be, as long as the researcher is able to justify the reason for the conclusion (Baker, 2012).

4.12.1 Research Interview Process

The interviews were conducted to enhance the semi-structured questions. Participants were first contacted by telephone and asked whether they were willing to be interviewed and whether they could propose the date and time that would best suit their schedule. A list of semi-structured interview questions was sent via email to those who agreed to be interviewed prior to the date of the interview, in order to enable them to go through the questions and prepare themselves. Eight

construction professionals (three project managers and five architects) agreed to be interviewed. The interviews took place in different places, such as the interviewees' offices (in a closed boardroom) and the interviewer's workplace (also in a closed boardroom). The project managers and architects were interviewed at separate times, although some of the interviews took place on the same date but at different time slots.

Of those who agreed to be interviewed, only one female architect participated in the interview process. In order to speed up the interview process, the interviewees were asked whether an audio-recording of the interview process could be made; a cell phone voice recorder was used to capture the proceeding of the interviews with the agreement of the interviewees. Participants from the two disciplines – project management and architecture – were selected on the basis that they were, in most cases, appointed by the client as the principal agent on a construction project, and that they dealt directly with the contractor on a continuous basis throughout the life cycle of the project. Therefore the assumption was that they understood the contractor's strengths and weaknesses in relation to the research topic (which entailed the investigation of the contractors' soft skills competencies in complex projects) better than other consultants, such as quantity surveyors and engineers. In order to gain the trust of the prospective interviewees, the researcher declared that he respected everyone's privacy, and that all information would only be shared with the institution through which the researcher was studying.

4.12.2 Qualitative Data Analysis

In a qualitative research strategy, data are non-numeric and not able to quantified (Visesbora, 2015), and so the qualitative data for this study were analysed through content analysis.

4.12.3 Demographic profile of interviewees

Title	Gender	Years of Experience	Years in Practice	Date of Interview
#1. Project Manager	Male	22	7	01 June 2018
#2. Project Manager	Male	+-30	25	08 June 2018
#3. Project Manager	Male	35	?	08 June 2018

#4. Architect	Male	12	12	11June 2018
#5. Architect	Male	25	25	11 June 2018
#6. Architect	Male	38	38	11 June 2018
#7. Architect	Male	45	45	11 June 2018
#8. Architect	Female	16	16	15 June 2018

TABLE 81: DEMOGRAPHIC PROFILE OF INTERVIEWEES 1

The objective of the first and second questions of the interview was to determine whether the interviewee understood complex projects, since the research topic was based on contractors' soft skills competencies in complex projects.

4.12.4 Question 1 of the interview: What are the causes of project complexity?

The objective was to identify the causes of project complexity.

Interviewees' perceptions of the causes of project complexity differed, with the following being identified:

- Location,
- Size of the project,
- Nature of the project/design,
- Technology required that goes into the project,
- Dealing with heritage issues,
- Client needs and expectations,
- Multidisciplinary project teams,
- Renovations and refurbishment,
- Coordination and communication,
- Budget constraints.

What are the various way of dealing with complex projects?

The objective was to identify ways in which complex projects can be dealt with. The following information and perceptions were identified by the participants:

- Brainstorm the project to identify the major components of the project – called the 'micro-side' of the project,
- Break the project into groups,
- Look at the high-level cost component,
- Break the project into macro-components, which is more detailed planning,
- Break it into micro-components, which is the sequencing of the activities,
- Detailed cost estimate of the project,
- Planning and programming.

4.12.4 Definition of Soft Skills

According to one of the interviewees' perceptions, Interpersonal Skills basically characterises the person. The personal skill enables a leader to manage a complex project with a large team. That means the qualities that leaders should have must enable them to build trust with a large team.

Examples of Soft Skills as per the interviewees' perceptions

- Attitudes,
- Ethics,
- Communication and time management,
- Problem-solving,
- Time management,
- Ability and willingness to learn,
- Conflict management,
- Leadership,
- Listening skills,
- Interpersonal skills.

4.12.5 Important Soft Skills

What are the most important Soft Skills for contractors in complex construction projects?

- Attitude,
- Thinking Ability,

- Leadership Skills,
- Decision-making Skills,
- Self-discipline.

How significant are the contractors' Soft Skills competencies in complex projects?

- Very significant, if the contractor has the ability to gain the trust and respect of all.

What do you think are the most important Soft Skills that could make a project successful?

- Attitude,
- Communication,
- Decision-making abilities,
- Interpersonal Skills,
- Discipline,
- Collaboration.

4.12.6 Lack of Soft Skills

What are the Soft Skills that contractors are missing in complex projects?

- Communication Skills,
- Ability to think on their feet to make quick decisions,
- Planning in general,
- Stakeholder management (not taking stakeholders into their heart),
- Discipline.

How do the Soft Skills affect the success of the construction projects?

- The consequence of not having the necessary skills can affect the project,
- If Communication Skills and Interpersonal Skills are lacking,

Why are the contractor's Soft Skills associated with project success?

- Soft Skills are a major contribution to the completion of the project within budget and time,
- To achieve the required quality,

- Because projects have a collective goal, and therefore it can only be achieved by collective teamwork.

4.12.7 Soft Skills Assessment

What strategies can you use to evaluate a construction site manager in complex projects?

- One-on-one meetings to determine the attitude of the individual and ask about work experience,
- Monitor and observe how they communicate with me,
- Question their knowledge of planning,
- Observation.

How do you identify if the construction site manager lacks Soft Skills?

- It will be picked up immediately through the level of communication,
- Through his/her level of planning,
- By seeing the results.

4.12.8 Soft Skills Development

What training programmes would you recommend to enhance contractors' Soft Skills competencies?

- Formal training,
- Basic management skills,
- Computer skills,
- Very importantly – mentorship programme.

4.12.9 Concluding Question

What would you like to add or share that was not covered in the interview questions?
The following points are the interviewees' perceptions in concluding their interviews:

- Currently experience a shortfall in our industry relating to construction managers lacking mentorship,
- Transfer of intellectual property for more people down the line does not exist, or certainly is not where it should be,

- Technology has a major influence on how things are done nowadays,

4.12.10 Summary of the Interviews

Although participants were provided with the interview questions in advance of the interview date, not all of them took the time to look at the questions and prepare for the interview. Hence some interviews took longer than expected, and not because the questions were long or difficult. The first interview took 13:47 minutes because the participant was well-prepared for the interview.

CHAPTER 5

5. Findings

The purpose of this study was to investigate construction professionals' perceptions of construction managers' soft skills in complex construction projects in South Africa. The objectives of the study, together with the research questions, were compiled, and a survey questionnaire consisting of 23 variables was emailed to construction professionals (consultants); 105 responses were received. The responses were analysed through the application of SPSS, and each variable was assigned a mean score that was converted into a ranking level. According to the descriptive statistics used for this study, the findings are as follows:

5.1 Needed Soft Skills

The objective of question 1 was to identify soft skills competencies that are needed for construction managers in complex projects in South Africa. A five-point Likert scale was used to determine the needed, highly needed, and extremely needed soft skills. According to the descriptive statistics used for this study, the following soft skills were found to be highly needed by construction managers in complex projects:

5.2 Highly Needed Soft Skills

- Communication Skills (SS1),
- Critical Thinking and Problem-solving Skills (SS5),
- Collaboration/Teamwork Skills (SS3),
- Decision-making Skills (SS7),
- Leadership Skills (SS2),
- Ethical and Professional Moral Skills (SS18),
- Coordination Skills (SS8),
- Self-management Skills (SS17),
- Conflict Management Skills (SS6),
- Motivation Skills (SS22),
- Team Integration Skills (SS16),
- Interpersonal Skills (SS23),

- Delegation Skills (SS9),
- Team Building Skills (SS21),
- Information Management Skills (SS10),

5.3 Needed Soft Skills

In the descriptive statistics used for this study, the following soft skills were found to be needed by construction managers in complex projects:

- Negotiation Skills (SS4),
- Influencing Skills (SS20),
- Persuasion Skills (SS19),
- Stakeholder Management Skills (SS14),
- Cultural Alignment Skills (SS15),
- Presentation Skills (SS11),
- Political Skills (SS12).

5.4 Lack of Soft Skills

The objective of this section was to identify soft skills that are lacking from contractors in complex projects in South Africa. Based on the feedback and perceptions of the participants, and the analysis carried out with SPSS, it can be confirmed that no soft skills were identified as lacking in contractors, since none of the variables had achieved a mean score of 3 or above.

5.5 Important Soft Skills

The objective of question 3 was to identify soft skills that are important for construction managers in complex projects in South Africa. A five-point Likert scale was used to rate each variable with a range between extremely unimportant (1) and extremely important (5). According to the descriptive statistics used for this study, the findings were as follows:

5.6 Very Important Soft Skills

According to the descriptive findings of this study, 15 soft skills with mean scores ranging between 4 and 5 were very important for construction managers to possess in complex construction projects. These are further explained below:

Communication skills (SS1): Multi-disciplinary team members in a complex construction project need to communicate effectively in order to share the information necessary for the success of the project. According to Yap *et al.* (2017), communication becomes complex, but it is essential for the successful delivery of a construction project. Poor communication between the project team members in issuing information and revising drawings may cause project delays and cost overruns. Ineffective communication among project team members is a major cause of project overruns, rework, and disputes (Yap *et al.*, 2017). However, Livesey (2016), cited by Yap *et al.* (2017), states that an effective communication management plan encourages a collaborative culture that develops a cohesive multidisciplinary team in complex construction projects. Poor communication is the most common project risk in construction because it can cause decreased performance, a higher turnover of staff, increased unnecessary expenditure, and thus affect the progress and quality of the project (Senaratne, 2015). In addition, Senaratne (2015) states that effective communication has the power to break down barriers by bringing construction project team members together, thereby propagating improved collaboration and integrated working within the construction team. Furthermore, effective communication in complex projects is important in design change management, and is required for project coordination to improve any change efficiently and effectively. According to Hosseini *et al.* (2017), in the context of construction project teams, the quality of communication among project team members is of the utmost importance, plays a pivotal role in enhancing the effectiveness of construction teams, and is a prerequisite for the success of an organisation. Reinertsen (1997), cited in Gresseth *et al.* (2017), states that the most important quality of communication is not to increase the flow of information, but rather to reduce the need for information.

Critical Thinking and Problem-solving Skills (SS5): Complex construction projects consist of multidisciplinary professional organisations that are geographically dispersed and work on different computer software, which creates design problems. Furthermore, the complexity of the design, including the problems and challenges associated with it, requires a construction

manager who can critically analyse the design and the challenges through his/her thinking process to resolve any discrepancies or unnecessary structural elements in the designs, including conflicting designs. According to the perceptions of the participants, critical thinking and problem-solving skills were found to be highly needed and very important for construction managers in complex projects, and were rated second on both objectives. However, in order to ensure effective problem-solving, problems need to be solved at the lowest possible level, thus minimising the possibilities of disputes in contractual relationships (Meng, 2012).

Decision-making Skills (SS7): Due to the complexity of the projects, challenges brought about by geographically-dispersed organisations and fragmented procurement strategies, construction professionals' decision-making skills were found to be highly needed and very important in complex projects. Construction projects are often delayed and incur extra costs due to the lack of decision-making skills. According to Doloi *et al*. (2012), slow decision-making from the client is due to the lack of proper coordination between the owner and the consultants or the owner and the contractor. However, decision-making skills were ranked 4 on objective 1 (needed Soft Skills), and ranked 3 on objective 3 (important Soft Skills).

Leadership Skills (SS2): Complex construction projects involve multidisciplinary organisations with project team members who have different knowledge, skills, and experiences. The complexity of these organisations and the knowledge, skills, and experience brought to the projects need to be integrated in order to collaborate and work towards a mutual objective. Therefore the integration of the different organisations in a complex project requires a construction manager with leadership skills that will enable him/her to apply his/her abilities and capabilities in motivating and leading the project team members to a single mutual objective. Construction managers' leadership skills have been recognised as one of the key factors affecting the performance of construction projects (Zhang *et al*., 2013). The comments made in the Egan Report (Egan, 1998: 14), cited in Picken (2017), state that in 1998 there was "a lack of a burning commitment of leaders in construction to improve quality and efficiency through change of organisational culture"; and Construction Excellent (2015), cited by Picken (2017), considered leadership to be a significant contributor to the construction sector's performance. Furthermore, construction managers' lack of soft skills, such as leadership skills and effective stakeholder engagement, are a common cause of project failure (Picken, 2017). Construction managers

therefore need to acquire and apply their leadership skills so that a healthy relationship among the project stakeholders is continuously maintained during the execution of the complex project.

However, according to the descriptive findings of this study, Leadership Skills was found to be highly needed with a ranking of 5, and very important with a ranking of 5. Therefore it is necessary to expect construction managers, as leaders of the construction activities in complex projects, to be equipped with both the hard and soft skills of leadership (Ngang *et al.*, 2013). According to Skipper and Bell (2006a), cited by Archer *et al.* (2010), in construction people are hired for their technical skills, fired for their lack of people skills, and promoted for their management skills.

Ethical and Professional Moral Skills (SS18): Moral and professional ethics require construction managers with positive attitudes, who are punctual, and who can adapt to the changing political landscape, the increase in complexity, and the many other challenges encountered in complex projects.

Collaboration/Teamwork Skills (SS3): Collaboration is increasingly becoming a preferred way of delivering projects involving multiple partners, suppliers, and customers (Chakkol *et al.*, 2017) and hence soft skill competencies among the project team members are a necessity to manage large and complex projects successfully. The construction supply chain in South Africa is fragmented, and operates in an environment of uncertainty and complexity, which complicates collaborative work (Sebastian, 2011). According to Saunders *et al.* (2012), cited by Ayegba *et al.* (2018), collaboration means building a democratic approach to communication and decision-making when constructing, planning, taking, and evaluating each action, research, stage, or cycle. Furthermore, collaboration enables access to more resources through sharing with other parties, and allows access to new technology and knowledge transfer for business enhancement (Ayegba *et al.*, 2018). However, large infrastructure projects are too complex for a single organisation, and so multidisciplinary organisations are co-located and work together as a single organisation aiming to achieve one common goal. According to Livesey (2016), managing multidisciplinary team members involves a different set of soft skills from those more technical construction management skills. However, it is the quality of collaboration among these parties that will influence the success of a complex construction project. Within the construction industry, some of the well-known problems in collaboration are communication, fragmentation,

and adversarial relationships (Kokkonen, 2017). According to Yap *et al.* (2017), cited by Ayegba *et al.* (2018), the construction industry is moving away from traditional contracting practices to collaborative and long-term working relationships. The willingness to cooperate and collaborate with other project team members, as opposed to working seperately or competitively, should be the fundamental role of construction managers in complex projects (Zhang, 2013). Although collaboration enhances project performance, it costs money in terms of coordination, communication, adaptation, and commitment to achieve it (Ayegba *et al.*, 2018).

Conflict Management Skills (SS6): Due to the diversity of the multidisciplinary and multicultural team members in complex construction projects, it is inevitable that conflicts arise between parties to the contract, and they are often highlighted as a major factor undermining the effectiveness of the project team members, thereby contributing to project failure (Zhang *et al.*, 2013). Furthermore, construction managers work with different people from different organisations with different cultural backgrounds. However, people also differ in their ways of thinking, their perspectives, experiences, attitudes, expectations, and emotional intelligence, all of which may lead to conflict in complex projects (Choudary, 2015). Conflict occurs when parties in a contract disagree on contactual matters, and one party seeks his/her own self-interest and is not willing to compromise for the benefit of the project. Furthermore, in construction projects, conflict among project team members often occurs within the team on the task owing to the involvement of various professionals, and such conflict could result in undesirable outcomes related to time, cost, and quality of the project (Senaratne, 2012). According to the descriptive findings, Conflict Management Skills is found to be highly needed and very important for construction managers in complex projects.

Coordination Skills (SS8): According to Sebastian (2011), cited by Lavikka *et al*. (2015), the lack of coordination between construction supply parties is one of the key reasons for poor performance in the construction industry. Furthermore, Yap *et al.* (2017) state that the lack of timely and effective communication in complex construction projects has an adverse impact on coordination among project participants. The lack of coordination among the various professional organisations in a complex project causes design changes that ultimately delay the project and require the construction manager's soft skills competencies to deal with such changes and delays that might have an impact on the success of the project. According to Sebastian (2011), contractual coordination is known to be important in defining financial and other rights,

whereas procedural coordination is needed during the project execution phase. Coordinating the collaborative work among multidisciplinary organisations in a complex project is demanding, due to high levels of uncertainty and the complexity of design and construction (Sebastian 2011). However, the construction industry in South Africa still lacks knowledge on the coordination of collaborative work among muldisciplinary organisations. According to Doloi *et al*. (2012), the non-availability of drawings/designs on time is generally due to lack of coordination between the construction site and the design office. Furthermore, Doloi *et al.* (2012) state that poor site management and supervision clearly highlights the lack of coordination between the various bureaucractic hierachies involved in complex projects.

Self-management Skills (SS17): Construction managers in complex projects are expected to have positive attitudes, be punctual, lead by example, and be able to adapt according to the needs of the complex project. However, these skills have a weak positive relationship of 0.20 (2-tailed) with Communication Skills (SS1).

Motivation Skills (SS22): A construction manager must be an inspirational leader who is capable of motivating the project team through the difficulties and challenges that might be experienced during the planning and execution of the construction project.

Team Integration Skills: Multidisciplinary and multicultural project team members need to be integrated and form a coherent organisation that is capable of tackling the challenges brought about by the complexity of the project.

Team Building Skills (SS21): Team building is the formal and informal team-level interventions that focus on improving social relations and clarifying roles, as well as solving task and interpersonal problems that affect team functioning (Aga *et al*., 2016). Therefore a construction manager, with his/her team building skills, should identify and establish team building strategies that will enable, enhance, and inspire the team in their respective roles. The construction manager has to clarify to the team members the overall objectives of the project and their respective roles to ensure the success of the project.

Interpersonal Skills (SS23): According to Aga *et al*. (2016), interpersonal skills inspire a frank discussion of relationships and conflicts among team members by clearing up hidden agendas and resolving conflicts. Furthermore, Aga *et al.* (2016) state that a construction manager's

interpersonal skills increase team work, such as mutual supportiveness, communication, and sharing of feelings.

Delegation Skills (SS9): Complex projects involve multiple activities that need much attention at all times, and a single responsible construction manager may not be capable of overseeing all of them at the same time. These activities are scheduled to be constructed concurrently or sequentially, and require much attention from an individual who is equipped with the necessary knowledge and skills. Therefore, the construction manager should be someone with delegation skills that will enable him/her to delegate his/her responsibilities to other employees with the necessary skills.

Information Management Skills (SS10): According to Yap *et al.* (2017), inadequacy of information exchange results in bad project performance. Many contruction projects fail to achieve the objectives of the client due to poor information management skills and a lack of proper systems of capturing information issued and outstanding information. This results in delays due to late information, which results in cost overruns.

Construction management is a multifaceted activity that demands a wide range of knowledge and hard and soft skills to accomplish the construction of complex projects successfully and according to the client's expectations. Construction managers' soft skills can be developed during the construction of complex projects through the process of collaborative working with other project team members from different backgrounds and with different priorities. These soft skills are considered to enrich construction professionals' competencies and thereby increase their ability to support communal progress and transformation. Furthermore, good construction professionals with essential soft skills are expected to be committed to their work and have the ability to take the initiative during the construction of complex projects.

5.7 Important Soft Skills

According to the descriptive statistics used for this study, the following soft skills were found to be important for construction managers in complex projects.

- Negotiation Skills (SS4),
- Influencing Skills (SS20,
- Stakeholder Management Skills (SS14),

- Persuasion Skills (SS19),
- Cultural Alignment (SS15),
- Political Skills (SS12),
- Presentation Skills (SS11),
- Entrepreneurial Skills (SS13),

5.8. Importance of soft skills in complex construction projects

The objective of this section was to ascertain the importance of soft skills in complex projects. A questionnaire was compiled and emailed to participants for data collection; 105 responses were received.

According to the descriptive statistics, thirteen variables obtained mean scores that were above 3.99 and less than four, which means that there was a positive agreement among the participants. Only one variable (To enhance employability with better career prospects) obtained a mean score of 3.85, which is less than four, which means that participants were neutral when rating the variables.

However, soft skills are found to be important for construction managers in:

- Fulfilling the expectations of the client,
- Performing effectively during the management of complex construction projects
- Contributing to the overall performance of the project
- Maintaining efficiency and producing quality outcomes
- Optimising construction organisations' performances in complex projects
- Helping to change the blame culture, and instilling a spirit of being a responsible team member
- Maintaining performance continuity in highly uncertain construction environments
- Allowing construction managers to organise the workforce in a way that better responds to the needs of the project
- Being more flexible and reacting quickly to changes
- Interacting with all multi-disciplinary stakeholders and managing complex construction project processes effectively,

- Embracing team selection and allocation of work according to varying project requirements
- Improving interdisciplinary collaboration and multi-stakeholders' partnerships on the construction site,
- Reflecting the organisation's good image
- Enhancing employability with better career prospects

5.9 Soft Skills Training Strategies

The objective was to identify training needs that can be used to enhance construction managers' soft skills in order to be competent in complex projects. The question comprises nine strategies. The collected data were analysed, and according to the descriptive statistics used for this, the findings reveal that there was agreement among the participants on the following training strategies:

- Mentorship (TS1a),
- Coaching (TS1b),
- Internship (TS1c),

However, there was only slight agreement or a neutral response among the participants on the following training strategies:

- Experiential learning (TS4),
- Short course in soft skills (TS2b),
- Formal classroom training (TS2c),
- Time space learning (TS5),
- Conferences/Workshops (TS2a).

There was disagreement among the participants on the following training strategy, which could not obtain a mean score of 3 or above:

- Online training (TS3)

5.10 Discussion

Due to the complexity and challenges faced by the construction industry in South Africa, technical (hard) skills alone are no longer adequate for construction managers in complex projects. Furthermore, the fragmented and geographically dispersed nature of construction organisations increases the distances between project team members and impacts on the management skills that are necessary to complete complex construction projects successfully. The increasing complexity of construction projects, the number of multidisciplinary project team members involved, and the associated time and budget overruns and contractual conflicts also clearly indicate that construction managers' technical skills alone are no longer sufficient for complex projects. According to Taylor (2016), there is no agreement about what soft skills actually are, which are important for managers, and how to acquire them. This statement adds to the comments of Furuoka (2011), Taylor (2005), and Blackmore (1999) when saying that "no completely satisfactory model of human skill yet exists". Hence, the purpose of this study was to investigate construction professionals' perceptions of construction managers' soft skills in complex projects in South Africa.

According to Zhang (2013), the complexity of construction projects places a greater emphasis on construction managers' need for soft skills, due to the unique and complex nature of the stakeholders, project team members, the multiplicity of requirements, and the difficulty in coordinating all the resources required for a project. Therefore, to achieve the first objective, this study aimed to identify the needed soft skills for construction managers in complex projects in South Africa. Based on the responses from participants, a descriptive analysis was carried out and 15 soft skills were identified as highly needed for construction managers, with Communication Skills (SS1), Critical Thinking and Problem-solving Skills (SS5), Collaboration/Teamwork Skills (SS3), Decision-making Skills (SS7), and Leadership Skills (SS2) identified as the top five. Furthermore, the study identified seven needed soft skills for construction managers in complex projects. According to Ahn (2012), these soft skills enable construction managers to succeed in today's complex, dynamic, and challenging complex projects, and also to be able to influence and interact with all key stakeholders, including subcontractors and the direct workforce.

According to Levasseur (2013), many technical people lack soft skills that would enable the organisation to achieve an optimal performance. Furthermore, Sunindijo (2013) states that, due

to the fast-changing environment of the construction industry and its increasing challenges, construction managers find themselves confronted by new issues, and have to undertake roles that have not traditionally been part of their responsibility. Thus, their roles have to be adapted and supplemented with non-technical skills in order to meet today's professional demands. Therefore, in order to achieve the second objective, the study aimed to identify the soft skills lacking in construction managers in complex projects. However, the results of the descriptive analysis indicated that no soft skills were lacking in construction managers in complex projects. According to Freeman (2017), institutions and employers from different industries have realised and eulogised the importance of the soft skills, and the need to complement construction professionals' technical skills. Furthermore.

Mitchell (2016) states that soft skills have become more important to employers, due to the growth in the number of jobs that have service responsibilities, and the types of organisation that require collaboration and communication. Therefore, the third objective of the study was to determine the importance of construction managers' soft skills in complex projects. According to the descriptive analysis conducted for this study, it was found that 15 soft skills are very important, while eight were found to be important. Communication Skills were found to be highly needed and very important on objective 1 and 3. According to Zulch (2014), communication skills are important to project success, and have been refferred to as the 'life blood' of a project because project team members need to share information, discuss the information, make decisions, and coordinate all the information related to the project. According to the study of Zhang (2012), communication achieved a mean score of 4.54, which was less than that in the current study by 0.11 (mean score), but was still within the range of 4 – 4.99. Furthermore, Nasir (2011) states that soft skills such as communication, teamwork, and interpersonal skills are more important because managers not only work with machine, but also work with other people with whom they have to interact.

The fourth objective was to identify the importance of the construction managers' soft skills in complex projects. According to the descriptive analysis conducted for this study, it was found that 13 variables obtained mean scores that were above 3.99 and less than 4, which means that there was positive agreement among the participants. Only one variable (To enhance employability with better career prospects) obtained a mean score of 3.83, which is less than 4, and means that participants were neutral when rating the variables.

According to Jain (2013), the acquisition of managerial soft skills through training is essential and leads to better-performing managers. Therefore, without the acquisition of what have come to be called 'soft skills', the level of potential success in the context of business transactions, production, and international trade cannot be maximised (Hang, 2015). Eriksson (2017) states that complexity in infrastructure projects raises the need for learning to develop new ranges of adaptive solutions when circumstances change. Therefore, in order to achieve the fifth objective of this study, descriptive statistics were produced, and it was found that participants agreed on Mentorship (TS1a), Coaching (TS1b), and Internship (TS1c) as the training strategies that could be used by construction managers to acquire the soft skills required for complex projects. However, further results indicate that there was only a slight agreement or a neutral response among the participants when rating the following:

- Experiential learning (TS4),
- Short course in soft skills (TS2b),
- Formal classroom training (TS2c),
- Time space learning (TS5),
- Conferences/Workshops (TS2a).

Although this analysis identifies Mentorship (TS1a) with a mean score of 4.30, Coaching (TS1b) with a mean score of 4.18, and Internship (TS1c) with a mean score of 4.08 as the preferred training strategies for soft skills, the correlation analysis carried out in determining the agreement among the groups indicated a negative agreement. Therefore it can be confirmed that the growing level of construction project complexity, the increasingly specialised division of trades, and the professionalsation of organisations requires a higher level of leadership, communication, collaboration/teamwork, problem-solving, decision-making, and coordination of the information necessary for the successful outcome of the project (Guangdong, 2017). Guangdong (2017) adds that effective communication enables project team members clearly to understand each other's views and intentions, explicitly to determine their rights, responsibilities, and benefits, and to facilitate teamwork.

In addition to the identified soft skills, their importance, and training strategies, Spearman's correlation was conducted on questions 1 – 3 in order to determine the relationships among the different soft skills. The results revealed that there were weak positive relationships between the

variables. Furthermore, Kendall's correlation was conducted on questions 4 and 5 in order to determine the agreement among the participants when rating the various variables. The results indicated a weak positive agreement for question 5 and a negative and positive agreement among the participants when rating the different training strategies.

5.11 Conclusion

The construction industry covers a wide range of projects, and every project is unique in nature, at it involves myriads of interrelated activities, tasks, work packages, and stakeholders (Joseph, 2016). The gaps between the hard and soft skill levels of construction professionals are widening, while construction projects are becoming more complex and demanding; thus the effective management of complex projects is hampered (Heerden, 2018). It was established from the literature review that soft skills postitively affect project performance, while project complexity has negative effects on it (Khattak, 2016). Therefore, the purpose of this research was to investigate construction professionals' perceptions of construction managers' soft skills in complex projects in South Africa. The descriptive study has provided convincing evidence for the significance of soft skills in the success of complex construction projects. Therefore, this study has identified a list of soft skills, the importance of soft skills in complex projects, and related training needs, which were used to collect data from construction professionals. The responses were first put in tables according to the rating scales in order to determine the perceptions of the construction professionals when rating the individual variables. However, a mixed method, which was both quantitative and qualitative, was applied in this study. A survey method was used to collect the quantitative data, while structured interviews were used to collect the qualitative data. Data were collected from architects, project managers, quantity surveyors, and engineers.

This research was limited to construction professionals based in Gauteng Province (South Africa). Furthermore, the study was limited to construction managers in complex projects consisting of multidisciplinary organisations with interdisciplinary team members from various backgrounds. This study was not intended to compare the relationship between the technical and soft skills of construction managers.

In order to determine the reliability of the study, Cronbach's alpha was first used on individual disciplines and then on combined disciplines; the results were found to exceed 0.70, as suggested by both Nunnally (1978) and Martin (2005). However, the generalisability of the findings across all provinces in South Africa is uncertain, because the study was only conducted in Gauteng Province due to time and cost constraints; so further studies that encompass all provinces could be conducted.

To achieve the research objectives, the study had to address the research questions first. The aim of the first objective was to identify the needed soft skills for construction managers in complex projects in South Africa. Descriptive statistics were used to analyse the results in order to determine the mean scores and standard deviations, which were further used to determine the relative importance index and the ranking of the variables. According to the descriptive statistics and the mean scores of the variables, the results indicated that 15 soft skills were highly needed, while seven were needed soft skills.

The second objective aimed to identify the soft skills that were lacking in construction managers in complex projects. However, according to the respondents' perceptions and the descriptive analysis, no soft skills were found to be lacking.

The third objective aimed to determine the soft skills that are important for construction managers in complex projects. The results revealed that 15 soft skills were very important, and eight were considered important.

The fourth objective aimed to determine the participants' agreement on the importance of construction managers' soft skills in complex projects. The results indicated that participants agreed on 13 variables and were neutral on one variable. Similarly, the aim of objective 5 was to determine the participants' agreement on the training strategies that could be used to enhance construction managers' soft skills. Participants agreed on three training strategies and were neutral on five others. This study conducted Spearman's correlations on the first three objectives, and it was found that there is a weak positive relationship among the variables. Kendall's correlation was conducted on questions four and five. The results of question 4 indicated that there was a weak positive agreement between participants, while question 5 indicated negative and positive agreement on certain variables.

Although the survey was unable to identify any soft skills that are missing or lacking in contractors, according to interviewees' perceptions, the following were identified as lacking:

- Interviewee 1 (#1) mentioned that communication is lacking in the construction industry, and that people tend to rely on technology, which has a major impact on how people communicate. In addition to the list of variables already provided, the following soft

skills were mentioned as lacking in contractors: their lack of the ability to think on their feet, and to make quick decisions.

- Interviewee 2 (#2) mentioned Communication Skills, Leadership Skills, Teamwork Skills, and Conflict Management Skills.
- Interviewee 4 (#4): Lack of respect
- Interviewee 5 (#5) mentioned problem-solving, communication, coordination, and delegation as lacking in contractors in South Africa.
- Interviewee 8 (#8) mentioned discipline and communication skills as major problems in the construction industry, and also mentioned the problem with internet and emails, saying that once the person had sent an email, they did not make any effort to communicate the problem with a phone call or by requesting a meeting.

The following soft skills were mentioned by interviewees as the most important soft skills for construction managers in complex projects:

- #1: Attitude skills, thinking ability, leadership, communication, and decision-making skills
- #2: Communication skills and leadership skills
- #3: Leadership skills and ability to communicate
- #4: Communication skills
- #5 mentioned communication, team building, motivation, and information management skills

According to #1, a mentorship programme was the preferred training strategy for contractors to enhance their soft skills; yet it was currently lacking in the construction industry. #4 mentioned on-site training or mentorship programmes as strategies to enhance contractors' soft skills. #5 stated that, in order to learn soft skills, one needs to be on site and see exactly what is happening, and not sit in an office behind a computer.

Due to the increasingly challenging and dynamic nature of the stakeholders, socioeconomics, the uncertainty of projects, and the fragmentation of the procurement system, the complexity of today's projects puts pressure on the construction industry to recruit, retain, and develop human capital not only in technical skills but also in management skills. According to Wald (2012), complex temporary organisations require integration and diverse forms of management that would facilitate the effective and efficient functioning of project team members actively to create

and develop collaborative relationships other than the traditional technical skills such as planning, scheduling and organising. The construction industry is viewed as one of the most information-dependent industries; thus the quality of communication is a key factor in the success of projects (Senaratne, 2015).

According to Rios-Carmenado (2015), technical competencies are not sufficient for today's world. This statement was supported by Bag (2016), who stated that most procurement professionals lack essential soft skills, which are more important than hard skills. In addition, Ogunsanmi (2016) asserted that construction managers need to be equipped with various essential skills that will enable them to prosecute complex projects diligently and effectively. Hence, construction managers as leaders of the actual construction process need to be competent in both hard and soft skills in order to be successful in their professions. Rahman (2016) stated that, as construction leaders, construction managers must use their knowledge, experience, technical skills, and soft skills to adopt or adapt any specific leadership role, based on work that needs to be done during the construction phase.

As a leader, the construction manager's responsibility is to create a joint team that works collaboratively towards a common goal (Pyykko, 2017). Diverse and multidisciplinary teams on a complex project are difficult to manage, and need a capable leader with both technical and soft skills who can identify the right fit for the project, and bring the whole team under one roof and have them work collaboratively in order to complete the project successfully (Kashya, 2017).

Construction managers are key players in the construction phase of a project; and much of the fate of a project lies in their hands through their use of soft skill competencies in addition to technical skills. Soft skills are very important in the construction industry, due to the presence of multidisciplinary stakeholders and the complexity of construction projects that require continuous interaction among project team members in sharing information, making clear decisions, resolving problems, and managing conflict that might affect the success of the project.

However, based on the challenges and the complexity of construction projects, it is important that construction managers and consultants are equipped with the essential soft skills in order to interact effectively with all stakeholders. Construction projects involve multidisciplinary stakeholders who have to share information, communicate the information, make clear decisions, and motivate and influence project team members to collaborate and work towards one mutual

goal. Construction projects often involve disagreement, and there are always conflicts; this requires project team members who possess both technical and soft skills in order to be able to resolve the differences before disputes occur. In addition, the success of complex projects depends on construction managers' abilities to take charge of the strategic management, and structure the temporary organisations (direct employees, and selected and domestic subcontractors) in order to collaborate and communicate relevant information throughout the project's life cycles.

According to Meng (2011), a lack of open communication is the main reason for the failure of construction partnering, while effective communications facilitate the exchange of ideas and visions, which results in fewer misunderstanding and stimulates mutual trust. Thus effective communication is important for project success, while ineffective communication can lead to misundestandings in construction projects (Zulch, 2014). In addition, coordination among participants during the planning, designing, and construction processes is a major challenge in complex construction projects in South Africa. Since communication skills, critical thinking and problem-solving skills, collaboration skills, decision-making skills, and leadership skills carry higher weight among the soft skills, it is necessary to focus on developing construction managers' professional language proficiency.

Developing the indispensable competencies of construction managers would ensure the efficient performance of complex construction projects. This study has identified contractors' soft skills competencies that are needed in complex projects, and the findings clearly assume that such competencies could enhance the success of complex projects in South Africa. It is further assumed that increased training and development in soft skills will enhance contractors' ability to execute complex projects.

Base on the literature review and the findings of this study, it can be inferred that there are challenges in the construction industry due to the lack of important soft skills among project team members, and that this impedes the performance of the construction industry.

5.9 Recommendations

Although this research was unable to identify the soft skills lacking in contractors in complex projects, based on the participants' perceptions, it was quite clear that soft skills are important

and essential for construction managers in complex projects. Thus it is suggested that construction organisations make it a policy that all construction managers be assessed prior to being assigned to a complex project. If found to lack the essential soft skills, such persons should be provided with adequate training that will enable them to interact and participate effectively in all matters relating to the project.

This study contributes to our knowledge by revealing the key soft skills that are necessary for construction managers in complex construction projects.

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